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WASTE CHARACTERIZATION STUDY OF PRE-COVID-19 COMMERCIAL OFFICE BUILDINGS

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ABSTRACT

This study examines the average commercial office waste profile by region and by program type. The regions included in this study, including New York, the Mid Atlantic, California and others, had different recycling/composting program mandates. Within regions, building waste diversion programs differed as well. The results of the review reflect some differences in the success of the diversion programs utilized: single stream recycling, multi stream recycling and with or without organics programs. Over 100 waste audit results were compiled representing commercial office waste prior to the changes in the commercial real estate and waste industries during the COVID 19 pandemic.

Keywords: Waste audit, office buildings, recycling, compost, waste diversion

INTRODUCTION

This report aggregates and summarizes the results of 114 waste audits conducted at commercial office building clients during 2019 by a consulting firm, Great Forest Inc. These studies assessed in detail the contents of the waste stream, total weight of waste and the amount of waste diverted via recycling or composting. The audits are comprehensive, including material weights and a breakdown of materials within each waste stream. All were done while buildings were at pre-COVID occupancy. The waste audit methodology used has been developed over 30 years of audit experience.

The results of this body of work are useful to establish waste profiles for commercial office buildings; to review effectiveness of various recycling systems, and to understand regional differences in recycling performance. Multiple waste characterization studies have been performed on residential waste for municipalities, or a combination of commercial and residential. As an example of a municipality study that included commercial waste, the 2018 Vermont Waste Charac-

terization report used a sampling method that involved "randomly selecting garbage trucks entering a landfill or transfer station […] and randomly selecting a 200 to 250-pound sample" (Vermont). In contrast, this study includes a review of 100% of the daily waste stream from the individual buildings audited, providing an illustration of waste characteristics at the building level. This study would be the largest and most comprehensive study on waste characterization in office buildings reviewed at the building level to date. Largest for the number of buildings included and most comprehensive, since the audits were based on whole building results, not samples.

Included in this study are buildings that are majority commercial offices with some retail and/or a cafeteria on site. The audits did not include hotels, residential buildings, mixed use buildings and industrial facilities. Three main regions are considered: New York Tri-State area, the Mid-Atlantic region of the U.S. and Northern California. Other audits took place both within the contiguous U.S. and in the following countries: Australia, Brazil, Canada, China, India, Indonesia, Isra-

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el, Japan, Mexico, Singapore and South Korea. Buildings audited are owned or operated by businesses seeking best practices in waste diversion practices, including large real estate firms, financial services companies, and tech companies.

The study is complicated by diversion programs varying across regions as well as within cities. One program example is a single stream program (SSR), defined by recyclable material collection that includes paper recyclables to be combined with glass/metal/plastic recyclable material. A dual or multi-stream program (Dual) is defined by having paper and cardboard recyclables kept separate from glass/metal/plastic recyclables.

This review finds that several aspects remained consistent across program types and regions. Cardboard recycling streams showed low contamination across all audits. Cardboard material showed a high rate of diversion. Organics programs, which are rolled out differently depending on local mandates, consistently show clean streams, with relatively low contamination. Paper, glass/metal/plastic, and mixed recycling streams show high contamination. Paper and glass/metal/plastic materials showed a low rate of diversion. These two latter considerations reveal a big missed opportunity in recyclable material aside from cardboard.

The results show there is room for improvement on both the upstream and downstream side. In the absence of diversion opportunities, consideration should be given to reducing the use of single-use materials that are hard to recycle or otherwise divert from landfill. On the downstream side, education on proper local recycling practices is key, ensuring materials are clean and sorted into the correct collection bins.

METHOD

Waste audits performed in this study are comprehensive, with each waste stream broken down by its material components and weighed separately. Materials sorted include:

· Residual
· Styrofoam (in CA audits only)
· Liquids
· PPE
· Paper
· Soiled Paper
· Glass
· Soiled Glass
· Metal
· Soiled Metal
· Plastic
· Soiled Plastic
· Non-Rigid Plastic (in CA audits only)
· Soiled Non Rigid Plastics (in CA audits only)
· Organics
· Cardboard
· Soiled Cardboard
· E Waste
· Wood
· Fabric

The following procedure is applied to a building's waste stream.

1. All building waste is put in separate areas per waste stream.
2. All bags of waste are weighed, categorized and recorded; all other relevant waste-related information is recorded and measured (equipment, setup, trends, compliance, etc.).
3. All bags of waste (except bathroom waste) are opened; the contents are separated into material categories: liquids, organic matter, glass/metal/plastic/cartons, mixed paper and residual materials. Each sorted material category is then weighed and recorded.
4. All cardboard and other loose material, if any, is measured, weighed and recorded.

All recyclable items (except electronics) are further separated into "clean" and "soiled" categories, meaning the recyclable item would not be accepted by a recycling facility, as it was too soiled by food waste or other contaminants. (It is assumed that any electronics diverted from the waste stream would not be contaminated.) Entire bags of recycling with too many soiled or trash items could wholly be considered too contaminated to open at the sorting center and instead be 100% disposed as trash. Our audits highlight the ratio of soiled to clean materials in a stream, but may not indicate when an entire load would be rejected.

Excluded in the waste audits are electronics recycling and specialty diversion programs such as shredded paper programs, product take-back programs and food donation programs picked up separate from daily collection. These diversion programs may be present in the buildings we audited but are not included in the audit results.

The audit process includes labeling waste streams and separating materials into categories by material type, noted above. Then they are weighed using industrial scales noting the waste stream. For example, a waste stream such as "Trash Stream" may contain the material categories: "Soiled Paper", "Liquids" and "Residual". These material categories are then compiled to provide a breakdown of each waste stream and a percentage diversion.

Over 170,000 pounds of waste were analyzed in these audits. In order to compare recycling programs and regions, we calculated an average building for each group or region. In order to provide an average office building waste profile, we took percentages of materials in each individual building's waste stream and multiplied the amounts against average building totals, based on the cumulative amounts from all buildings audited in any given group or region.

Definitions

"Residual" consists of inorganic or composite materials that would not be accepted in a typical organics program or locally mandatory commercial recycling program, such as Styrofoam and plastic film/non rigid plastics. "Residual" also consists of liquids and electronic waste, both of which can and should be diverted through other means. Residual materials in this category may include: binders, fabric, medical

waste and wood. Residual waste includes non-rigid plastics (shopping bags, plastic film, packaging material), snack bags and wrappers, paper coffee cups with plastic lining, plastic sauce packets, bathroom waste including paper towels, and single use food containers with composite material (usually paper or paperboard with a plastic lining). Unused pantry products like new coffee pods and new sugar packets were also considered Residual, since they contain multiple materials and cannot be placed in the recycling streams present in the regions examined here.

