CONSTRUCTION PLASTICS INITIATIVE BENCHMARKING STUDY

An investigation into plastic diversion from Canadian construction projects

Light House

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Cover Image: The Construction Plastic Initiative's signature collection bin for plastic showing instructions to construction crews on accepted plastics. As part of the Construction Plastics Initiative (CPI) ten construction sites are participating in the collection and diversion of all plastics generated during each construction project.

Images throughout this report show the plastic value chain developed by the Construction Plastic Initiative.

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EXECUTIVE SUMMARY

This benchmarking study, conducted by Light House as a foundational step of the Construction Plastics Initiative (CPI), analyzes plastic waste diversion across 253 LEED-certified construction projects in Canada completed between 2009 and 2019. Building on Light House's 2020 Watching Our Waste report, this study provides the first focused analysis of plastic-specific waste diversion intensity (measured in kg/m^2) to establish a baseline for the data collection through CPI.

The analysis revealed statistically significant differences in plastic diversion intensities by building type, region, and year. Institutional and residential buildings exhibited the highest diversion intensities. Key findings include:

- **Plastic waste diversion intensity is influenced by building type**. Moreover, the variability across building typologies suggests that construction practices and project-specific factors may also play a key role. Across all LEED projects analyzed, the average plastic waste diversion intensity ranged from 1.1 to 2.7 kg/m^2, with institutional and residential buildings producing significantly more plastic waste per square metre than educational buildings.
- **Statistically significant regional differences were observed** between Alberta and Quebec, suggesting that provincial context, including supply chain behaviour, waste infrastructure, and policy frameworks, can impact diversion outcomes in these provinces.
- **Year of project completion emerged as a predictor of plastic waste diversion intensity**. A notable peak in 2015 closely aligns with national trends in plastic disposal.
- **Plastic waste diversion data showed wide variation, but most projects clustered below 1.0 kg/m^2**, aligning with international studies. The presence of a long "tail" of higher values (extending up to 10 kg/m^2) may be linked to projects that included demolition waste in their reporting.
- **Current reporting systems make it difficult to track plastics specifically**, as they are often included in commingled waste streams or inconsistently reported by haulers and contractors.

To illustrate the volume of plastic diverted, the construction of an educational complex such as the St. George campus of the University of Toronto with a total floor area of approximately 260,000 m^2 and the lowest plastic intensity of 1.12 kg/m^2 would divert 291,000 kg of plastic, equivalent to 48,500,000 plastic bags. An institutional building with the highest plastic diversion intensity, like the Hospital for Sick Children in Toronto with an area of 260,000 m^2, would divert 700,000kg of plastic, equivalent to 140,000,000 plastic bags.

It is important to note that interpreting these results is challenging due to, among multiple other factors, inconsistencies in LEED reporting practices, regional construction dynamics, and the exclusion of total plastic waste data.

This report demonstrates the need for more granular and standardized reporting of construction plastics, as well as targeted interventions to support diversion. Recommendations include supplier engagement to minimize plastics coming onsite, improved on-site plastic collection and sorting, enhanced tracking tools to accurately measure and report plastic volumes, and the extension of Extended Producer Responsibility (EPR) regulations to the industrial, commercial, and institutional (ICI) construction sector. These actions will support Canada's transition to a circular built environment and provide a framework for future data-driven policy and practice in construction waste management.

All plastics generated from construction sites participating in the Construction Plastics Initiative are collected separately from other construction waste.

1. INTRODUCTION

In 2024, Light House initiated the Construction Plastics Initiative (CPI) to capture, track, process and reuse plastic materials generated from construction sites in Metro Vancouver. The first-of-its-kind initiative is tracking plastic waste from ten construction projects in the region, documenting the types and volumes of each plastic type, pelletizing specific resins through an extrusion process and working with plastic manufacturers to incorporate the plastic into new building products.

As a preliminary step, this benchmarking report analyzed plastic waste diversion data from 253 LEED-certified projects in Canada to establish a baseline against which to assess findings from CPI. This report builds on an unprecedented study entitled *Watching Our Waste*, conducted by Light House in 2020, that analyzed construction waste diversion patterns across 690 LEED-certified projects in Canada.[1] Drawing from project-level waste reports, *Watching Our Waste* offered a detailed view of how different material categories (wood, concrete, drywall, metal, and others) were diverted from landfills during building construction. Among these categories, plastic waste emerged as a poorly understood stream, frequently underreported and often embedded in co-mingled waste streams, representing a small portion of total weight but raising disproportionate environmental concerns.

Report objectives

The overall objective of this report is to establish a baseline understanding of plastic waste diversion in Canadian LEED-certified construction projects, in order to provide a point of reference for findings from

1 Light House (2020). *Watching Our Waste: Analysis of Material Waste from LEED-Certified Projects in Canada*. light-house.org

the upcoming Circular Plastics Initiative (CPI) and guide future efforts to improve plastic waste reporting and reduction strategies on construction sites. More specifically, the study's objectives are to:

- Quantify plastic waste diversion intensities (kg/m^2) across LEED-certified construction projects.
- Compare plastic waste diversion intensities across building types (e.g., residential, commercial, institutional).
- Evaluate regional variations in plastic waste diversion.
- Assess temporal trends in plastic waste diversion across projects completed from 2009 to 2019.

This report focuses exclusively on plastic waste diversion in LEED projects, recognizing the urgent need to better quantify and contextualize plastic use in the construction sector. Plastics, particularly in the form of packaging, protective wraps, and temporary site materials, are light in weight but high in environmental persistence, frequently missed by effective recycling systems in the construction sector. Importantly, this study provides no insight into the end fate of the plastics diverted, whether they were recycled, repurposed, or otherwise managed, only that they were reported as kept out of landfill.

It is important to highlight that, despite their relatively low share of construction waste by mass, plastics carry a disproportionately high carbon intensity compared to many other construction materials, amplifying the environmental cost of their disposal and underscoring the importance of diversion and reduction strategies. For instance, in the US Environmental Protection Agency's Waste Reduction Model tool, PVC and PP emit approximately 1.93 kg and 1.52 kg of CO_2e (CO_2 equivalent) per kg of material produced. In contrast, drywall and asphalt concrete average 0.22 kg and 0.11 kg CO_2e per kg produced.[2] These comparisons illustrate how even small amounts of plastic waste can have a carbon footprint, reinforcing the critical importance of reducing and diverting plastic volumes to achieve waste and climate goals.

