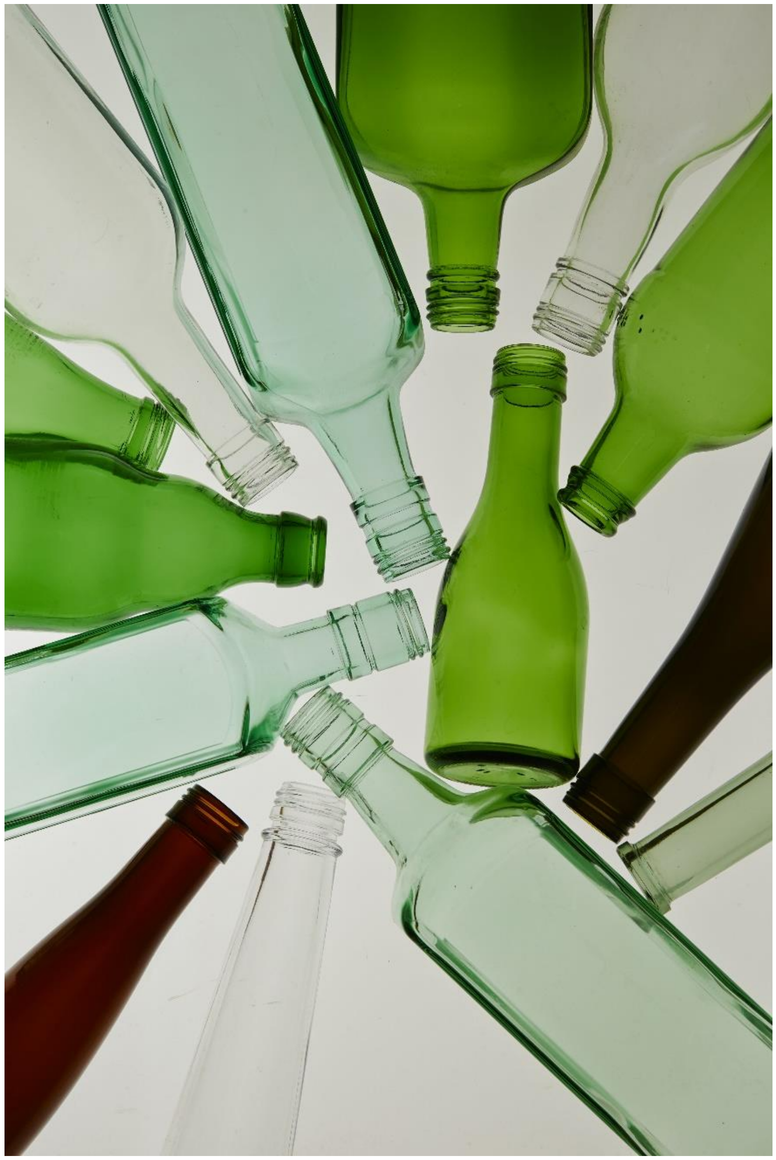

2018 Glass Recycling Survey

RESULTS

Glass Recycling Coalition | June 2018

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Introduction

The Glass Recycling Coalition (GRC) is a non-competitive, collaborative coalition focused on making glass recycling work. In the spring of 2017, GRC conducted its first survey of the following groups in order to measure how different members of the glass recycling chain viewed the current state of glass recycling, to better provide services to improve it:

- public sector (recycling coordinators and solid waste staff from cities, counties, solid waste districts, and state environmental departments)
- materials recovery facilities (MRFs)
- end market representatives (brands, bottle manufacturers, fiberglass representatives, and processors)

GRC conducted the survey again in 2018 to measure changes in attitude, track progress in improving glass recycling, report out on current conditions, and guide the direction of future GRC efforts.

This report presents the results of the 2018 Glass Recycling Survey with a comparison to the 2017 results. These findings provide a real-time attitudinal snapshot of how glass is currently recycled, how it is collected and processed, and where it ends up. The findings also show current beliefs about glass recycling from numerous perspectives. Finally, the survey offers insight into the types and extent of glass recycling challenges, as well as interest in tools and financial resources to aid with these concerns. GRC intends to conduct this survey annually to mold GRC effectiveness.

KEY FINDINGS

The attitudes and experiences about glass recycling found in the 2017 survey largely held true in 2018, with notable changes noted below.

- Expectations of consumers and residents to be able to recycle glass decreased slightly. Ninety-three percent of respondents from the public-sector, and 92 percent of the total three groups surveyed indicated that their residents/customers expect to recycle glass compared to 96 percent and 95 percent, respectively, in 2017.

- Concern about glass recycling decreased by 14 percent among public-sector respondents from 2017, while concern increased among glass industry respondents by 14 percent. Both sectors identified cost-effectiveness as a top concern.

- Respondents care what happens to recycled glass; 53 percent of public-sector respondents and 74 percent of glass industry respondents indicated that the final destination of recovered glass is important to them (down from 75 percent and 85 percent, respectively, in 2017). Both groups ranked bottle-to-bottle recycling as their preferred end use of recovered glass.

- Twenty-seven percent of MRF respondents have additional glass cleanup equipment, compared to 40 percent of MRF respondents in 2017.
- About 50-60 percent each of public-sector and glass industry respondents facing glass recycling challenges expressed interest in public-private partnerships and grants to improve glass recycling.
- Nearly 80 percent of respondents from each of the three groups surveyed believe the cost of collecting and processing recyclables should be shared among various members of the recycling chain, up from half of each group in 2017.

ABOUT THE GLASS RECYCLING COALITION

The Glass Recycling Coalition (GRC) brings together a diverse membership of 40 companies and organizations representing glass container and fiberglass manufacturers, brands that use glass to showcase their products, haulers, processors, material recovery facility, capital markets and end-markets to make glass recycling work.

Established in April 2016, GRC is a non-competitive coalition of U.S. value chain members involved in glass recycling and dedicated to supporting the most accessible and viable glass recovery and recycling options for consumers. The coalition encourages financially sustainable mechanisms that produce quality cullet and strengthen glass markets. For more information, contact info@glassrecycles.org

GRC Members:

Allagash Brewing Company
Ardagh Group
Balcones Resources
Bell's Brewery
Binder USA
Brewer's Association
Diageo
CP Group
Emterra Group
Gallo Glass
Good Planet Laboratories
Goose Island
Glass Packaging Institute
Heineken
Institute of Scrap Recycling Industries (ISRI)
Knauf Insulation
Machinex
National Waste & Recycling Association
Northeast Recycling Council (NERC)
New Belgium Brewing
North American Insulation Manufacturers Association (NAIMA)
O-I
Owens Corning
Rumpke Recycling
PACE Glass
Pernod Ricard USA
Pratt Industries
Republic Services
Ripple Glass
Rocky Mountain Bottle Company
Sierra Nevada Brewing Company
Sims Municipal Solutions
Southeast Recycling Development Council (SERDC)
Strategic Materials
The Recycling Partnership
Urban Mining NE
Waste Management

Government Advisory Council Members:

Massachusetts Department of Environmental Protection
State of Washington State Department of Ecology
City of Fort Collins Waste Reduction & Recycling
Rhode Island Resource Recovery Corporation
City of Houston Solid Waste Management Department

Survey Results

The GRC offered the survey to public-sector representatives, MRFs, and glass industry members nationwide for six weeks from the end of April through beginning of June 2018. Over 5,400 municipal officials, MRF contacts, and glass industry members received an email with an electronic link to the survey; 289 recipients clicked the survey link from these emails. Additionally, the survey was posted on the GRC website and social media pages and was promoted to the audience GRC's webinar "Glass Recycling Solutions and the Role of Fiberglass as a Consumer and Industrial End Market" on April 26, 2018.

More than 300 representatives throughout the glass recycling value chain provided their perspectives on the state of glass recycling in the survey. Figure 1 shows the breakdown of respondents amongst the public-sector (203 respondents), MRFs (82 respondents), and the glass industry (19 respondents) (note: some public-sector respondents also represent a MRF, and are counted under both sectors). Public-sector respondents represented 77 percent of total survey respondents. The 2018 survey received approximately 50 additional responses over the 2017 survey. The number of respondents increased in each sector increased; however, the 2017 survey grouped "other" respondents in with the glass industry though this category was removed in the 2018 survey.