"Paper" as a waste material here includes mixed paper, paperboard, white ledger, paper bags, newspaper, paperboard boxes, and similar items. Many office buildings also have programs to shred confidential papers. These materials will most often not appear in the waste audit since collection, shredded paper pick up does not go through the property management's waste program.

"GMP" refers to glass bottles and jars, aluminum and tin cans, and rigid plastics only. Cartons are often included in this category, but this varies by region.

"Clean" refers to the quality of a recyclable material in that the material would be accepted for recycling at a recycling facility.

"Soiled" refers to the quality of a recyclable material in that the material would not be accepted for recycling at a recycling facility.

"Organics" includes both food waste and compostable plastic and paper products.

"Cardboard" or "OCC" includes corrugated cardboard primarily from shipping boxes.

"Liquids" are any liquids found in any waste stream. Liquids measured by the audit team were found in a container and poured out for weight. Even though liquid can be considered "organic" material, the best protocol for disposal is down the drain.

"Ewaste" or "Electronic Waste" refers to computers, televisions, printers, scanners, small-scale servers, computer peripherals, TV peripherals, and portable devices. Included in this category is Universal Waste: Fluorescent bulbs, batteries,

pesticides, mercury containing equipment, non-alkaline batteries and PCB containing ballasts.

"Compostable Waste" is waste that is capable of disintegrating into natural elements in a compost environment, leaving no toxicity in the soil.

"Waste" refers to all materials discarded including trash and recyclables.

"Trash" refers to the waste stream or collection point and is not considered a material.

"Recycling" refers to recyclable materials including mixed paper, glass/metal/plastic/cartons, and cardboard.

"SSR" refers to a recycling program, Single Stream Recycling, where paper, cardboard, GMP are collected together. (Sometimes there is a separate collection point for cardboard.)

"Dual" refers to a recycling program, Dual Stream Recycling, where paper and cardboard are collected separate from GMP.

"NY" refers to the dataset including the Tristate area, New York, New Jersey and Connecticut.

"DMV" refers to the dataset including Maryland, DC and Virginia.

"CA" refers to the dataset including California.

"National/International" or "O" refers to the dataset including the following US states: AZ, CO, FL, GA, MA, NC, NV, OK, OR, PR, RI, TN, TX, WA and the following countries: Australia, Brazil, Canada, China, India, Indonesia, Israel, Japan, Mexico, Singapore and South Korea.

RESULTS

Results were compiled by region to understand what trends were common among all areas and programs and where trends diverged. New York region (NY) is the largest dataset with 57 buildings. California (CA) and National/International datasets each have 23 buildings. DMV (DC region) is the smallest dataset with 11 buildings and/or campuses. The differences in the typical waste profile (Chart 1) were not statistically significant across regions, including international.

Office Waste Profile 2019
2019 Composition of Office Aggregate Discards

Cardboard 11.1%

Residual 27.0%
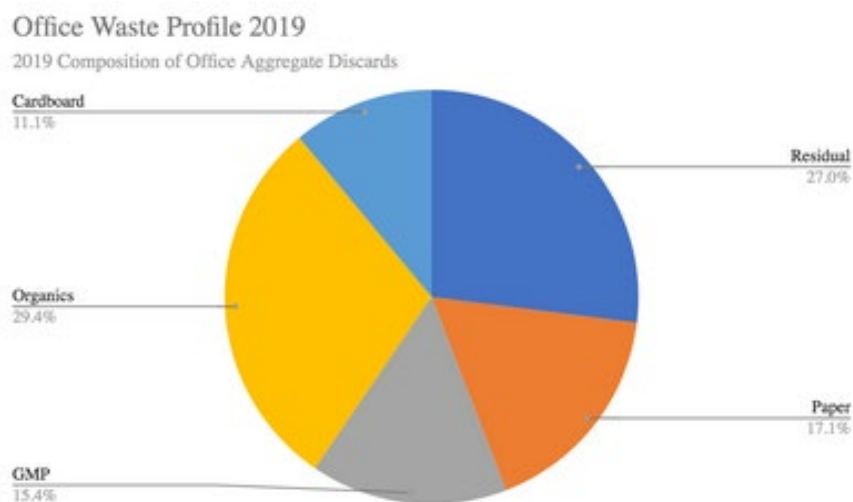
Paper 17.1%

GMP 15.4%

Organics 29.4%

Chart 1: Materials found in the commercial office waste stream

Cardboard was most consistently diverted across all sites. Making up 12% of the waste stream of buildings, its diversion was high across every program and every region. The overwhelming majority of cardboard material in buildings was diverted to a recycling stream, with only 2-9% of cardboard in the waste stream lost to the Trash stream. Paper materials made up a larger portion of the waste stream, at 17%, but showed inconsistent diversion. Compared to the high diversion of cardboard, large amounts of paper were observed in the Trash stream, although the proportion varied significantly by region.

Making up 15% of the general waste stream, GMP was consistently found contaminated, whether placed in the trash or with recyclables. The largest portion of the GMP materials found in the audits was plastic. The highest portion of contamination in the GMP recycling stream and the highest portion of recyclables going into the Trash stream was consistently plastic.

The largest portions of the office building waste were organics and residual waste. This highlights the need to focus on programs outside of recycling, including (1) waste reduction, (2) residual material that can be diverted through better management practices and specialty programs and (3) potential organics diversion. Organics separation for composting or other diversion programs, when implemented, saw a clean stream with less than 10% contamination on average. The amount of organics not diverted varied greatly.

Ewaste was found in the average waste stream across all regions and programs. Ewaste is a divertable material collected separately from the daily waste stream. Ewaste is included in this profile only where it turned up in the daily waste stream. Liquids also show up consistently in waste audits regardless of region or program. Proper procedure would see most liquids poured down a drain instead of dumped with containers in the Trash stream. Liquids increase weight of and take up space in a waste load, increasing load size and causing incrementally more fuel combustion for waste transport. Additionally liquid contaminates otherwise recyclable materials and prevents processing.