The LEED project dataset used in this study offers a unique and detailed source for analyzing construction plastic waste diversion at scale. By requiring projects to report diversion intensities and waste stream details, LEED enables insights that are otherwise rare in the construction sector, where plastic is often included under mixed waste categories. Public concerns about plastic pollution, the implementation of Extended Producer Responsibility (EPR) policies for retail packaging, and the pending requirement for producers of plastics in the construction sector to report out through Canada's Federal Plastics Registry[3] signal a broader shift toward circular economy goals and material accountability for the construction industry in Canada. By exploring both the intensity of plastic waste diversion (measured as kilograms per square metre of floor area) and the variation of these values across provinces, building types, and project timelines, this report highlights opportunities for reduction, reuse, and innovation in managing construction plastics.

It is the intention of this study to help inform decision-making for designers, contractors, developers, policymakers, and LEED project teams. Ultimately, this work will contribute to Canada's broader efforts to reduce plastic pollution in the built environment.

2 US Environmental Protection Agency, Waste Reduction Model Tool, Version 16, December 2023, epa.gov/waste-reduction-model
3 Environment and Climate Change Canada. (2024). Federal Plastics Registry. canada.ca/en/environment-climate-change

Plastic waste generated on construction sites includes a wide variety of materials, including plastic film, protective packaging, stretch wrap, pipe, strapping and foam corner guards.

2. RELATED WORK

Plastics are a ubiquitous, but often overlooked, component of modern construction. Their uses span a wide range of applications, from functional building components like piping, insulation, and vapour barriers, to temporary or single-use materials such as stretch wrap, strapping, foam corner guards, plastic film, and protective packaging. Many of these materials are critical during the transportation and installation of construction products, but are quickly discarded and rarely recovered, especially when they are combined with mixed or co-mingled waste streams.

While the lightweight of plastic makes it less visible in weight-based waste accounting, its low density and compressibility mean it can take up considerable space in construction waste streams if not compacted or managed properly. Metro Vancouver's waste audit, referenced in Light House's report, ***Watching Our Waste***, showed that plastics represented a smaller share by weight but could still occupy significant volume if unmanaged.[4] This characteristic, combined with its persistence in landfills, makes plastic a disproportionately challenging material to address. Plastics are often hard to recycle and frequently become contaminated with adhesives, soil, or other materials, or are mixed with multiple resin types, all of which diminish their market value and recoverability.

Recent research shows the pressing need to address plastic waste in the construction sector. In a comprehensive review, Santos et al. (2023) examine the current global state of recycling for plastic waste from construction, renovation, and demolition (CRD) activities.[5] By analyzing challenges such as high material

4 Light House Sustainable Society. (2020). *Watching Our Waste: Analysis of Material Waste from LEED-Certified Projects in Canada*. light-house.org

5 G Santos, E Esmizadeh, M Riahinezhad. (2023). Recycling Construction, Renovation, and Demolition Plastic Waste: Review of the Status Quo, Challenges and Opportunities. *Journal of Polymers and the Environment*. doi: 10.1007/s10924-023-02982-z

contamination, sorting complexity, low economic viability, and policy gaps, the authors highlight the reality that most CRD plastic waste currently ends up in landfills despite its theoretical recyclability. Among other findings, this work determined that approximately 80% of the plastic waste from on-site construction activities is clean packaging and can be easily diverted from landfills, which presents an opportunity for higher intensities of diversion. The authors detail technological options, including mechanical and chemical recycling, and emphasize the need for improved collection infrastructure, regulatory price signals, and manufacturer-led product design for recyclability initiatives to enable large-scale CRD plastic recycling. By identifying these systemic barriers and proposing a framework for logistical collaboration between manufacturers and construction sites, the study stressed both the challenges and strategic opportunities for closing plastic waste loops, insights that directly inform the recommendations of this report to adopt collection networks, targeted product design, and regulatory alignment in construction waste management.

A growing body of research has attempted to characterize plastic waste from construction. For instance, Low et al. (2025) audited plastic waste across six new-build construction sites in Auckland, New Zealand, to better understand the composition and sources of plastic waste in the construction industry.[6] The research team collected and analyzed 7.2 tonnes of plastic waste, categorizing it by function, construction stage, and plastic type. The study found that soft plastics constituted the largest portion by mass (45%), followed by PVC and HDPE pipes (22%), and expanded polystyrene (5%). Notably, most plastic waste was generated during the final stages of construction. The average plastic waste intensity was 0.61 kg/m^2. This was similar to values reported by Berry et al. (2022) and significantly higher than figures reported in similar studies, highlighting the need for standardized plastic waste management practices.[7] Low et al. (2025) recommended targeted separation of key plastic types on-site, particularly during the finishing stages, to enhance landfill diversion and support circular economy initiatives.

While there have not been reports of plastic waste generation in construction in Canada, the Canada Plastics Pact (CPP) has aimed to quantify plastic waste from the industrial, commercial, and institutional (ICI) sectors. Most waste audits done by local governments and those conducted by Statistics Canada report plastic waste under aggregated categories or exclude construction-specific plastic streams altogether. This lack of disaggregation makes it difficult to benchmark performance or develop effective reduction strategies.

In the Circular Economy Roadmap, the CPP acknowledge this gap, calling for improved tracking, pilot programs for plastic reuse, and better collaboration with manufacturers.[8] However, comprehensive data on the generation and diversion of plastic waste in construction remains sparse, particularly for non-residential projects, where product complexity and subcontractor layers affect plastic usage.

This study represents the first stage in addressing that data gap by reviewing LEED project data and focusing exclusively on plastic waste diversion patterns, offering a clearer picture of where plastic is used, how much is diverted, and how performance varies across project types, regions, and time periods.