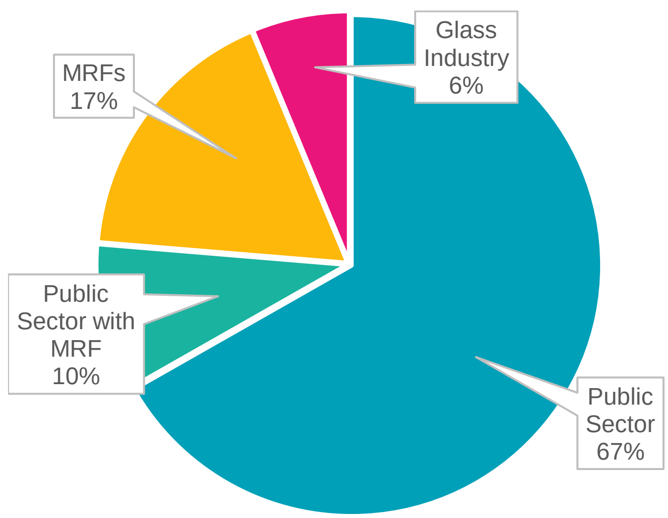


Figure 1- Breakdown of survey respondents by sector

Each sector answered a set of questions that pertained to their sector; the survey results are presented in this report by these groups. While a number of questions only pertained to one sector, the survey included common questions across each category to provide comparative analysis. Given the small number of MRF and glass industry representatives that responded to the survey, comparisons can only be made for the survey respondents, and may not represent the industry as a whole for those groups. Furthermore, changes in survey results between 2017 and 2018 are due in part to the increase in survey respondents (e.g., the number of MRF responses more than doubled), not purely changes in the US recycling landscape.

Figure 2 illustrates where respondents are from in the US. Survey participation was highest in the southeast.

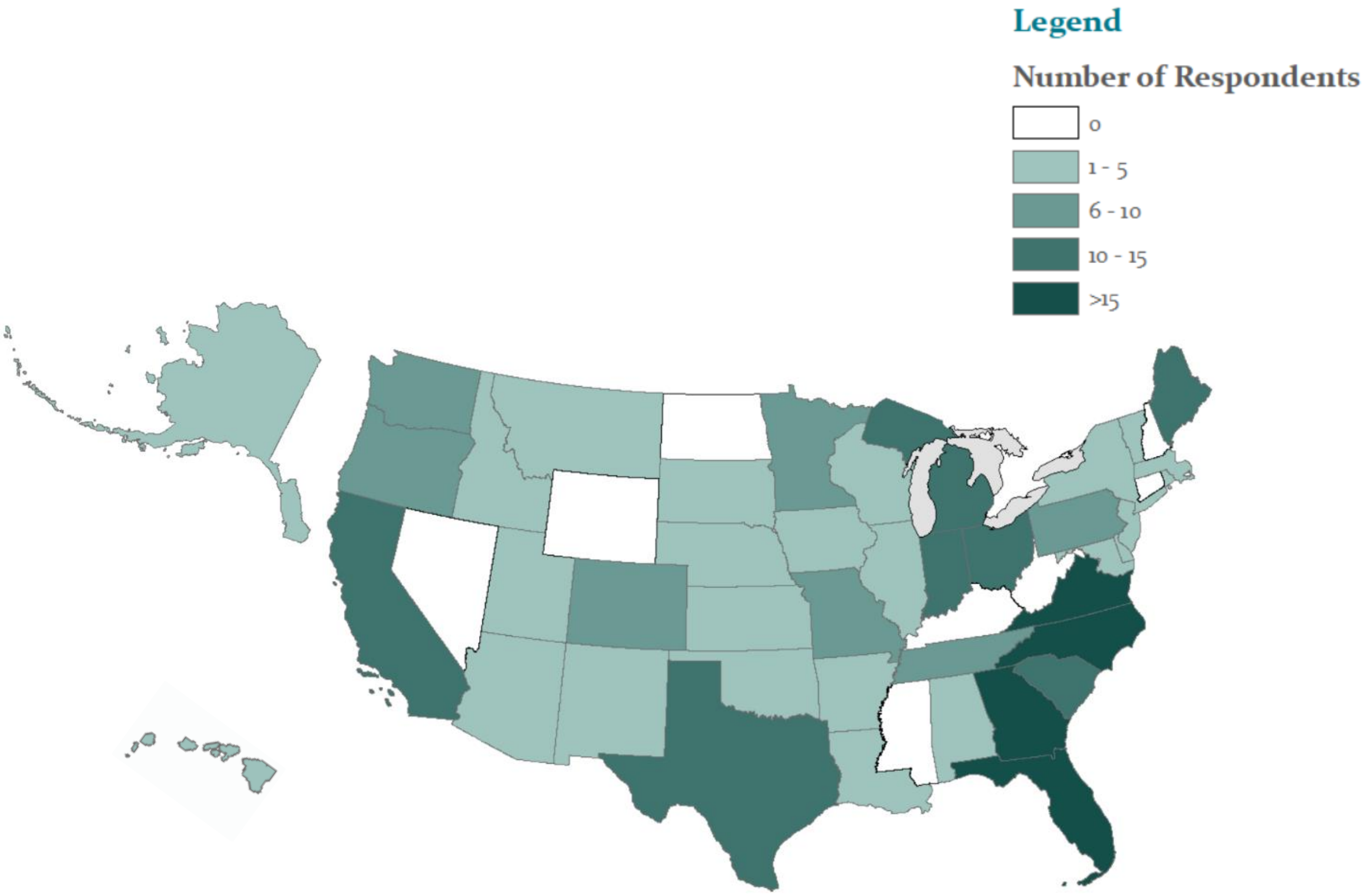


Figure 2- Geographic Representation of All Respondents

Public Sector Responses

PUBLIC SECTOR

Public-sector representatives from municipalities, counties, solid waste districts, and states provided insight on community recycling programs and the glass recycling challenges they face. Many are the respective policy makers in their jurisdictions, but this characteristic was not measured. Public-sector responses increased from 175 in 2017 to 203 this year.

Community Recycling Programs

Table 1 shows the prevalence of different collection systems used to collect glass in respondents' communities (note that percentages add to over 100 percent because communities may have more than one system for collecting glass). More than half of respondents have glass collection available through a drop-off program. Glass may also be collected at curbside in some of these communities, while in others it may be the only collection method used for glass. More than half of respondents collect glass through a single stream curbside program. Eleven percent of public-sector respondents do not recycle glass, similar to the findings from the public-sector in 2017. Finally, single stream recycling with glass continued to grow while older residential methods decreased, despite current difficulties with markets for many materials due to dramatic changes (i.e. China, tariffs, etc.) year over year.

Table 1- Prevalence of different systems to collect glass among public-sector respondents

Collection System	Percent of Respondents That Use Collection System, 2018	Percent of Respondents That Use Collection System, 2017
Single stream curbside	55%	49%
Dual stream curbside	6%	9%
Glass collected separately at curbside	9%	13%
Source separated curbside collection	5%	8%
Drop off	59%	65%
None	11%	12%
Other	7%	4%

Two-thirds of public-sector respondents have made changes to their recycling programs in the face of current market conditions (Figure 3). Over half of public-sector respondents have increased recycling education. One-third of public-sector respondents have made no changes in response to market conditions. Several respondents who selected "other" have increased manual sorting to reduce contamination.

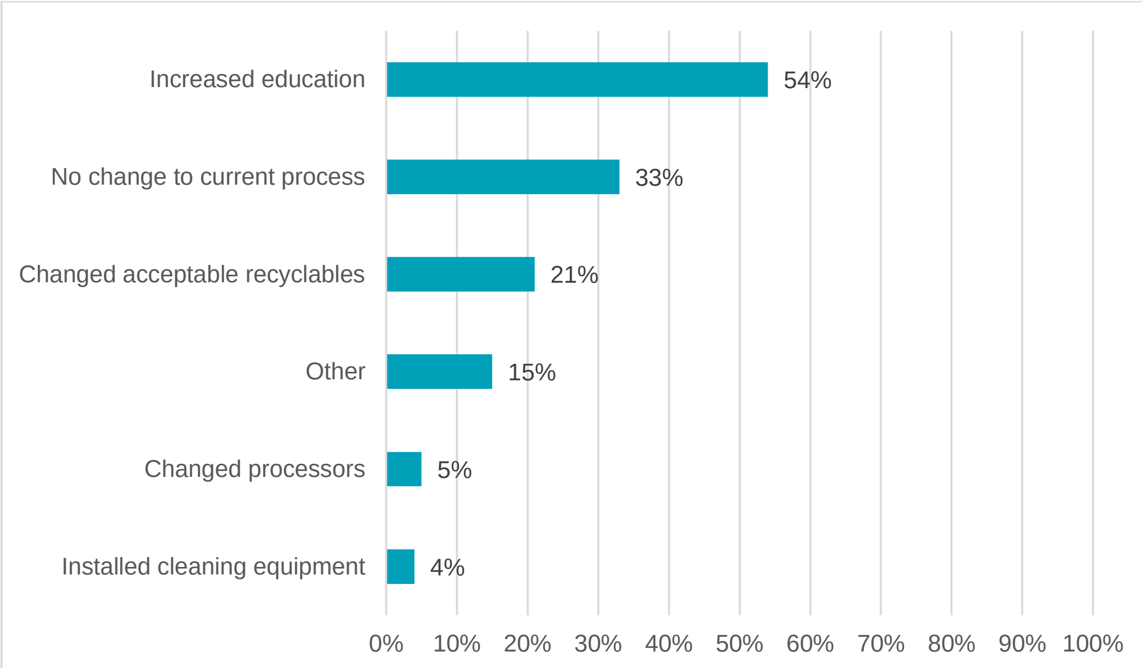


Figure 3- Changes made to public sector respondents' recycling programs in response to current market conditions

Residents overwhelmingly want to recycle glass: 93 percent of public-sector respondents indicated that residents in their community expect to recycle glass. The public sector's responses illustrate the influence of their residents in their decisions around recycling. Respondents were asked for the top three reasons glass should be kept in recycling programs , and they most commonly selected "Residents want to recycle glass" (selected by 72 percent of respondents, down from 86 percent in 2017). The influence of residents' concerns is not specific to glass recycling, but to recycling programs on the whole.