Trends diverged when looking at the amount of recyclables found in the trash for each program type. Looked at in aggregate, there is little difference in successful recycling diversion between the SSR and Dual programs. However when looked at by region, the success of each program diverges. The NY and National/International datasets have a mix of Dual and SSR recycling programs. The DMV and CA datasets show only SSR recycling programs, with some variation in program roll out. The range of missed recyclables by region can be found in the Appendix.

Waste Stream Characterization

Separate to the waste profile (Chart 1), there are the programs established to divert these materials. All buildings utilized some or all of the following diversion programs: single stream recycling, paper recycling, cardboard recycling, GMP recycling, diverted organics and trash. Since the compilation of all buildings show diversion programs that are particular to some buildings and not others, the waste characterization chart is then presented for each general program type with respect to the success of the program in diverting material from the waste stream: SSR with organics diversion, Dual with organics diversion, SSR without organics diversion and Dual without organics diversion. Since volume of waste varies greatly due to a range of building sizes, this data is normalized to allow for easy comparison.

Across all data sets, the majority of an average building's waste wound up in the Trash Stream (Chart 2). This follows the waste profile, where residual waste is one of the largest components. Since some buildings used a SSR program and others Dual, both single stream recycling and the Dual recycling streams (paper and GMP) appear in the average building chart. Cardboard recycling was often, but not always, a separate stream in both SSR and Dual programs.

Among the breakdown of materials found in each program stream are soiled materials – Soiled Paper, Soiled GMP and Soiled Cardboard. The presence of soiled recyclables is an
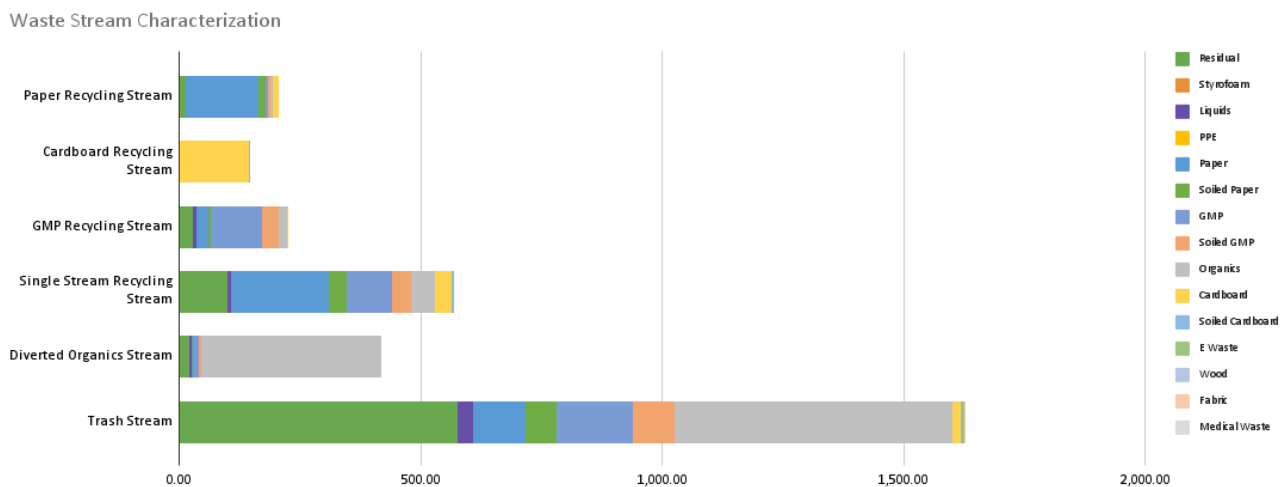

Chart 2: All regions, all programs - waste characterization by waste stream. Materials found in each waste stream in lbs, average waste audit.

indicator that materials in the recycling stream are contaminated. The degree of contamination will impact recommendations. For example, if there is a focus on soiled GMP in the trash, the recommendation cannot simply be on diverting more GMP but on taking additional steps to clean out recyclables. If the additional steps aren't taken, soiled GMP in the Trash Stream is technically correct, because soiled GMP in the recycling will not be recycled.

Of the buildings surveyed, 63 utilized a single stream program (SSR), and the remaining buildings in the dataset utilized a dual or multi-stream (Dual) program. For each program type, SSR or Dual, with or without an organics program, the average contents of each waste stream are shown below.

On average SSR with organics programs have a majority of material going into the trash stream, and each diversion stream has a majority of that stream's target material. The SSR shows a significant portion of residual waste, liquids and organics. Even with an organics program, on average, more than a third of the trash stream is organic material. Roughly the same amount of GMP was found in the trash stream as in the SSR stream. 24% of paper material was found in the trash stream.

More streams are relevant to a Dual with organics program (above). The Dual chart includes an SSR stream because some buildings include single stream recycling separate from paper and GMP streams, such as in collection from deskside bins. Again, roughly a third of trash stream is organic material. Roughly the same amount of GMP is found in the Trash stream as the GMP & SSR streams combined.

GMP and soiled GMP remain a presence in the trash stream across all programs. It seems from these results that the type of program had a minor influence on the success of the recycling diversion program.

All programs showed large levels of contamination in recycling, with the exception of cardboard and organics, and generally poor diversion, as seen by the amount of recyclables in the Trash Stream. The amount of recyclables in the Trash Stream is further examined in the Missed Opportunity Trash Stream section.

Looking at these characterization graphs, one might conclude that SSR programs are better than Dual at diverting waste. However, the Dual programs that had an organics diversion program were mainly present in regions where organics was not rolled out to the whole building. The SSR with organics program was rolled out in buildings to the entire building is the majority of cases. Comparing organics amounts in Dual organics versus SSR organics reflects this discrepancy.

In buildings without organics (both Dual and SSR), it stands out that the biggest opportunity for diversion is organics. In Dual with organics, the same opportunity exists, to roll out organics diversion to the rest of the building. Organics in the waste stream is consistently a larger amount than the recyclable materials. Given that recycling diversion programs are already in place, incremental improvements in recycling are not going to make as much of an impact on increasing diversion within a building as a potential organics program.

Recyclable Materials in Recycling Stream vs Recyclable Material Improperly disposed

To understand how users are interacting with trash and recycling bins we looked at the amount of clean recyclables properly or improperly disposed. Recyclables labeled Improperly Disposed in Refuse Collections are defined as clean recyclables placed in the Trash stream only. Recyclables placed in the Organics stream are excluded. Soiled recyclables going in the Recycling bin (of any kind) are also excluded. In order to offer comparison between the data sets we have normalized the data by taking the total pounds of the building average for the material category and multiplying by the subset's percentage of material properly or improperly disposed.