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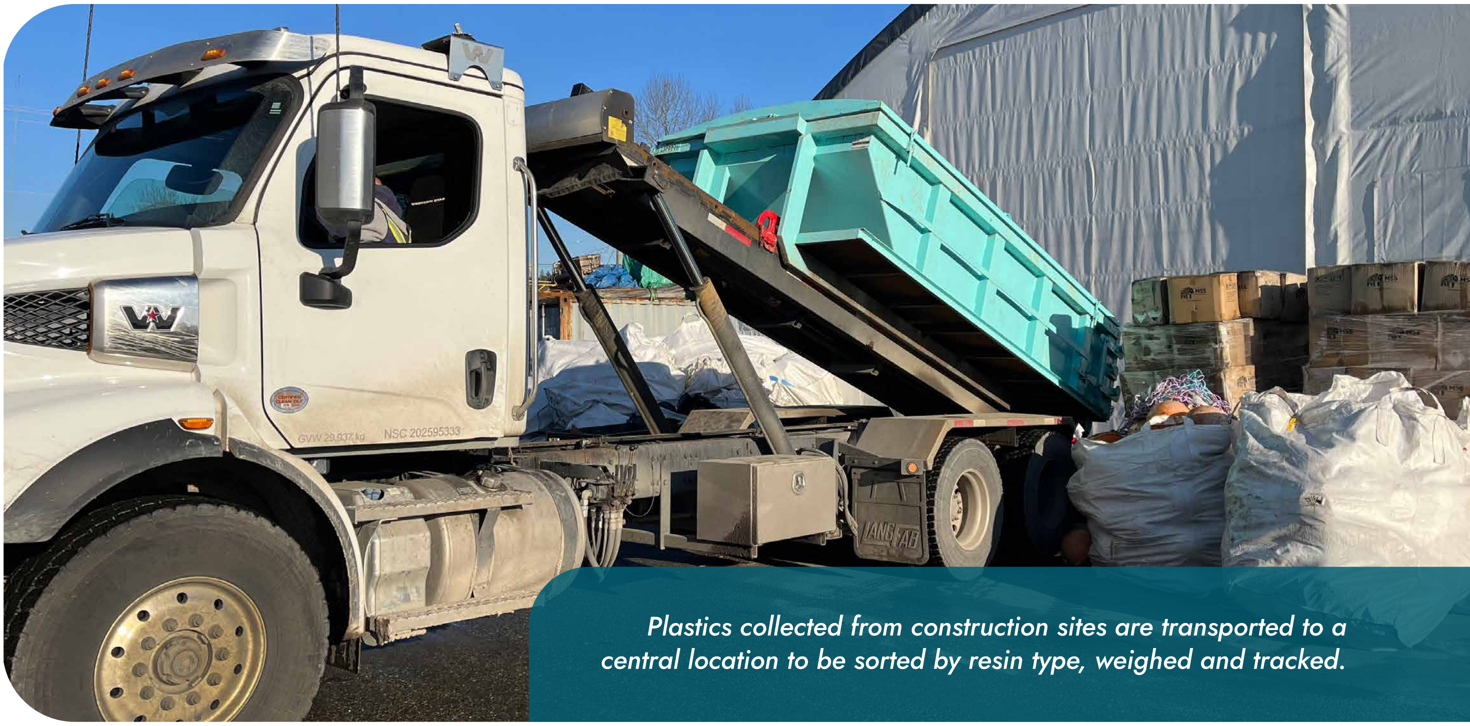
6 J Low, S Berry, G Hernandez, P Thomson, G Steinhorn, H Waghela, C Briggs, C Berry, A-T Berry. (2025). Comprehensive Plastic Waste Characterisation to Enhance Landfill Diversion in New Zealand's Construction Industry. Sustainability, 17(6), 2742. doi: [10.3390/su17062742](10.3390/su17062742)

7 T-A Berry, J K Low, S L Wallis, L Kestle, A Day, G Hernandez. (2022). Determining the Feasibility of a Circular Economy for Plastic Waste from the Construction Sector in New Zealand. *IOP Conference Series: Earth and Environmental Science*, 1122(1), 012002. [doi: 10.1088/1755-1315/1122/1/012002](10.1088/1755-1315/1122/1/012002)

8 Canada Plastics Pact. (2021). *Roadmap to 2025: A shared action plan to build a circular economy for plastics packaging.* plasticspact.ca



Plastics collected from construction sites are transported to a central location to be sorted by resin type, weighed and tracked.

3. METHODOLOGY

This study builds directly on the methodology established in Light House's ***Watching Our Waste*** report, which assessed all construction waste streams across LEED-certified projects in Canada. Moreover, this work focuses exclusively on plastic waste diversion. The goal was to quantify plastic waste diversion intensity (in kg/m^2) and explore how it varies by building type, province, and project year.

3.1 Data source and filtering

As with ***Watching Our Waste***, this study drew from waste data reported by LEED-certified projects from across Canada completed between 2009 and 2019, obtained from the Canada Green Building Council, which oversees LEED certifications in Canada. From that broader database, a subset of 253 projects that specifically reported plastic waste diversion as a distinct material stream was isolated.

Using LEED data for this report comes with challenges. It is important to note that the methods of waste data collection and reporting varied between projects. Some relied on detailed tracking systems, while others may have used weight estimates from haulers or recycling facilities. In particular, the identification of plastic as a distinct waste diversion may depend on the level of on-site sorting and the reporting practices of third-party service providers. These differences may affect the accuracy and comparability of the plastic waste diversion data.

A key distinction in this study is that the analysis is based on plastic waste diversion, that is, the portion of plastic waste that was recovered, recycled, or otherwise diverted from landfill, rather than the total plastic waste generated. This sets it apart from most previous studies described in Section 2, which typically measure all plastic waste produced on-site, regardless of whether it was ultimately diverted. As a result, the values reported here will not capture the full scale of plastic use on construction sites but instead reflect what was successfully tracked and diverted. This distinction is important when comparing results across studies, as diversion data represents only a subset of total plastic waste and is influenced not just by how much plastic is used, but by the effectiveness of waste management, sorting, and reporting practices on each project.