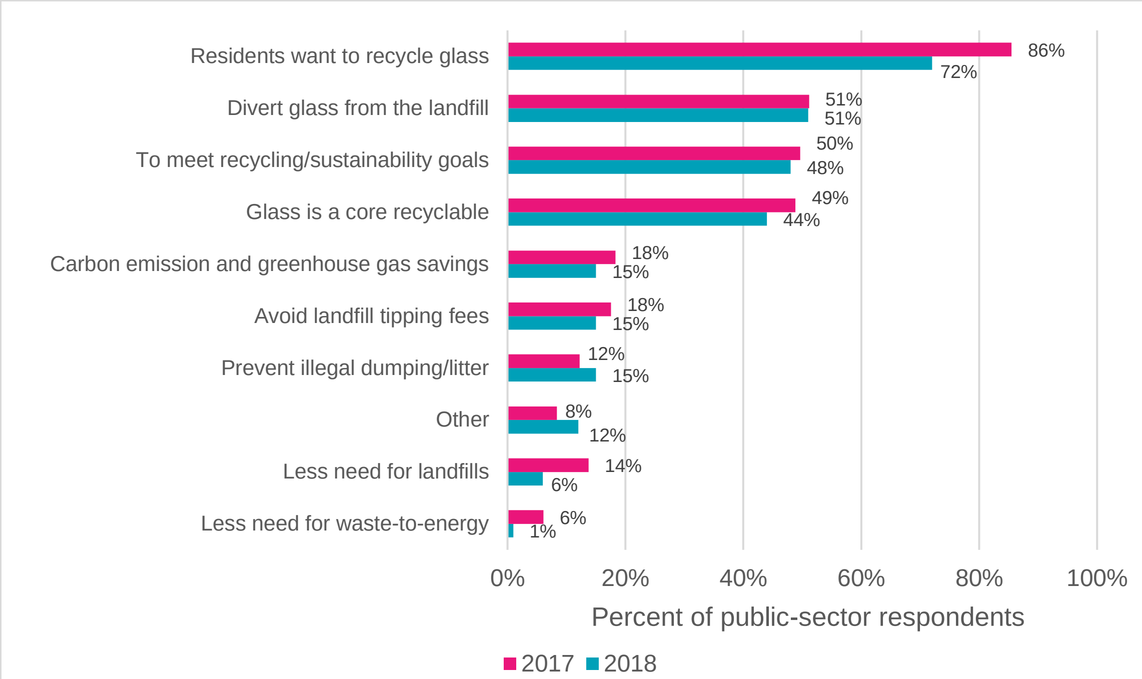


Figure 4- Public-sector respondents' top reasons glass should be kept in recycling programs. Common "Other" responses were to support manufacturers/jobs or that glass should not be recycled.

When asked for the top three program priorities for recycling in their community (Figure 5), respondents most commonly selected "resident satisfaction" (65 percent of respondents). The top reasons to keep glass in recycling and recycling program priorities were largely consistent with responses from 2017; however, one noteworthy finding is that the desire to reduce contamination in community recycling programs increased by 13 percentage points in 2018 as quality restricted market choices severely for residential programs in 2018.

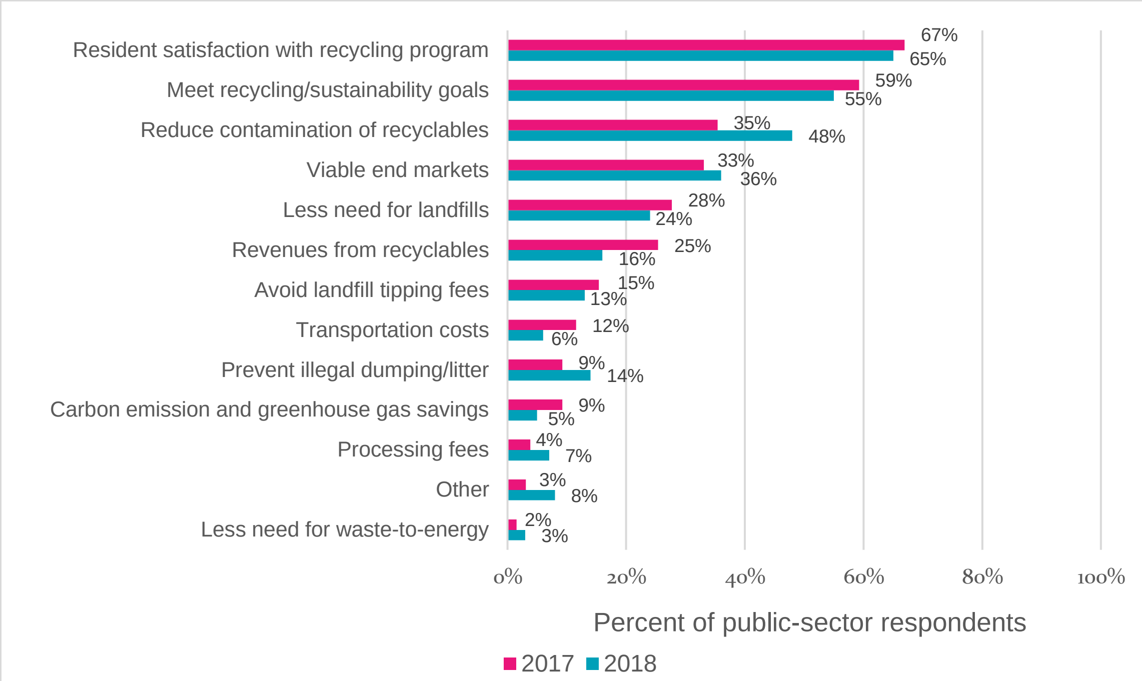


Figure 5- Public-sector respondents' top priorities for community recycling programs

Figure 6a illustrates which member(s) of the recycling value chain public-sector respondents suggested should cover the cost of collecting and processing recyclables. Over three-quarters of public-sector respondents believe that two or more entities should share these costs, up from about half of respondents in 2017. Of the respondents that selected one entity to cover the costs of recycling, most selected either residents or packaging manufacturers.

Figure 6b breaks down which groups public-sector respondents believe glass recycling net costs should be shared with. Residents were most often selected. Packaging manufacturers, the most common selection in 2017, was second. Over half of these respondents indicated that cities/counties should share the service costs of recycling glass.

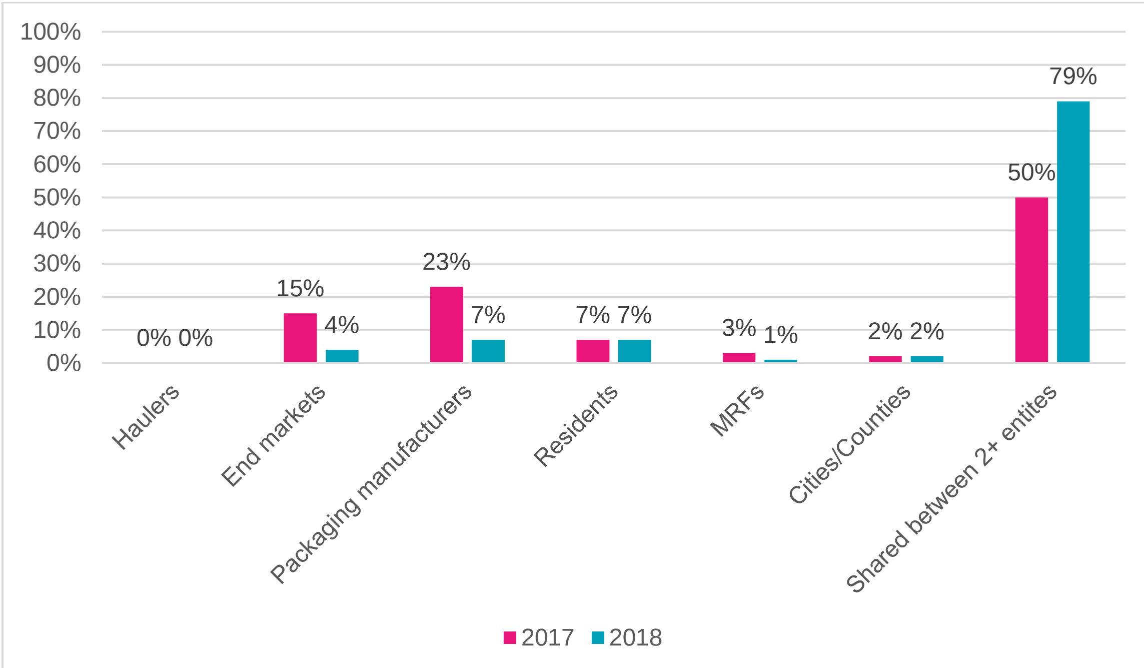


Figure 6a- Public-sector respondents' choices of which group(s) should cover the costs of recycling in 2018 compared to 2017