Across the regions, very small amounts of cardboard were found soiled in our audits. In contrast to clean paper and cardboard, more clean plastic was found improperly disposed in proportion to the material recycled correctly.

In comparing single stream (SSR) and dual stream (Dual) programs we found little difference between the program results when all regions are combined in one dataset. However when compared by region, results varied. See appendix for additional detail.

- In NY, the amount of recyclable material found in the Trash stream was higher in SSR than in Dual. i.e. Dual recycling systems improve recycling performance.
- In DC region, the largest amount of improperly disposed materials was the GMP materials with less than 40% diverted correctly.
- In CA, across all recyclable materials, the majority of the material (though with GMP, only a slight majority) was disposed correctly. i.e. recycling separation was better on the west coast than the east coast, but only slightly.
- Overall, regardless of program or region, cardboard was consistently disposed of correctly over 90% of the time.

Missed Opportunities in the Trash Stream

Since the Trash Stream is consistently the largest waste stream in a building, the proportions of divertable waste are significant. Here the Trash Stream breakdown by material shows how much divertable material has not been diverted, indicating the effectiveness of the building's diversion program(s). By identifying the materials that end up in the waste stream, opportunities for waste prevention and diversion can be identified. Results did not vary greatly when viewed by program, as can be seen in Charts 3-6, in the Trash Stream bar of the bar chart. The Trash Stream had a fairly consistent profile: a third organics (32-40%), a third recycling (22-29%) and a third residual waste (33-38%). This profile is consistent with the Stanford University study, which identified 25% of their landfill stream as recyclable and 36% compostable (Stanford 2019). Ewaste, fabric, wood and medical waste/PPE were separate categories that did not appear above 1% in the Trash Stream. If considering which program, be-
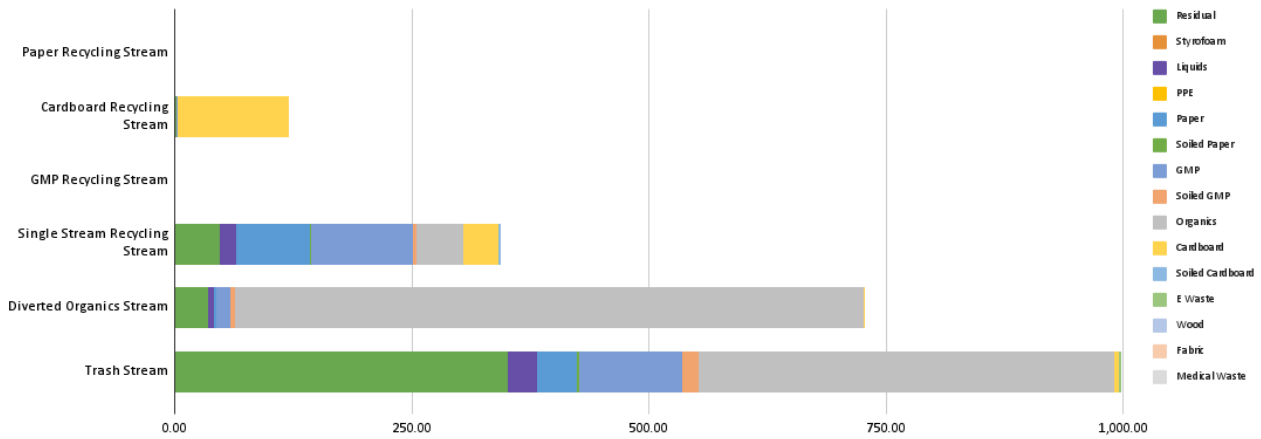
Chart 3: All regions, SSR program with organics diversion program (30 buildings) - waste characterization by waste stream. Materials found in each waste stream.
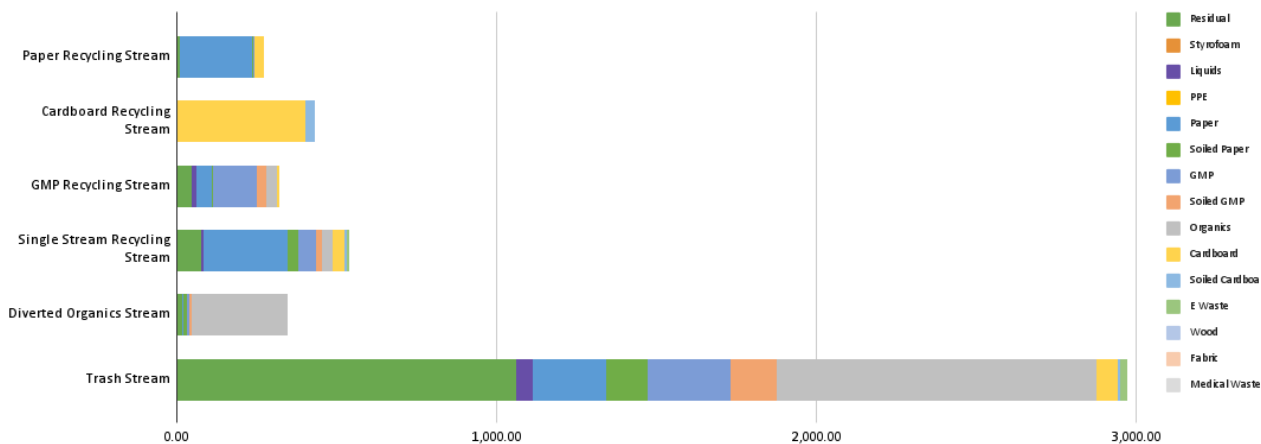

Chart 4: All regions, Dual program with organics diversion program (12 buildings) - waste characterization by waste stream. Materials found in each waste stream.

tween recycling and organics diversion, should be given more attention, this graph shows that organics amounts trend higher than recyclables, where a recycling diversion program is already in place.

Liquids notably do not belong in either the Trash stream or any of the daily waste streams, but liquid, by weight, made up a large enough portion of the Trash stream, that it was equal to or more than some individual recyclable materials, including metal, glass, cardboard and ewaste. This indicates that barriers to appropriate disposal of liquids are in place, whether that be from a lack of awareness or convenient disposal for liquids nearby, such as a sink or drain.