3.2 Waste diversion intensity calculation

For each eligible project, the plastic waste diversion intensity was calculated using the following formula:

$$\text{Plastic Waste Diversion Intensity (kg/m}^2\text{)} = \frac{\text{(Mass of Plastic Waste Diverted (kg))}}{\text{(Building Gross Floor Area (m}^2\text{))}}$$

Plastic Waste Diversion Intensity in this report is defined as the amount of plastic waste diverted from landfill (kg) divided by the building gross floor area (m^2) of the project. For instance, for multistorey buildings, this means that the total usable area of each constructed level is summed, not just the building footprint, to provide an accurate measure of waste diversion per unit of space delivered. The advantage of this metric is that it normalizes data by unit area, enabling direct comparisons across different building types, geographic locations, and project completion years.

3.3 Classification by building type

To enable this work's analysis, the LEED projects were grouped into five major building typologies based on their Primary Occupancy designation. Table 1 provides the number of projects analyzed per building type.

Table 1: Projects by building type, based on primary occupancy

Building Type	Number of Projects
Institutional	62
Commercial	58
Educational	58
Residential	41
Industrial	34
Total	253

These classifications enabled exploration of trends in plastic waste diversion intensity across different use types. Appendix A provides additional information about the primary occupancy of these building types.

3.4 Timeframe and geographic scope

All projects included in the analysis were completed between 2009 and 2019 and were located across multiple Canadian provinces. The project completion year was used to assess temporal trends.

3.5 Statistical analysis

To understand whether differences in plastic waste diversion per square metre were meaningful across different building types, provinces, or years of completion, we used a simple statistical approach called ANOVA (Analysis of Variance). This test checks whether the average waste levels are significantly different between three or more groups, such as comparing residential, commercial, and institutional projects.

If the ANOVA test showed a significant difference (indicated by a p-value below 0.05), we then used a follow-up test called the Tukey HSD test. This helped us determine which specific groups were different from each other. For example, it could show whether residential buildings generated more plastic waste than educational ones.

This method works well even when the number of projects in each group is not the same, making it a good fit for our dataset.

Plastic materials made from polypropylene and polyethylene are separated, baled and shipped for processing.

4. RESULTS

4.1 Plastic waste diversion by building type

To evaluate the differences in plastic waste diversion intensity among building types, the dataset was categorized by five primary building typologies. The results indicate notable variation in average plastic waste diversion across building types, summarized in Table 2.

Table 2: Average, median and standard deviation of plastic waste diversion based on building type

Building Type	Average (kg/m²)	Median (kg/m²)	Standard Deviation
Institutional	2.71	1.73	2.64
Residential	2.42	1.91	2.33
Commercial	1.94	1.35	1.85
Industrial	1.48	1.03	1.82
Educational	1.12	0.70	1.25

The statistical analysis suggested that plastic waste diversion intensity is influenced by building type. Moreover, the variability within each group, as indicated by standard deviations, suggests that construction practices and project-specific factors may also play a key role.

To further explore which building types differ significantly in their plastic waste diversion intensity, an additional analysis compared groups, as summarized in Table 3. The results show that institutional buildings diverted 1.59 kg/m^2 and 1.24 kg/m^2 more plastic waste per unit area built, 2.71 kg/m^2 in average, than both educational, 1.12 kg/m^2, and industrial buildings, 1.48 kg/m^2. Residential buildings also diverted 1.30 kg/m^2 more plastic waste, 2.42 kg/m^2, than educational buildings. These differences were observed despite the high standard deviations observed in the data. No other statistically significant difference was observed between other building types.

To illustrate the volume of plastic diverted, the construction of an educational complex such as the St. George campus of the University of Toronto with a total floor area of approximately 260,000 m^2 and the lowest plastic intensity of 1.12 kg/m^2 would divert 291,000 kg of plastic, equivalent to 48,500,000 plastic bags. The construction of an institutional building with the highest plastic diversion intensity, like the Hospital for Sick Children in Toronto with an area of 260,000 m^2, would divert 700,000kg of plastic, equivalent to 140,000,000 plastic bags.

It is important to note that lower diversion intensities in some building types may reflect not only weaker diversion practices but also the possibility that less plastic waste was generated in the first place. At the same time, the higher diversion intensities observed in institutional and residential projects suggest that these typologies may generate more plastic packaging and protective materials, particularly due to complex interior finishes, furniture, and equipment installation, thus providing greater opportunities for recovery. By contrast, industrial and educational projects may rely on simpler construction systems and bulk materials, resulting in less plastic use and consequently lower diversion potential.

Table 3: Building types with significant differences in plastic waste diversion intensity

Comparison	Mean Difference (kg/m²)	p-value	Significant?
Educational vs Institutional	+1.59	0.0003	Yes
Educational vs Residential	+1.30	0.0176	Yes
Industrial vs Institutional	+1.24	0.0415	Yes
Other comparisons	—	>0.05	No

4.2 Plastic waste diversion by province

To evaluate geographic variation in plastic waste diversion intensity, the LEED project dataset was analyzed by province. Table 4 shows the average, median, standard deviation, and count of projects for each province.

Statistical tests indicated that the only statistically significant difference was between Alberta (AB) and Quebec (QC). Alberta projects had 1.55 kg/m^2 lower plastic waste diversion intensities than those in Quebec. All other pairwise differences between provinces were not statistically significant. It is important to note, however, that the sample sizes for New Brunswick (NB), Nova Scotia (NS), and Saskatchewan (SK) were very small, and therefore the reported averages for those provinces may not be representative of true regional patterns or provide a reliable basis for comparison.

Table 4: Average, median, standard deviation, and count of plastic waste diversion based on province

Province	Average	Median	Standard Deviation	Count
Alberta	1.02	0.81	1.03	44
British Columbia	1.84	0.52	2.72	21
New Brunswick	1.30	1.30	1.82	2
Nova Scotia	0.91	0.27	1.12	9
Ontario	2.09	1.67	2.05	74
Quebec	2.57	1.60	2.32	90
Saskatchewan	0.10	0.11	0.05	6

4.3 Plastic waste diversion by year of project completion

The study considered plastic waste diversion intensity levels over the 2009—2019 period. Projects in the filtered LEED database were grouped by completion year. Table 5 shows the average, median, standard deviation, and number of projects in the filtered LEED dataset for each completion year.