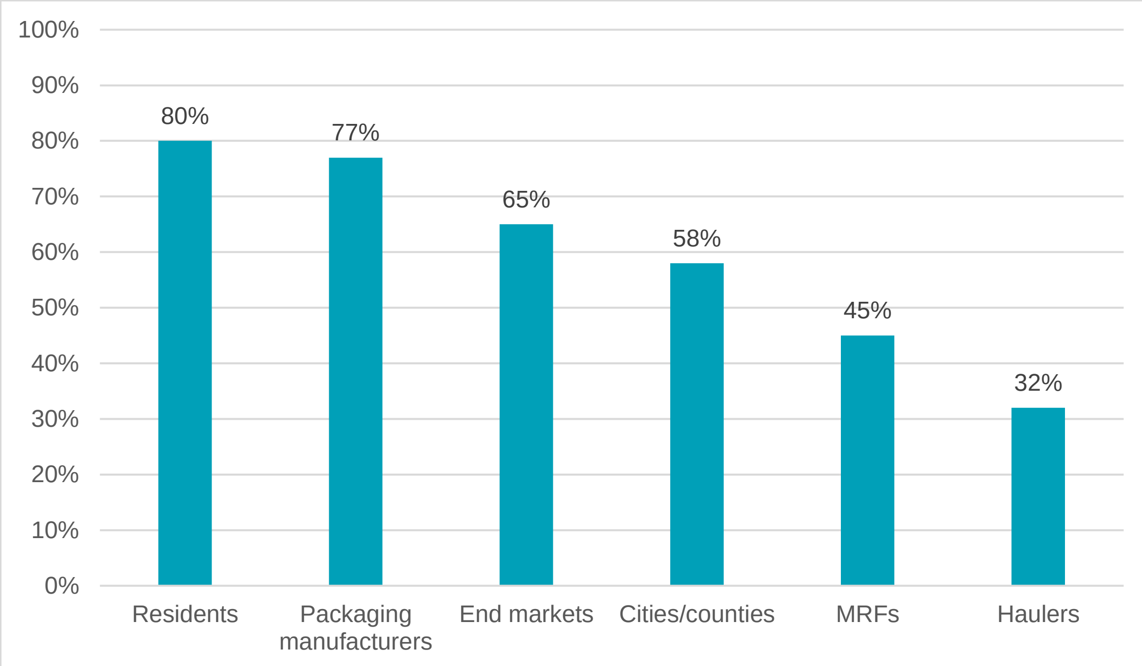


Figure 6b- Public-sector respondents' choices of which groups should share the costs of recycling

Final Destination of Glass

About half of public-sector respondents indicated that the final destination of their community's glass is "very important" or "somewhat important" to them, (Figure *8*7), down from 75 percent last year.

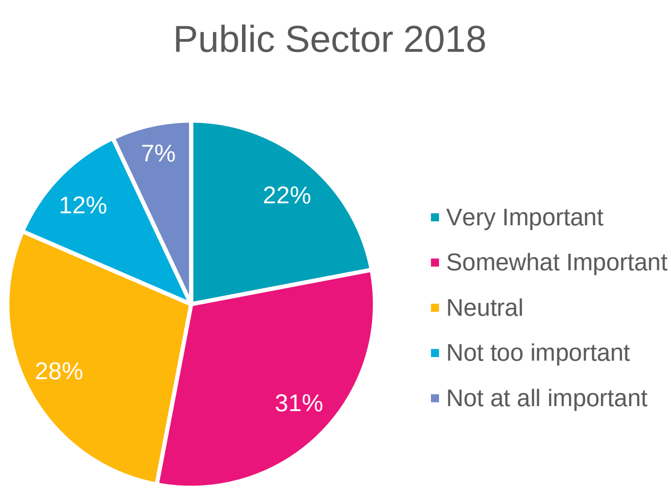
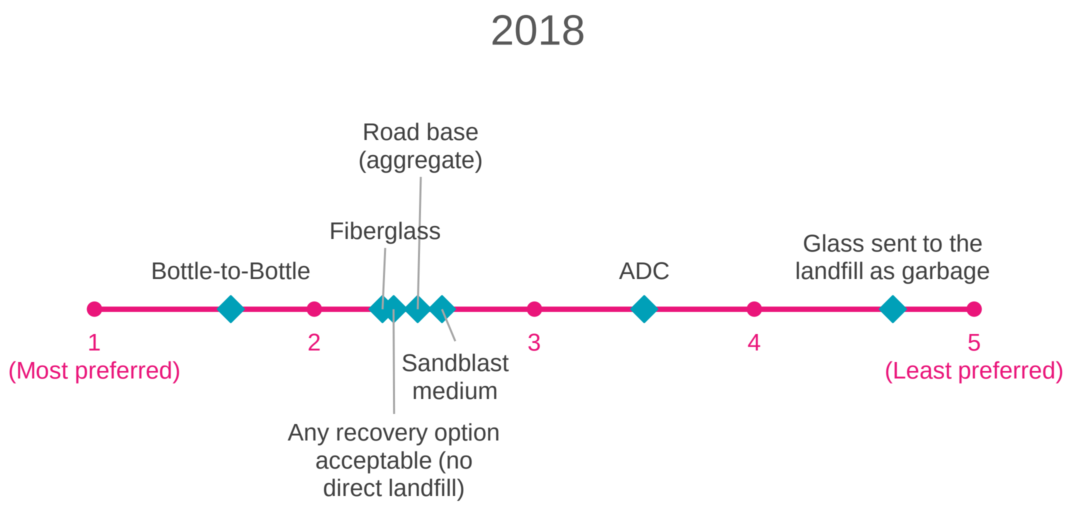


Figure 7- Importance of the final destination of glass recovered by community recycling programs to public-sector respondents

Sixty percent of public-sector respondents know the final destination of the glass recovered in their community. One reason for this low number is the turn-key aspect of many recycling programs where the service provider "owns" the recycling material after it is collected.

Another 12 percent of respondents do not accept glass in their recycling programs, and the remainder do not know the destination of their collected glass for recycling.

Public-sector respondents held very similar preferences for glass recycling end uses in 2018 and 2017. Respondents rated different glass end uses on a scale of one to five (one being the best end use and five being the worst end use). Figure 88 plots the weighted average score for each end use from most to least favorable; the lower the weighted average, the more preferable the end use. Public-sector respondents ranked bottle-to-bottle recycling most favorably and sending glass to the landfill with garbage least favorably.



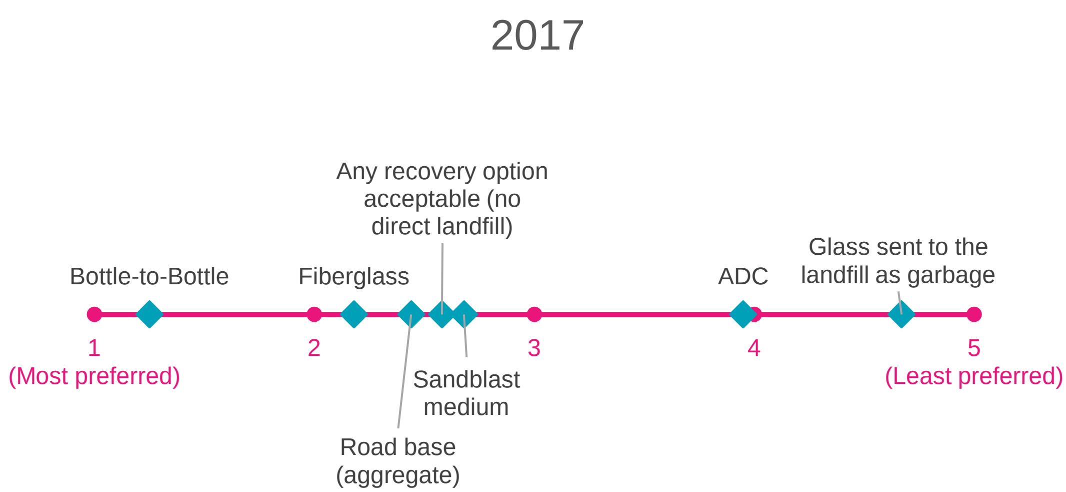


Figure 8- Weighted averages of public-sector respondents' preferred glass end uses, in order from most to least preferable

Glass Recycling Concerns & Opportunities

Fifty-four percent of public-sector respondents indicated that they have some concerns with glass recycling, down from 63 percent of public-sector respondents in 2017. This answer surprised researchers. Table 2 details the challenges that these communities face. Not surprisingly, the most prevalent challenge among these respondents is contamination, with 34 percent of this group indicating they have a concern relating to contamination. Other main concerns pertain to end markets (for instance, they have no or few end markets nearby, or their nearby end markets will not consistently accept their community's glass) and the cost-effectiveness of glass recycling.