Only when we looked at the target regions in our study did the breakdown of the Trash Stream vary greater than 10% in any category. For example, in the Mid Atlantic 45% of material in the average Trash Stream was Residual with clean recyclables making up 16%. In CA, 24% of material in the av-

erage Trash Stream was Residual with recyclables making up 26%.

The discrepancy of the variety between regions and the comparative consistency between programs is notable, although the reason for this is unclear. It would seem that regional variation both here and in the recyclable material improperly disposed would be linked to the local relationship to waste diversion, recycling and organics recycling, specifically cultural adoption, knowledge, and expectation of participating in such programs.

CONCLUSION

This review of over 100 detailed waste audits of commercial office buildings provides insight into the predictable breakdown of the average commercial building's daily waste profile from 2019. The relative amounts of the material com-
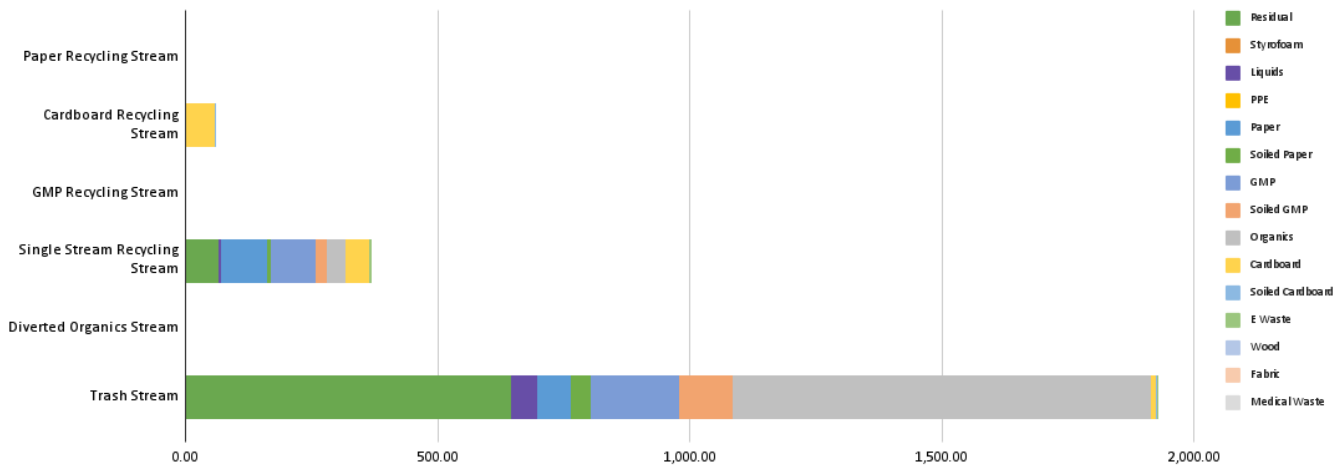
Chart 5: All regions, SSR program without organics diversion program (33 buildings) - waste characterization by waste stream. Materials found in each waste stream.
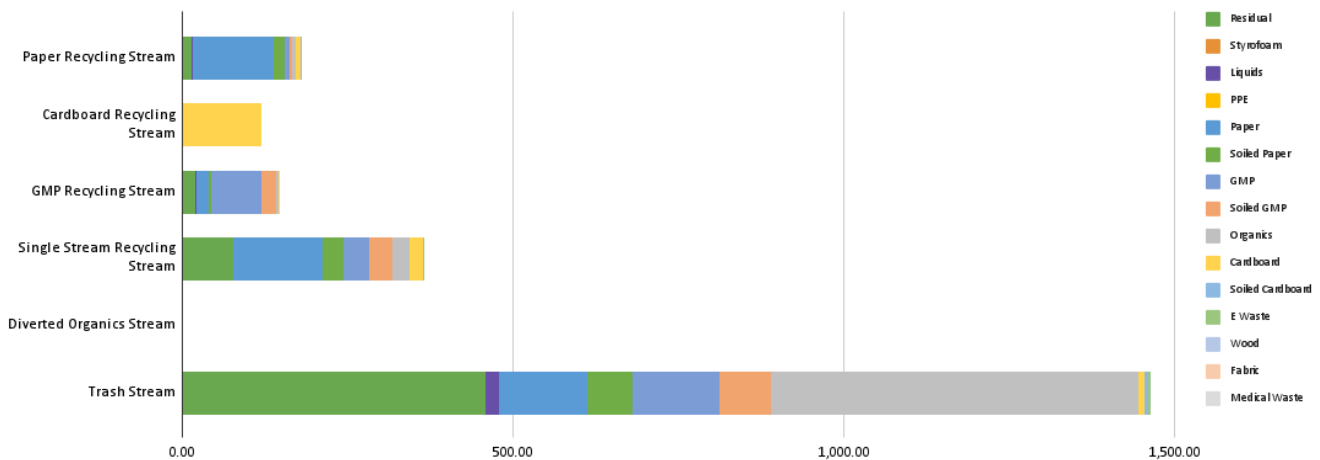

Chart 6: All regions, Dual program with no organics diversion program (30 buildings) - waste characterization by waste stream.

ponents, paper, GMP, cardboard, organics and residual did not vary greatly by subset.

While the implementation of diversion programs vary in their degree of success, our findings suggest that the region where a building is located is more likely to have an impact than the type of program installed. Recyclables in California were more likely to be in the recycling stream than other regions. Even so, across all regions and programs, plastics diversion was low and cardboard diversion was high.

These findings also show opportunities for significant improvement to enhance diversion rates for buildings with a recycling program in place. The proportion of organics found in the Trash stream show, even in buildings with organics programs, that organics is a bigger opportunity for diversion than recyclables.

In general, there are differences in building diversion performance that will impact the results of a waste audit that are not reflected in our analysis. These include the infrastructure

of the waste program, such as the presence of effective communications, like signage, bin options and bin placement. These can have a greater impact on the effectiveness of a recycling program, particularly as it impacts paper, GMP and E Waste recycling, than the type of program installed. Future analysis will be needed to incorporate more information on waste infrastructure and its relative impact on the success of diversion programs.

In spite of deficiencies in the data, or differences in results from similar programs in different regions, the analysis shows a trend of how building occupants will behave utilizing specific programs. Cardboard diversion is highly successful, while other recyclables show low levels of diversion in comparison to cardboard. Buildings with an Organics diversion program, while varying in roll out and percentages diverted, exhibit low levels of contamination, in comparison to the amount of contamination found in certain recycling streams. The breakdown of building waste streams is predict-

able, as seen in the similar waste profiles across regions. The trends found in our datasets point to a degree of predictability in diversion based on region and diversion program, with the caveat that the degree of success depends on many more factors.