Table 5: Plastic diversion intensity based on the year of completion

Completion Year	Average	Median	Standard Deviation	Count
2011	0.60	0.36	0.59	5
2012	1.17	0.64	1.13	21
2013	1.80	0.73	2.15	33
2014	2.32	1.20	2.56	33
2015	3.00	2.47	2.48	49
2016	1.79	1.18	1.83	41
2017	1.14	0.66	1.35	36
2018	2.23	1.19	2.32	20
2019	1.46	1.51	1.21	8

The statistical test showed that 2015 stands out as a year with significantly higher plastic waste diversion intensity compared to previous years. In particular, a significant increase was observed between 2012 and 2015, followed by a significant decrease in plastic waste diversion intensity between 2015 and 2017. All other year-to-year differences were not statistically significant, indicating that while variation exists, it is most pronounced in just a few key years.

Plastics are cleaned, shredded and extruded to create a clean plastic pellet that can be used to manufacture new products.

5. ANALYSIS AND DISCUSSION

This study analyzed plastic waste diversion intensity across 253 LEED-certified construction projects in Canada, using standardized metrics (kg/m^2) to evaluate trends by building type, province, and year of completion. The findings reveal statistically significant differences in some instances across all three variables. This section explores potential causes for such differences based on previous studies and the results presented above.

5.1 Institutional and residential buildings have the highest diversion intensities

Plastic waste diversion intensity was highest in institutional and residential projects, with significantly lower values observed in educational buildings. These results may align with other studies that link high plastic waste diversion to complex interior fit-outs, higher volumes of protective packaging, and diverse subcontractor involvement.

For example, Hernandez et al. (2022) found that the services and cladding phase generated the most plastic waste across four construction sites audited in New Zealand.[9] In addition, a study on construction and demolition (C&D) waste in three multi-level housing projects in Madrid by González Pericot et al. (2014) found that most of the plastic waste was produced during the services and cladding, and during

9 G Hernandez, J Low, A Nand, A Bu, S Wallis, L Kestle, T Berry. (2022). Quantifying and managing plastic waste generated from building construction in Auckland, New Zealand. *Waste Management & Research*, 41(1), 22–35. doi: 10.1177/0734242X221105425

the exterior and weatherproofing stage.[10] Similarly, Chauhan et al. (2023) reported up to 0.53 kg/m² of film plastic in Finnish residential buildings during the final stages of construction, primarily from packaging and protection materials.[11] These results suggest that higher finish complexity and packaging demand in institutional and residential sectors may lead to greater plastic waste diversion intensities. While these findings do not point to causality, they may reflect differences in construction methods, material use, and waste management practices across sectors. It is possible that projects with complex interior fit-outs, extensive packaging, or varied subcontractor involvement appear more prone to higher plastic waste diversion intensity. In practice, a contractor would need to see a critical mass of plastic waste before considering it worthwhile to divert it. The smaller the quantities of a particular material generated, the harder it is to justify separation and diversion. As a result, finish-intensive building types such as hospitality, residential (particularly high-end), or other institutional projects tend to generate more packaging and plastic waste than industrial buildings, while educational projects may produce less packaging than other institutional projects and therefore have fewer opportunities to divert plastic.

To better understand the influence of building type on plastic waste diversion, distribution of plastic waste diversion intensity (kg/m²) was analyzed for each building typology, as illustrated in Figure 1 (see next page).

While the mean and standard deviation for several building types appear high, particularly in institutional and residential projects, the underlying frequency distributions tell a more detailed story. Most data points cluster below 1.0 kg/m², forming a clear concentration in the lower range that aligns with values found in other studies. Beyond this cluster, the data exhibits a gradual tapering (or long tail) that extends toward 10.0 kg/m², which in turn raises the overall average and increases the standard deviation. This pattern suggests that summary statistics alone may obscure the dominant trend in the dataset and highlights the value of using distribution-based analysis to understand diversion intensity variations.

One plausible explanation for the long tail in the data, as shown in Figure 1, is the inconsistent inclusion of demolition waste in LEED project reporting. LEED guidelines require that if an existing structure is removed as part of a project, its waste should be included in diversion reporting. However, this practice may not be uniformly followed, and even when demolition waste is reported, it is often not separated from new construction waste. Since floor area typically reflects only the new construction footprint, any inclusion of demolition debris, especially from large buildings, can artificially inflate waste diversion intensity (kg/m²). This may explain why some projects exhibit very high values, even though most cluster well below 5 kg/m². In Figure 1, this tail behavior is clearly visible, extending out to 10 kg/m², and supports the interpretation that demolition-inclusive projects are outliers within the broader dataset. Notably, educational buildings are the only typology that do not exhibit a tail beyond 5 kg/m², suggesting more consistent reporting practices or a lower likelihood of including demolition activity in those projects.

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10 N González Pericot, P Villoria Sáez, M Del Río Merino, O Liébana Carrasco. (2014). Production patterns of packaging waste categories generated at typical Mediterranean residential building worksites. *Waste Management*, 34(3), 590–595. doi: 10.1016/j.wasman.2014.06.020

11 K Chauhan, A Peltokorpi, and O Seppänen. (2023). Analysing Film Plastic Waste in Residential Construction Project. Proceedings of the International Conference on Resource Sustainability, 0220. doi: 10.24928/2023/0220