Table 2- Percent of public-sector respondents facing specific glass recycling challenges in their community

Glass Recycling Challenges	% Public-sector Respondents Facing Challenge in Their Community, 2018	% Public-sector Respondents Facing Challenge in Their Community, 2017
Contamination issues	34%	60%
End markets (e.g. few/unreliable options)	22%	82%
Cost-effectiveness	22%	45%
Hauler/MRF stopped accepting glass	14%	16%
Processing capability	12%	22%
Hauler raised price to keep glass in the program	12%	16%

Respondents who expressed concerns with glass recycling were asked about their interest in financial resources. Over 60 percent of this group expressed interest in grants and public-private partnerships, down from over 70 percent of public-sector respondents in 2017 (Figure 9).

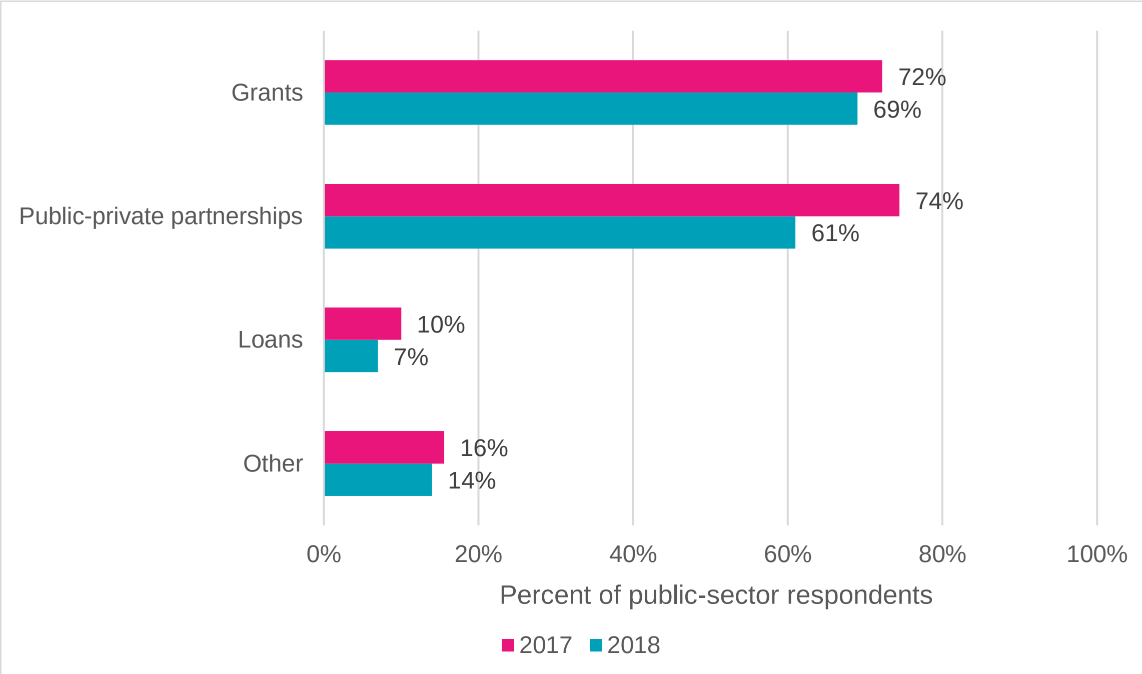


Figure 9- Interest in certain financial resources from public-sector respondents facing glass recycling challenges

Respondents facing glass recycling challenges were also asked to select tools or information that would be useful to increase quality glass recycling in their community. The top three tools, each of which were selected by approximately 45 percent of those who are facing glass recycling challenges, were types of glass end markets, case studies of local governments making glass recycling work, and information on grant funding for glass recycling (Table 3). Interest in information about glass recycling for legislators and decision makers increased from 29 percent of respondents to 44 percent of respondents, while interest in options for preserving glass in recycling collection decreased from 40 percent of respondents to 24 percent of respondents. Almost 75 percent of these respondents indicated that webinars and presentations are the best way to share these tools and information; the response was similar in 2017 (Table 4).

Table 3- Percent of public-sector respondents experiencing challenges with glass recycling that would find the following tools to be useful

Tool/Information	Percent, 2018	Percent, 2017
Types of end markets that are available for glass	45%	54%
Case studies of local governments making glass recycling work	45%	40%
Information on grant funding for glass recycling	44%	45%
Information about glass recycling for legislators/decision makers	44%	29%
Best practices in glass recycling collection or processing	43%	50%
Options for preserving glass in recycling collection	24%	40%
A list of top considerations when making recycling program changes	19%	16%
Process of how glass is recycled into new containers	14%	20%
Other	12%	12%

Table 4- Preferred platforms for sharing tools and information among public-sector respondents experiencing challenges with glass recycling

Platform	Percent, 2018	Percent, 2017
Webinars/presentations	72%	77%
Email alerts	68%	58%
Newsletters	45%	45%
Social media	22%	13%

Glass Industry Responses

GLASS INDUSTRY

Representatives from the glass industry answered many of the same questions as the public-sector. The glass industry respondents provided similar feedback on the state of glass recycling to that from public-sector respondents. Glass industry responses consisted of 12 glass industry representatives and 38 “other” respondents in 2017, compared to 19 glass industry representatives (no “other” respondents) in 2018.

Who should pay for recycling?

Figure 10a illustrates which member(s) of the recycling value chain glass industry respondents suggested should cover the cost of collecting and processing recyclables. Similar to the public-sector, 84 percent of glass industry respondents believe that two or more entities should share these costs. Of those that indicated that the cost should be shared, 87 percent selected cities/counties as one of the groups that should share in the costs of recycling, up from 28 percent in 2017 (Figure 10b).

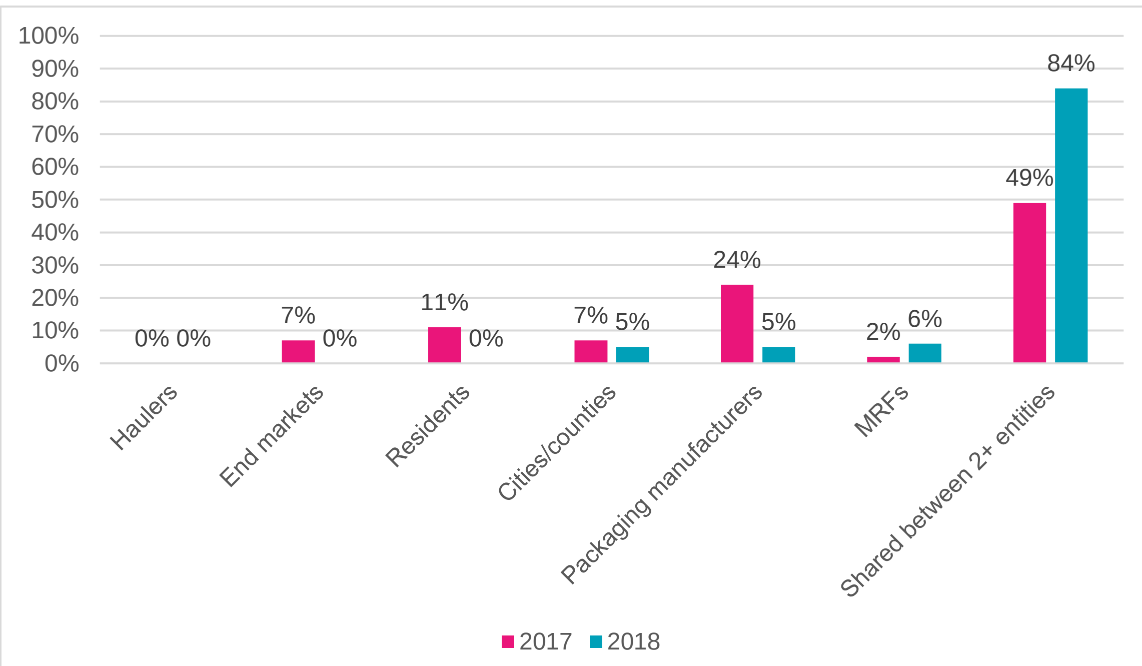


Figure 10a- Glass industry respondents’ choices of which group(s) should cover the costs of recycling