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Appendix

Table 1: Regional and Program comparison of proportion of material in Trash Stream.

	Residual	Organics	Mixed Recyclables	Soiled Mixed Recyclables
NY	42%	30%	17%	10%
DMV	45%	37%	16%	>1%
CA	24%	45%	25%	1%
O	29%	45%	20%	6%
All SSR Programs Only	36%	38%	19%	3%
All Dual Programs only	38%	32%	17%	12%
All with organics	33%	39%	19%	4%
All without organics	37%	34%	18%	8%

Regional Comparison of Missed Opportunity Among Recyclables

Table 2: Percentage of clean recyclables improperly disposed for buildings with single stream programs.

Region	All Results	NY	DMV	CA	International & Other US
# sites	63	17	11	23	14
Paper	43%	62%	36%	27%	42%
OCC	6%	7%	2%	5%	9%
GMP	62%	80%	60%	47%	46%

Table 3: Percentage of clean recyclables improperly disposed for buildings with dual stream programs.

Region	All Results	NY	International & Other US
# sites	42	36	6
Paper	42%	40%	57%
OCC	8%	9%	2%
GMP	58%	55%	62%

Table 4: Material breakdown for Organics and Trash streams across regions. This table indicates the percentage of the stream that is organic material and the percentage of the stream that is contaminated in the Diverted Organics stream. This table indicates the percentage of the stream considered missed opportunities for diversion in the Office Trash Stream with residual considered not divertable.

	Diverted Organics Stream	Office Trash Stream	Diverted Organics Stream	Office Trash Stream	Diverted Organics Stream	Office Trash Stream	Diverted Organics Stream	Office Trash Stream
	NY		DMV		CA		International & Other US	
Residual	4.89%	41.72%	4.32%	45.25%	2.94%	24.20%	9.07%	28.68%
Styrofoam*	0.00%	0.00%	0.00%	0.00%	0.01%	0.19%	0.00%	0.01%
Liquids	0.28%	1.59%	0.11%	1.81%	0.73%	3.89%	1.61%	3.18%
PPE	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Paper	1.22%	7.71%	0.47%	4.67%	1.23%	9.79%	0.43%	5.01%
Soiled Paper	1.44%	4.34%	0.00%	0.01%	0.00%	0.15%	1.07%	2.25%
GMP	0.83%	8.01%	0.63%	10.77%	3.22%	13.39%	3.30%	12.90%
Soiled GMP	1.81%	5.14%	0.00%	0.05%	0.13%	1.32%	1.58%	3.64%
Organics	89.53%	29.71%	94.42%	36.65%	91.57%	45.26%	82.08%	42.25%
Cardboard	0.00%	1.12%	0.05%	0.51%	0.16%	1.31%	0.12%	1.29%
Soiled Cardboard	0.00%	0.17%	0.00%	0.00%	0.00%	0.00%	0.73%	0.38%
E Waste	0.00%	0.41%	0.00%	0.29%	0.00%	0.49%	0.00%	0.32%
Wood	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Fabric	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%
Medical Waste	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Total	**100.00%**	**100.00%**	**100.00%**	100.00%	**99.99%**	**99.99%**	**99.99%**	**99.98%**

* Styrofoam listed as separate material in California audits. In other regions, styrofoam was listed under residuals

California Region

Recyclable Materials in Recycling Stream vs. Recyclable Material Improperly Disposed

- Recyclable Material in Recycling Collections
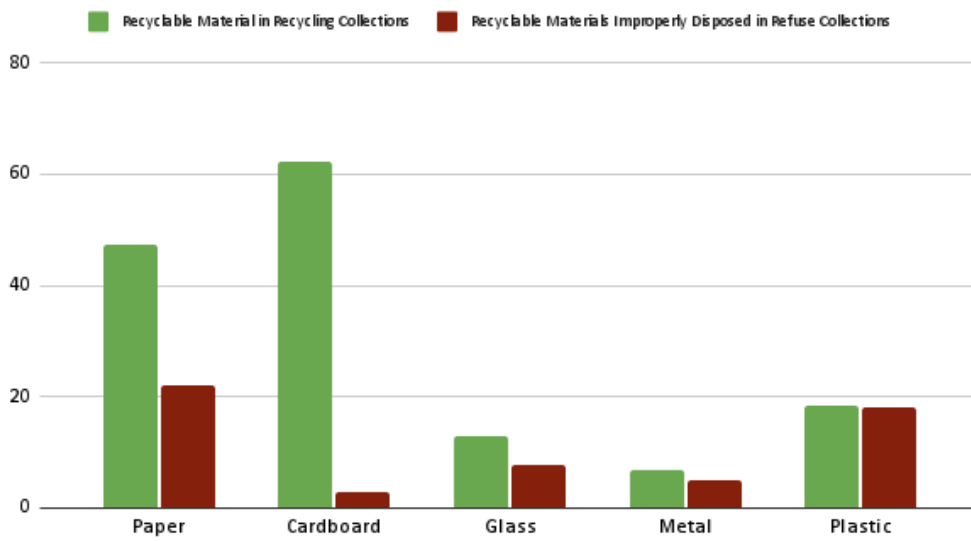- Recyclable Materials Improperly Disposed in Refuse Collections