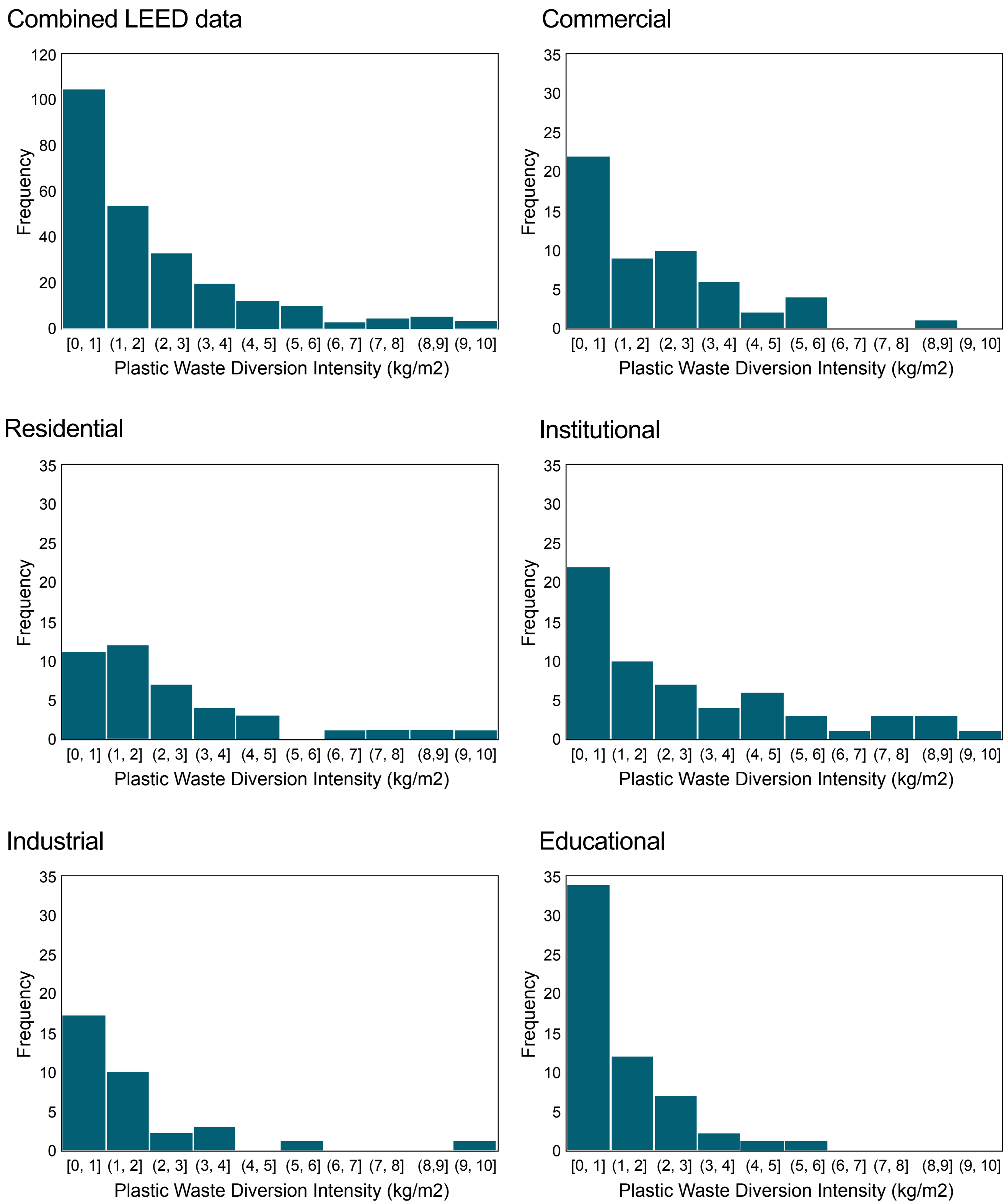

Figure 1: Count of projects with different plastic waste diversion intensities (kg/m²) by building type

5.2 Regional variation lacks sufficient data to be conclusive

Statistically significant differences were found between Alberta and Quebec. Alberta may have lower plastic waste diversion due to regional construction practices, lower use of plastic packaging or protective materials, or differences in subcontractor waste sorting behaviour. Quebec's higher intensity may reflect more centralized construction practices, differences in material specification, or stronger enforcement of waste reduction practices. However, the available data does not provide sufficient evidence to draw conclusions about variations between provinces. The lack of evidence to support significant differences between regions was also observed in the *Watching our Waste* study.[12] When visualized, the data from the 690 LEED-certified projects from across Canada does not provide enough information to identify clear regional trends. Even in provinces with over 100 LEED-certified projects, no meaningful patterns emerge. It should be noted that the reported data covers diverted plastic waste data, which should not be confused with overall generated waste.

5.3 Temporal trends show many factors at play

While the year of completion was not a strong predictor of plastic waste diversion intensity, it was seen that projects completed in 2015 had notably higher average waste diversion intensities than those completed in other years. The data does not establish causality, but the 2015 spike may reflect several overlapping influences, including evolving material packaging practices, increased reliance on plastic-based components, and inconsistent LEED documentation protocols during that period. With so many potential factors at play, it is difficult to attribute this trend to any single driver. Instead, the temporal variation likely reflects a complex relationship of industry practices, market dynamics, and shifting regulatory expectations.

As discussed above, it is understood that end-of-project practices like finishing and furnishings contribute a significant portion of plastic waste on construction sites, often arriving later in the project timeline. As a result, it might appear that plastic waste diversion is closely tied to the project's completion year. However, this association can be misleading as most construction projects span multiple years, and waste generation and diversion activities occur throughout. Therefore, the plastic reported as diverted in a project's final year may reflect accumulation over the entire construction period, not just the final stages.

These conclusions and future plastic waste diversion practices may be informed by other studies. Thomson et al. (2025) emphasized that targeted project-level interventions, such as clear signage, training, and supplier take-back programs, can increase diversion intensities to over 60%.[13] However, inconsistent implementation across projects and years may explain variability in LEED-reported data. Low et al. (2025) also reported significant year-to-year variation in plastic waste intensity across multiple New Zealand projects, emphasizing the importance of temporal benchmarking and the role of evolving industry practices.[14]

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12 Light House Sustainable Society. (2020). *Watching Our Waste: Analysis of Material Waste from LEED-Certified Projects in Canada.* light-house.org

13 P Thomson, J Low, T-A Berry. (2024). Addressing barriers and unveiling opportunities for plastic waste recycling in the New Zealand construction industry. *Frontiers in Sustainability*, 4, 1487972. doi: 10.3389/frsus.2024.1487972