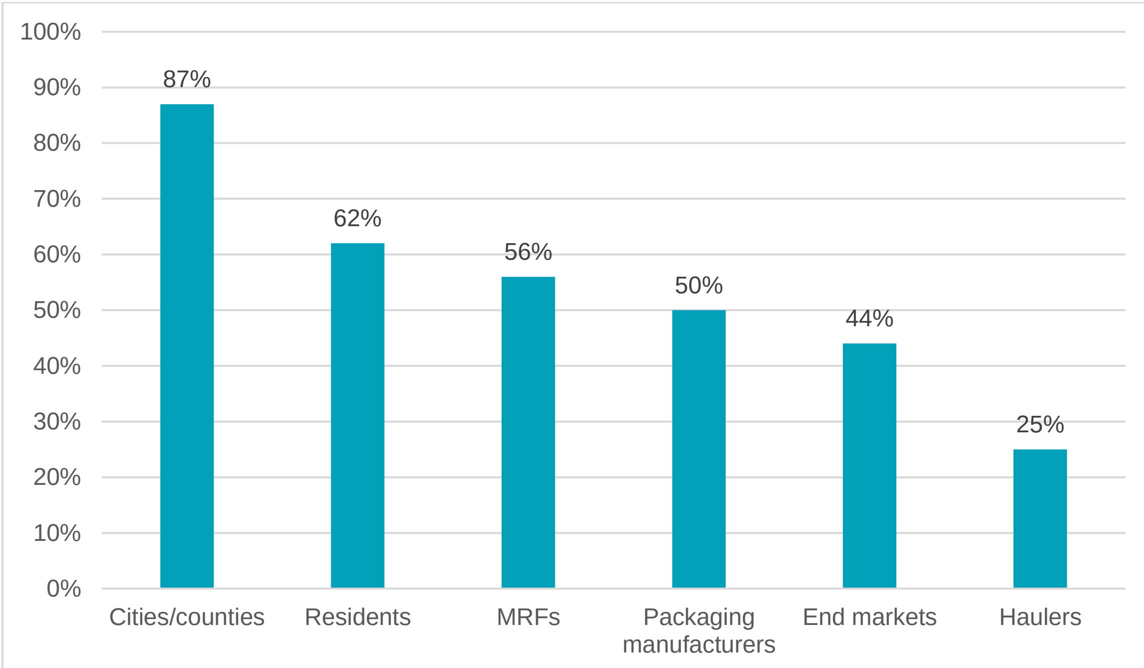


Figure 10b- Glass industry respondents' choices of which groups should share the costs of recycling

Why should glass be recycled?

Like the public-sector, glass industry representatives revealed a push from the public to recycle glass. Ninety percent of their customers expect to recycle glass. Furthermore, when glass industry respondents were asked to select their top three reasons that glass should be kept in recycling programs, they, like the public-sector, most commonly selected “people want to recycle glass” though by ten fewer percentage points than in 2017 (tied with “glass is a core recyclable”, which was selected by 63 percent of glass industry respondents up from 52 percent in 2017) (Figure 11).

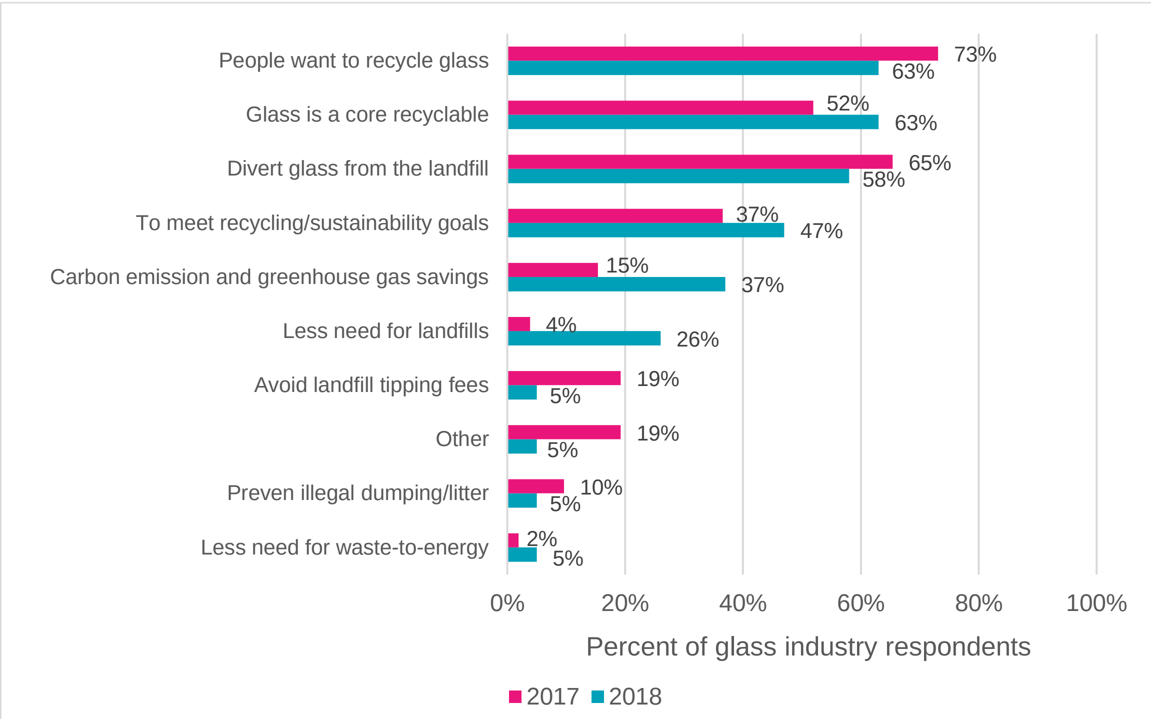


Figure 11- Glass industry respondents’ top reasons glass should be kept in recycling programs

Final Destination of Glass

Glass industry respondents also revealed that they are concerned with the final destination of recovered glass; 74 percent of glass industry respondents rated the final destination of recovered glass as “very important” or “somewhat important” (Figure 12), though 85 percent of glass industry respondents selected these options last year. The glass industry further revealed their concern about the final destination of their glass by rating different glass end uses on a scale of one to five (one being the best end use and five being the worst end use).

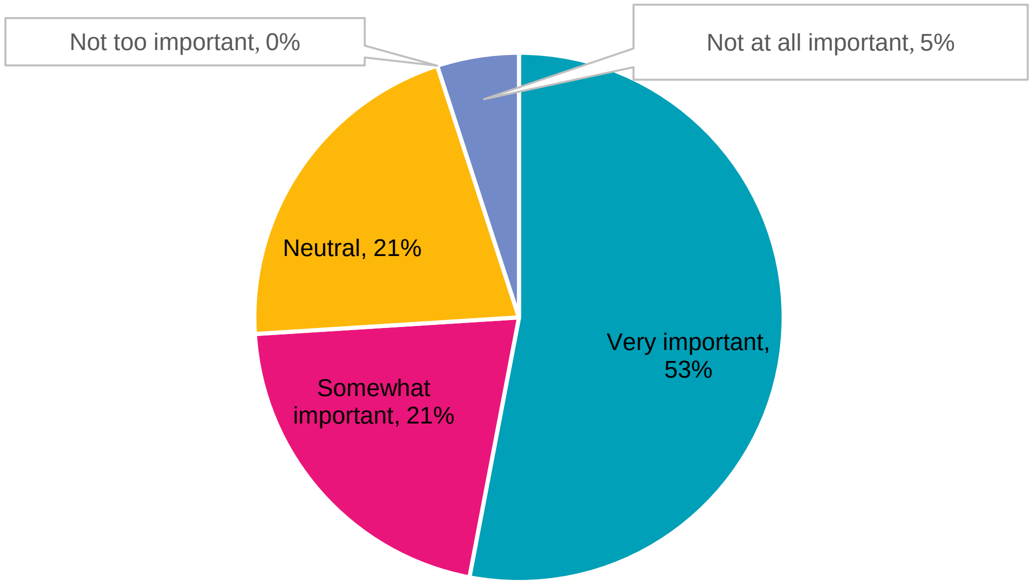


Figure 12- Importance of the final destination of glass recovered by community recycling programs to glass industry respondents

Figure 13 plots the weighted average score for each end use from most to least favorable; the lower the weighted average, the more preferable the end use. Glass industry respondents ranked glass end uses in nearly the same order of preference as the public-sector respondents. Not surprisingly, respondents ranked bottle-to-bottle recycling most favorably and sending glass to the landfill with garbage least favorably.