Chart 7: Example Improperly Disposed Recycling: All programs in California region clean Recyclables properly and improperly disposed.
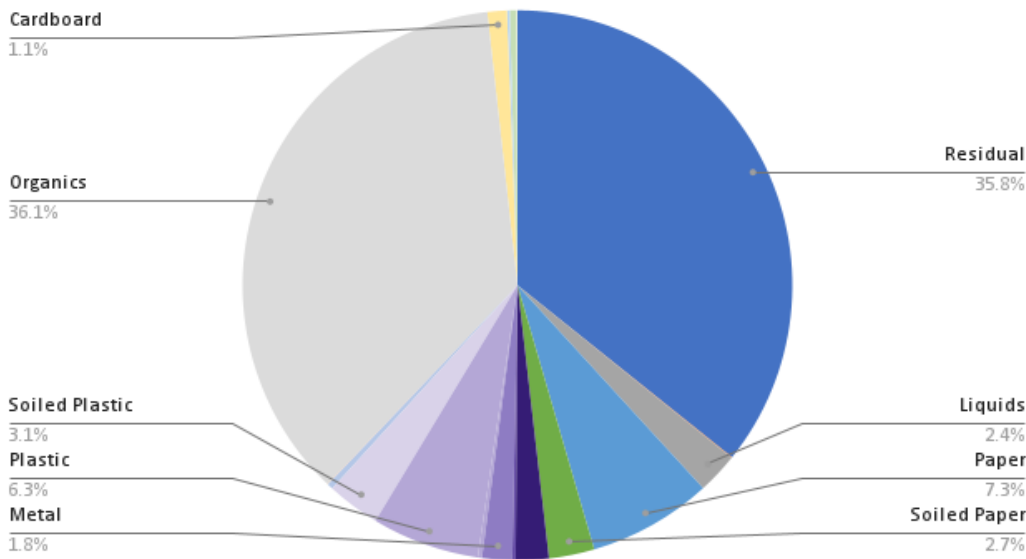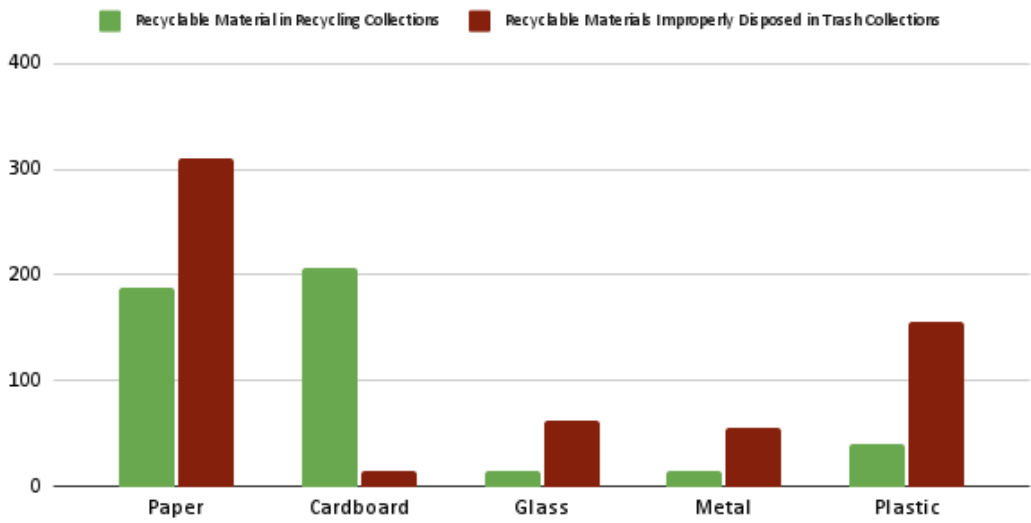
Percentage Breakdown of 2019 Office Trash Stream

Cardboard 1.1%
Organics 36.1%
Soiled Plastic 3.1%
Plastic 6.3%
Metal 1.8%
Residual 35.8%
Liquids 2.4%
Paper 7.3%
Soiled Paper 2.7%

Chart 8: Trash Stream Waste Profile

Chart 9: Improperly Disposed Recycling SSR Programs, NY Region

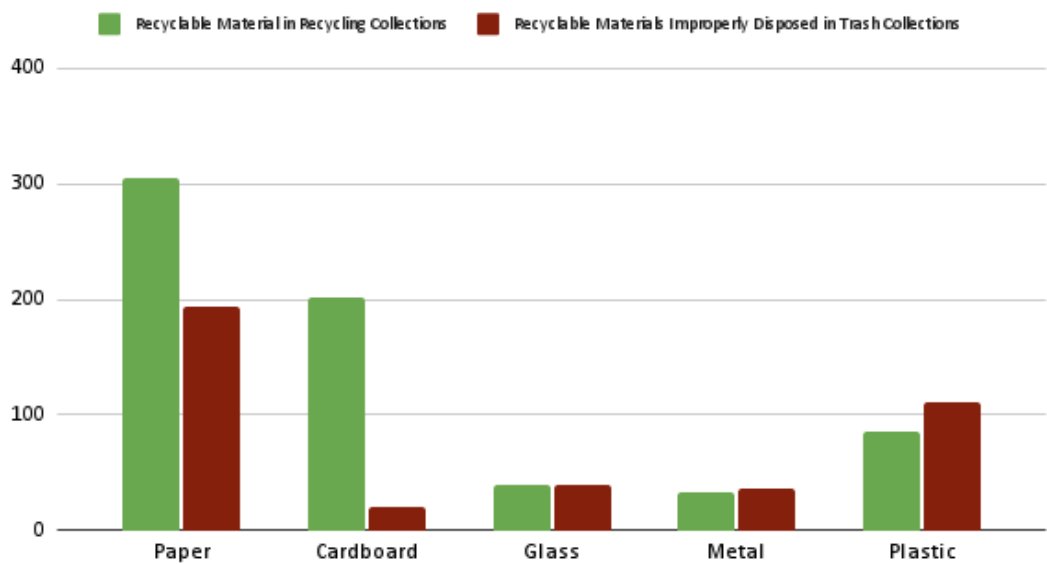Recyclable Materials in Recycling Stream vs. Recyclable Material Improperly Disposed