14 J Low, S Berry, G Hernandez, P Thomson, G Steinhorn, H Waghela, C Briggs, C Berry, A-T Berry. (2025). Comprehensive Plastic Waste Characterisation to Enhance Landfill Diversion in New Zealand's Construction Industry. Sustainability, 17(6), 2742. doi: 10.3390/su17062742

5.4 LEED diversion intensities may follow national plastic waste trends

The observation that plastic waste diversion peaked in 2015 within the LEED project dataset aligns with broader national trends. According to Statistics Canada, Canada's total plastic waste disposal reached 3.8 million tonnes in both 2014 and 2015, marking the highest annual plastic disposal volumes of the decade, as shown in Figure 2. This temporal alignment suggests that LEED projects, despite generally stronger waste management plans, were not insulated from national consumption and disposal patterns. The trend is documented by the Office of the Auditor General (2024), which also notes that the national volume of plastic waste hovered near this peak until a slight decline in 2019.[15]

This synchronicity may reflect a relative surge in construction and infrastructure spending, potentially post-2008 financial recovery, resulting in higher material throughput, including plastic packaging and temporary protective materials.

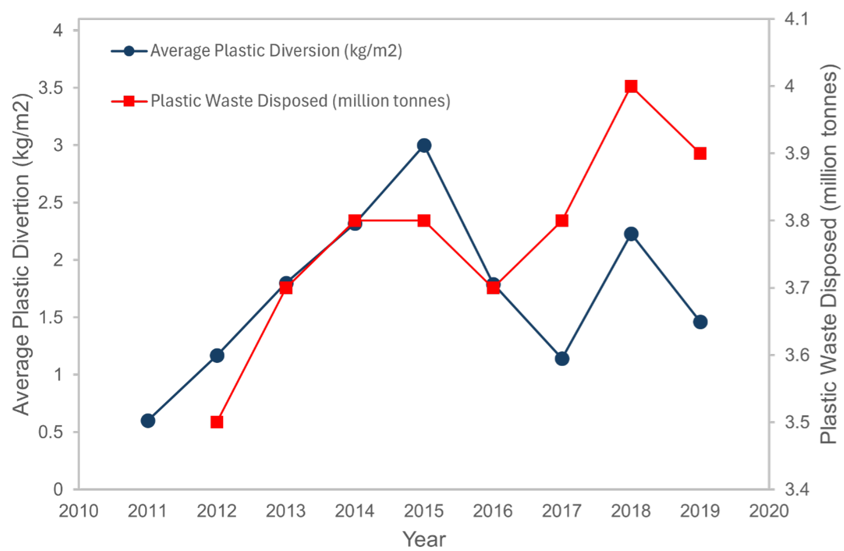

Figure 2: Average Plastic Waste Diversion in LEED buildings in Canada (kg/m2) and total annual plastic waste in Canada (million tonnes)

Figure 2 compares national plastic waste disposal with plastic waste diversion reported in LEED-certified projects. It is important to recognize that LEED-diverted plastic represents a narrow subset of total construction-related plastic waste, which itself is a subset of overall plastic waste generation in Canada. Because these categories are nested, shifts in broader plastic consumption or disposal trends can be expected to influence patterns within construction, and by extension, LEED projects. While the magnitude of change may differ, temporal alignment between these datasets is both logical and informative, reinforcing the need to interpret LEED data within a wider material and policy framework.

In this context, the elevated plastic waste diversion intensities observed in 2015 LEED projects are not anomalies, but part of a broader national pattern. They underscore the need for longitudinal waste tracking,

15 Office of the Auditor General of Canada. (2024). *Reports 1 to 5 of the Commissioner of the Environment and Sustainable Development to the Parliament of Canada*. oag-bvg.gc.ca/

especially as Canada begins to implement the Federal Plastics Registry, which may help reverse such trends through more transparent reporting and accountability in the built environment. However, it is important to note that the dataset used in this report does not include projects completed after 2019, limiting our ability to assess whether recent policy developments or industry shifts have begun to influence plastic waste generation on construction sites.

5.5 Comparison with other studies

Table 6: Comparison between this study and previous reports of plastic intensities

Study	Country	Plastic Intensity (kg/m²)	Building Type	Scope and Methodology
Low et al. (2024)[16]	New Zealand	0.85	Residential	Site audits, 8 dwellings, all plastic waste generated, sorted by phase and polymer
Low et al. (2025)[17]	New Zealand	0.21	Educational	Full plastic waste audit on 6 projects. One residential project was removed as the data was incomplete.
		0.82	Residential	
		0.7	Institutional	
Chauhan et al. (2023)[18]	Finland	0.34	Residential	Film plastic waste only, 3 apartment buildings, packaging focus
González Pericot et al. (2011)[19]	Spain	0.15	Residential	Packaging plastic waste only; materials audit on 3 projects with a total of 320 dwellings
González Pericot et al. (2014)[20]	Spain	0.53	Residential	Packaging plastic waste only; materials audit on 10 projects with between 32 and 226 dwellings each, and a total of 1173 dwellings
This study	Canada	2.71	Institutional	Diverted plastic waste from a 253 LEED project dataset
		2.42	Residential	
		1.94	Commercial	
		1.48	Industrial	
		1.12	Educational	

16 J Low, G Hernandez, T-A Berry. (2024). Plastic waste characterisation to maximise landfill diversion from a New Zealand residential construction site. *Frontiers in Sustainability*, 4, 1455480. doi: 10.3389/frsus.2024.1455480

17 J Low, S Berry, G Hernandez, P Thomson, G Steinhorn, H Waghela, C Briggs, C Berry, A-T Berry. (2025). Comprehensive Plastic Waste Characterisation to Enhance Landfill Diversion in New Zealand's Construction Industry. Sustainability, 17(6), 2742. doi: 10.3390/su17062742

18 K Chauhan, A Peltokorpi, and O Seppänen. (2023). Analysing Film Plastic Waste in Residential Construction Project. Proceedings of the International Conference on Resource Sustainability, 0220. doi: 10.24928/2023/0220

19 N González Pericot, M Del Río Merino. (2011). Management of Waste from Packaging of Construction Materials in Building Construction Works. The Open Construction and Building Technology Journal, 5(1), 149–155. doi: 10.2174/1874836801105010149

20 N González Pericot, P Villoria Sáez, M Del Río Merino, O Liébana Carrasco. (2014). Production patterns of packaging waste categories generated at typical Mediterranean residential building worksites. *Waste Management*, 34(3), 590–595. doi: 10.1016/j.wasman.2014.06.020

To better understand the magnitude and context of plastic waste diversion in Canadian LEED-certified projects, it is helpful to compare this study's results with similar research conducted internationally. Several recent audits and field studies in New Zealand, Finland, and Spain provide reference benchmarks that highlight both alignment and divergence with the findings in this report.