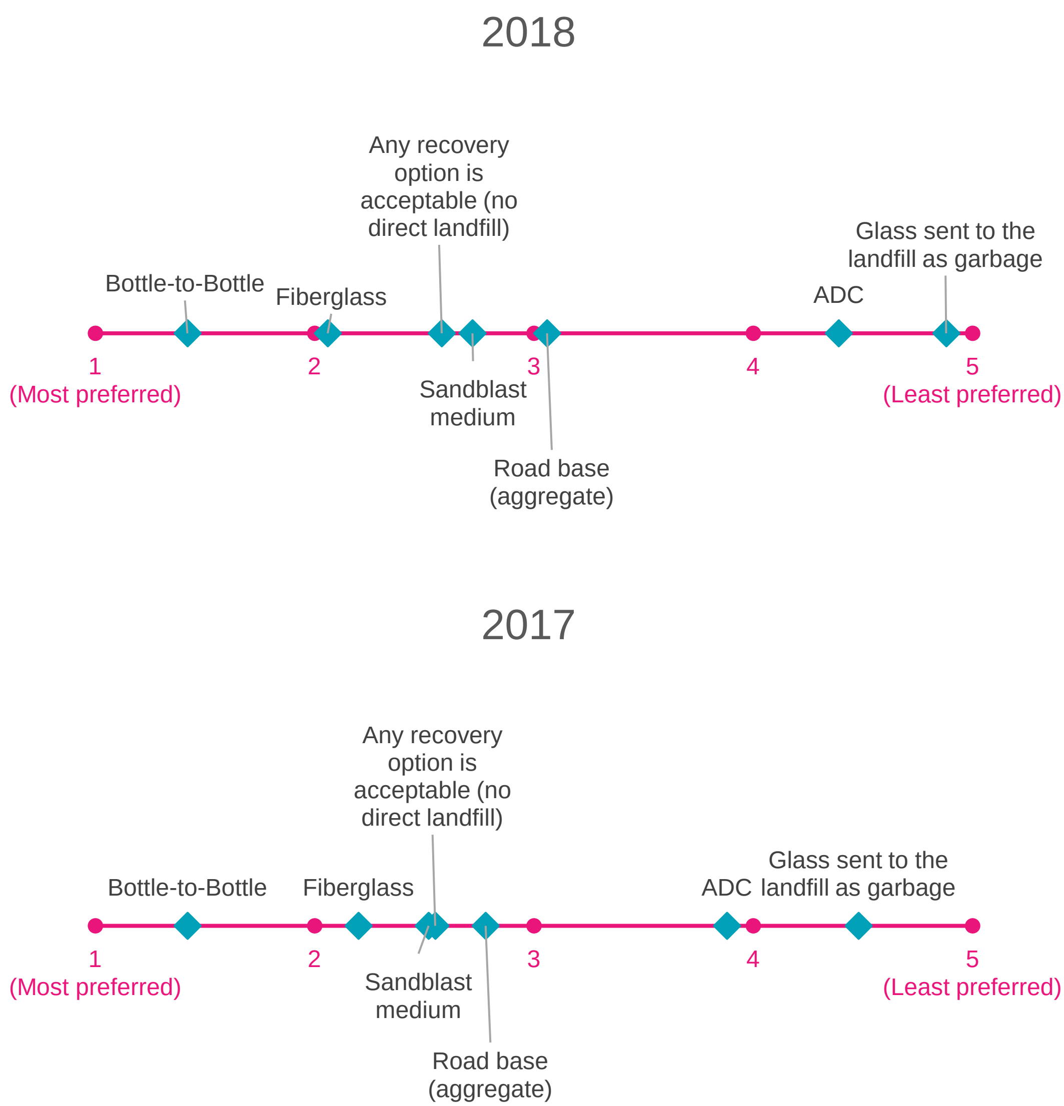


Figure 13- Weighted averages of glass industry respondents' preferred glass end uses, in order from most to least preferable

Glass Recycling Concerns & Opportunities

Seventy-nine percent of glass industry respondents indicated that they have concerns with glass recycling. Glass recycling challenges they identified are listed in Table 5. Like the public-sector, the glass industry identified contamination as a top concern, though this was tied with a recognition of service providers that stop accepting glass and that not enough glass is being recycled. Interestingly, although contamination was selected as a top concern, only 26 percent of glass industry respondents identified a lack of advanced glass cleaning systems in MRFs as a challenge. End markets, surprisingly, has decreased considerably as a concern in the glass industry, similar to the public-sector, though this is an often-cited problem in the media.

Table 5- Percent of glass industry respondents who identified specific glass recycling challenges

Glass Recycling Challenges	Percent of Glass Industry Respondents, 2018	Percent of Glass Industry Respondents, 2017
Contamination/quality issues	53%	64%
Some recycling service providers have stopped accepting glass	53%	55%
Not enough glass is being recycled	53%	22%
Cost-effectiveness	47%	56%
Lack of glass processing options	42%	40%
End markets	37%	51%
Lack of advanced glass cleaning systems in MRFs	26%	38%
Opponents' efforts to remove glass	26%	16%
Customer service issues trying to move glass	11%	15%

Glass industry respondents were also asked about their interest in financial resources to improve glass recycling. The glass industry, like the public-sector, expressed more interest in public-private partnerships and grants than in other types of financial resources, but less interest than expressed in 2017 (Figure 14).

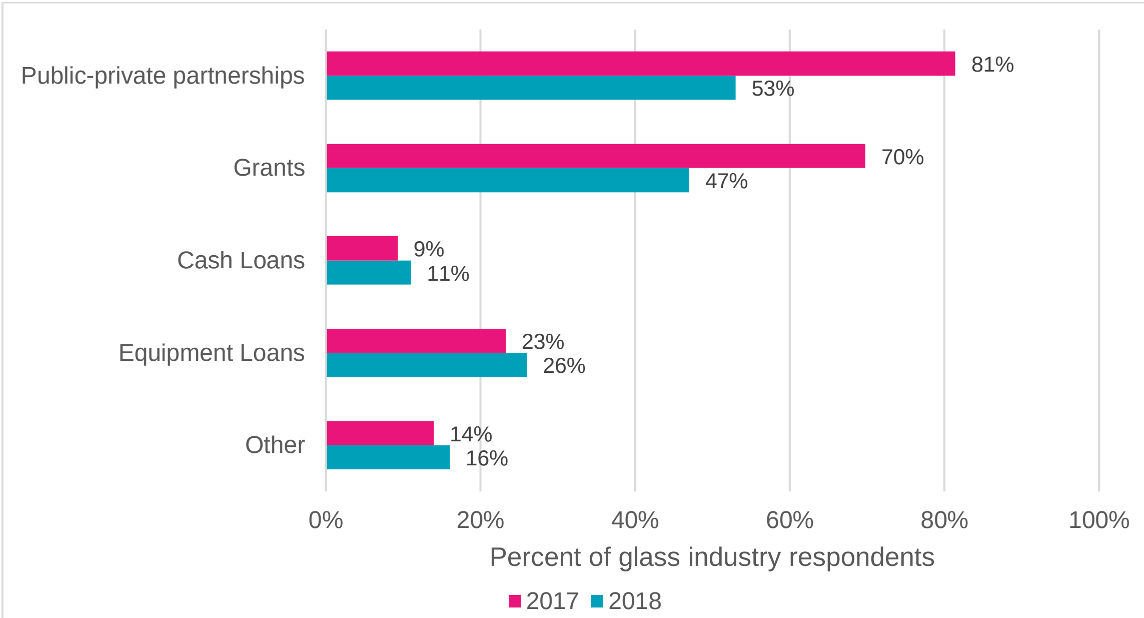
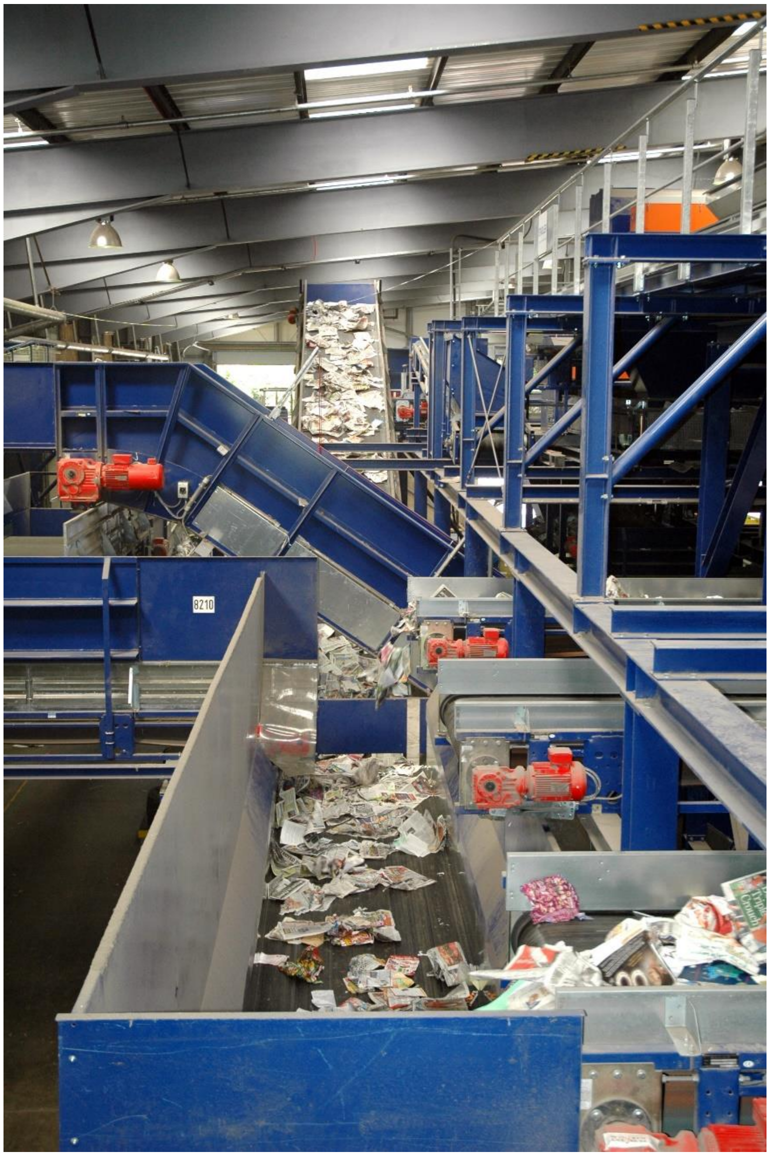


Figure 14- Interest in certain financial resources from glass industry respondents

Material Recovery Facility Responses



MRFS

Materials Recovery Facility respondents provided a glimpse into how recycled glass is currently processed and where it is sold. MRF responses increased from 31 in 2017 to 82 this year.