Chart 10: Improperly Disposed Recycling Dual Programs, NY Region

Mid Atlantic Region

Recyclable Materials in Recycling Stream vs. Recyclable Material Improperly Disposed
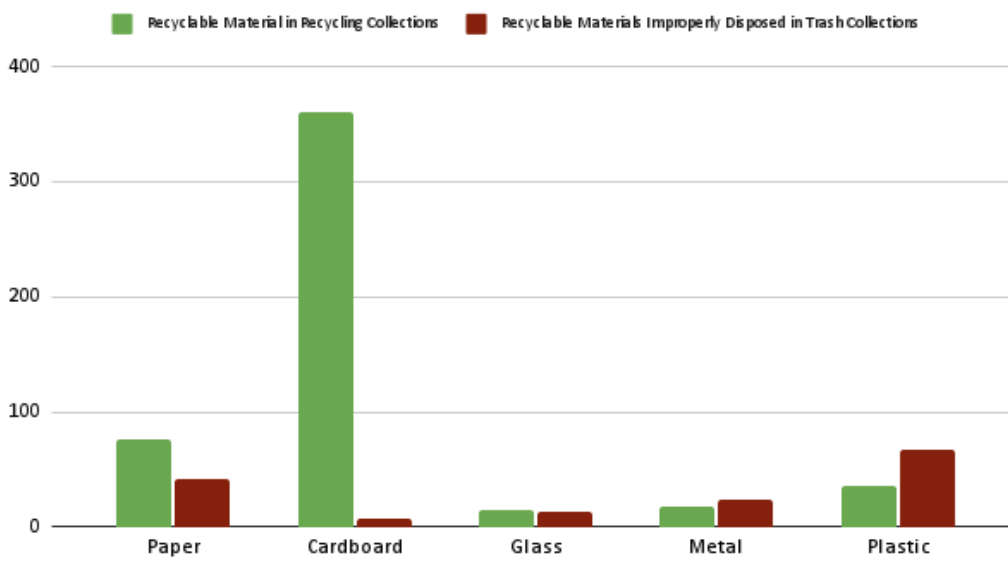

Chart 11: SSR program in Mid Atlantic region recyclable materials improperly disposed compared to properly disposed.

National and International Dataset

Table 5: List of locations where audits were performed in the National/International dataset and the number of audits performed in those areas.

Location	Audits
Atlanta, GA	1
Bangalore, India	1
Cambridge, MA	1
Chicago, IL	1
Denver, CO	1
Hong Kong, China	1
Jakarta, Indonesia	1
North Carolina	1
Mesa, AZ	1
Mexico City, Mexico	1
Montreal, Canada	1
Oregon	1
Reno, NV	1
Sao Paulo, Brazil	1
Seattle, WA	4
Seoul, South Korea	1
Shanghai, China	1
Singapore	1
Sydney, Australia	1
Tel Aviv, Israel	1
Texas	3
Tokyo, Japan	1
Tulsa, OK	1
Warwick, RI	1

Recyclable Materials in Recycling Stream vs. Recyclable Material Improperly Disposed

■ Recyclable Material in Recycling Collections ■ Recyclable Materials Improperly Disposed in Trash Collections
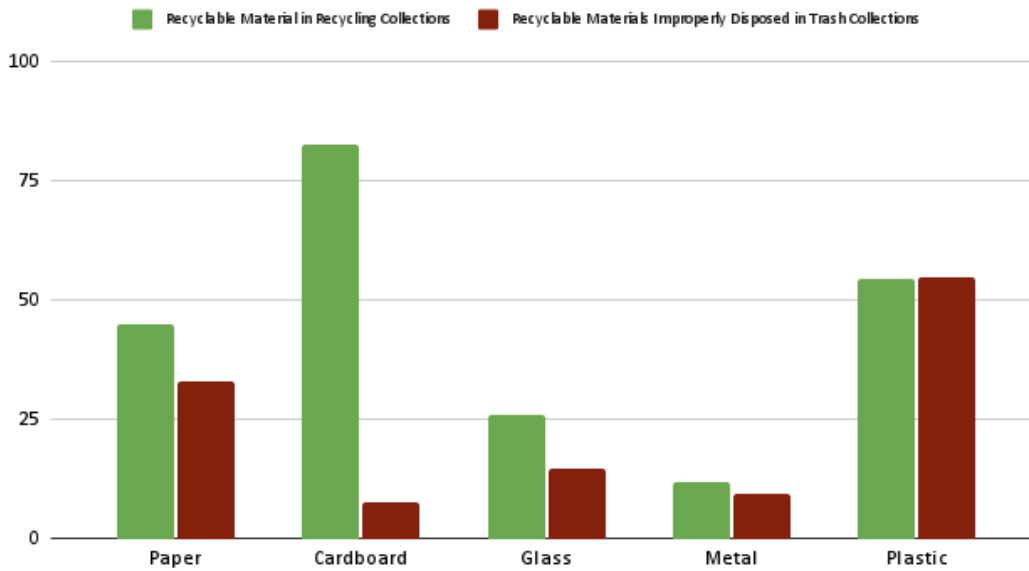

Chart 12: SSR program in National/International dataset recyclable materials improperly disposed compared to properly disposed.

Recyclable Materials in Recycling Stream vs. Recyclable Material Improperly Disposed

■ Recyclable Material in Recycling Collections ■ Recyclable Materials Improperly Disposed in Trash Collections
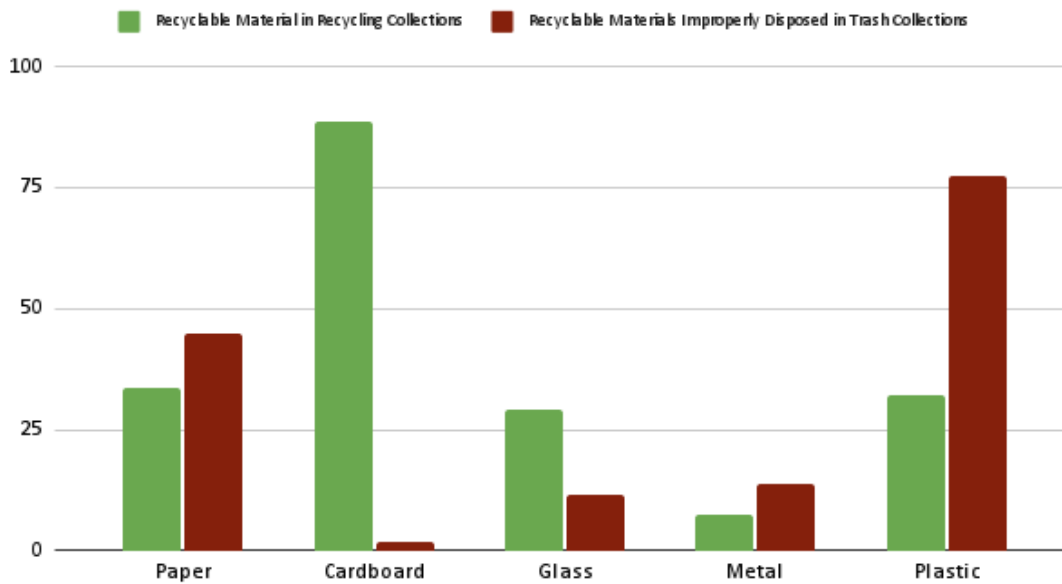

Chart 13: Dual program in National/International dataset recyclable materials improperly disposed compared to properly disposed.