One key distinction is that while most international studies report total plastic waste generated, this report focuses solely on plastic waste that was diverted from landfills, as reported by projects in their LEED documentation. This means that the values presented here represent a subset of total plastic waste: the portion successfully identified, separated, and sent for recycling. The comparison reveals that Canada's plastic waste diversion on LEED projects is on the higher end of the spectrum, but this is not necessarily indicative of higher plastic waste generation. Rather, this illustrates the distinction between total plastic waste generated and the smaller category of diverted plastic waste, as identified in previous studies.

These insights emphasize the importance of developing consistent waste tracking methodologies and suggest that Canada has an opportunity to lead in transparent plastic waste reporting and reduction strategies.

The extruded plastic pellets are incorporated into innovative new building products, such as InfinaNet™ – a concrete void technology used to displace concrete in multi-unit residential projects, demonstrating the potential for creating a circular economy for construction plastics.

6. CONCLUSIONS AND RECOMMENDATIONS

This study provides the first focused analysis of plastic waste diversion intensity (kg/m^2) in Canada. Building on Light House's *Watching Our Waste* report (2020), the research focused on how plastic waste diversion varies by building type, province, and year of project completion, offering insights into where and how plastic is diverted in the construction sector.

6.1 Key findings

Key empirical findings from this study include:

- Across all LEED projects analyzed, the average plastic waste diversion intensity ranged from 1.1 to 2.7 kg/m^2, with institutional and residential buildings producing significantly more plastic waste per square metre than educational buildings.
- Statistically significant regional differences were observed between Alberta and Quebec, suggesting that provincial context, including supply chain behaviour, waste infrastructure, and policy frameworks, can impact diversion outcomes in these provinces.
- Year of project completion emerged as a strong predictor of plastic waste diversion intensity. A notable peak in 2015 closely aligns with national trends in plastic disposal.

These findings reinforce the reality that plastic waste in construction remains inconsistently tracked and under-managed, even in high-performance, LEED-certified projects. Most current diversion reporting practices do not require disaggregated data by material type, making it difficult to track performance, benchmark improvements, or identify opportunities for reduction specific to plastics.

While the findings in this report offer valuable insights, they should be interpreted with caution due to inconsistencies in data collection and reporting methods across LEED projects. The lack of standardized, material-specific tracking, especially for plastics, may have introduced variability into the results. In addition, the relatively small sample sizes in some instances (such as certain provinces or project years) limit the robustness of comparisons and highlight the need for caution in interpretation. Together, these factors underscore the need for more consistent data collection protocols to improve the reliability of plastic waste reporting in future construction projects.

6.2 Recommendations

In light of these findings, the following actions are recommended to reduce plastic waste generation and improve plastic-specific data collection and reuse:

1. Improve Material-Specific Tracking
   - Encourage LEED and green building certification bodies to require plastic-specific diversion reporting within construction waste management credits.
   - Develop simple digital tools or add-ons to existing waste tracking systems to enable material-level reporting, particularly for plastic packaging, films, and rigid components.
2. Facilitate On-Site Source Separation
   - Provide guidance and infrastructure to facilitate on-site sorting of various plastic types (e.g., soft film, rigid packaging, EPS foam) and minimize contamination.
   - Train subcontractors and site managers in plastic identification and sorting protocols, leveraging visual tools and signage.
3. Encourage Research and Pilot Projects
   - Develop awareness-building campaigns for the construction sector focused on the importance of plastic diversion and recycling, to increase industry engagement and uptake of best practices.
   - Support demonstration projects and pilot initiatives focused on plastic packaging return schemes, on-site reuse, or recycling into new construction materials.
   - Partner with manufacturers already exploring take-back programs or integrating recycled content into their packaging or products.
4. Adopt Supportive Policy
   - Expand provincial EPR regulations governing paper and packaging to cover plastics associated with building materials and the institutional, commercial and industry sectors generally.
   - Ensure reporting requirements are implemented in 2026 as scheduled under the Federal Plastics Registry.
   - Promote the adoption of design-for-circularity principles, including clear material labeling, recyclability standards, and product design that facilitates packaging return and reuse.

As noted, this study is a precursor to a report to be issued with findings from Light House's Construction Plastics Initiative. In addition to exploring plastic tracking and waste reduction strategies, CPI applies a circular economic lens to construction plastics, looking to reduce construction plastics at source, as well as treating any unwanted and residual plastics as a resource for the manufacturing of new products. To that end, we offer the following additional recommendations to advance a circular built environment for plastics:

5. Engage Suppliers
    - Work with suppliers to reduce plastic packaging and to implement take-back programs for plastic packaging
6. Encourage Smarter Procurement Practices
    - Work with general contractors and sub-trades to explore ways to reduce the amount of plastic products procured on projects.

APPENDIX A – BUILDING TYPE ASSIGNMENT

Table A1: Building type assignment in this study in relation to LEED's primary use classification

Building type in this study	Building primary use as reported in LEED
Institutional	Assembly, Clinic, Community Centre, Community Safety, Library, Nursing Home, Hospital.
Commercial	Bank, Laboratory, Office Building, Retail.
Educational	Classroom, Conference Room, College, Day Care, Elementary School, High School, K-9 School, Lecture Hall, Primary School, School Dining Hall, Secondary School.
Residential	High-rise Multi-unit Residential, Mid-rise Multi-unit Residential, Low-rise Multi-unit Residential, Mixed-use Residential.
Industrial	Industrial, Manufacturing.