Glass Processing

MRF respondents were asked which type(s) of processing system they operate for glass (Figure 15). The most commonly used processing system by MRF respondents is single stream or mixed recyclables; 55 percent of MRF respondents use single stream processing for glass (regardless of whether they use additional glass cleaning equipment). Although the percentage of public-sector respondents that do not accept glass remained consistent from last year, the percentage of MRF respondents that do not accept glass increased from four percent in 2017 to 15 percent in 2018. The general decline in MRF commodity revenue from market uncertainties over the past year is the likely cause of the increase as MRFs sought to shed existing net cost centers, though this needs to be tested.

Twenty-seven percent of MRF respondents have additional glass cleaning equipment. Figure 16 shows the types of glass cleaning equipment these respondents use; most (64 percent) use air knives, vacuums or blowers to remove paper and organics. Another seven percent of MRF respondents indicated that they do not have additional glass cleaning equipment but would consider it, and 10 percent have already considered additional equipment but determined it too costly.

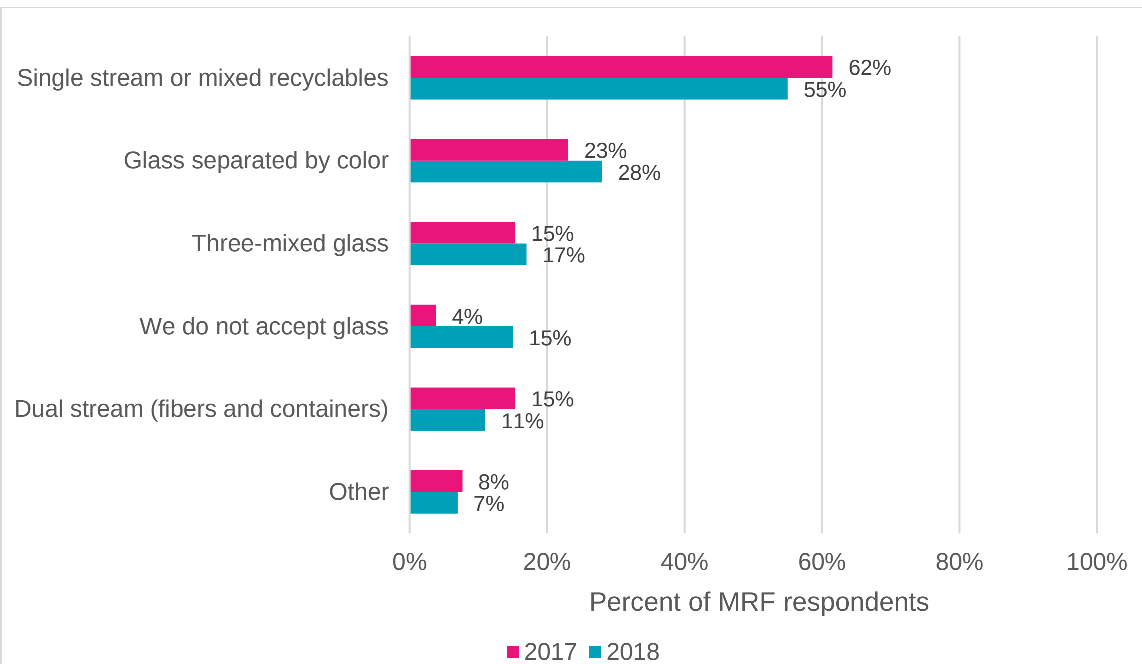


Figure 15- Processing systems used by MRF respondents for glass

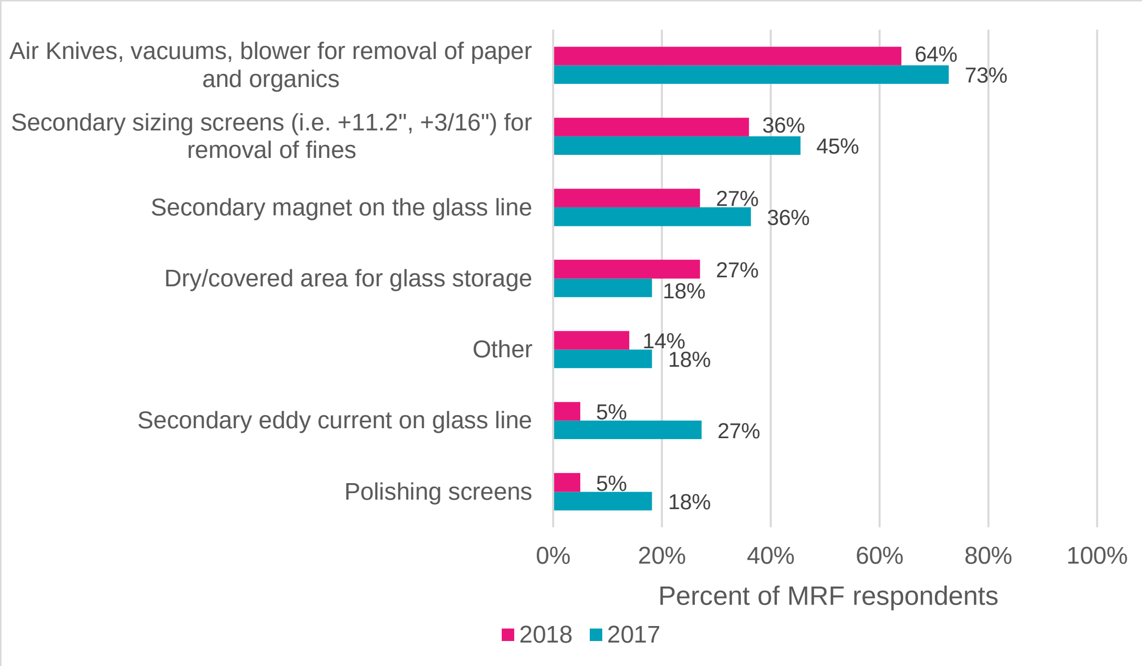


Figure 16- Additional glass clean up equipment used by MRF respondents

When asked about changes made to recycling operations in the face of current market conditions (Figure 17), only 15 percent have installed cleaning equipment. Most commonly, MRFs have increased recycling education, with 41 percent of MRF respondents doing so. Over a quarter of MRF respondents have made no changes in response to market conditions. Several respondents who selected “other” have begun landfilling recyclables.

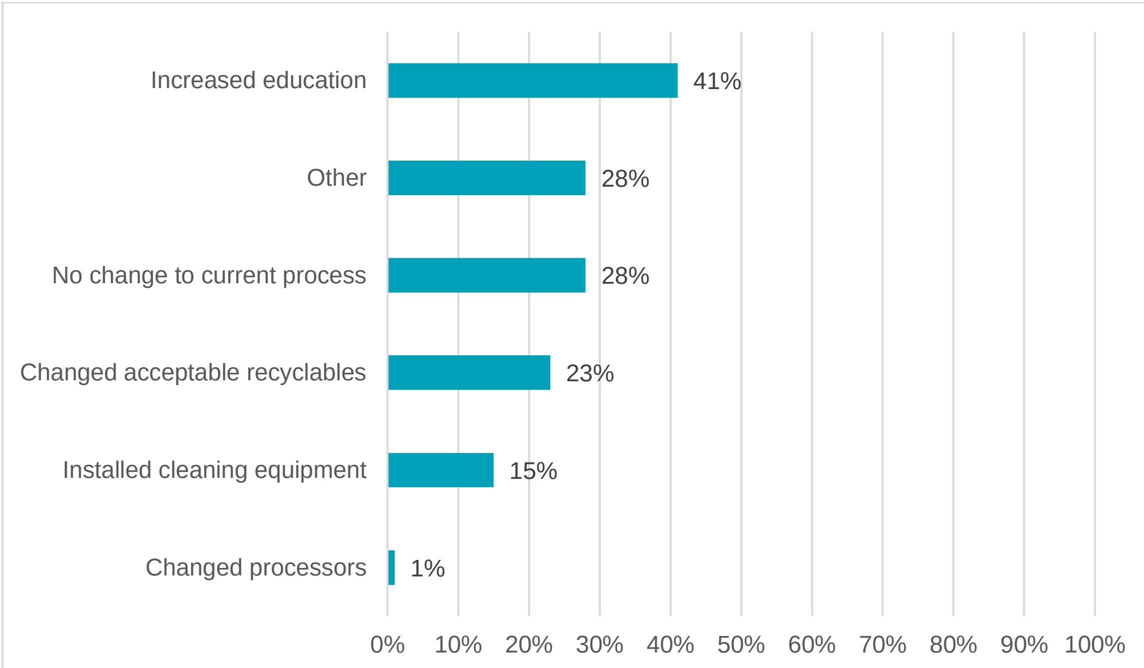


Figure 17 Changes made to MRF respondents' recycling operations in response to current market conditions

Destination of Collected Glass

MRF respondents were asked to provide all of the end uses of the glass processed at their facility (Table 6). The MRFs' most utilized end use is bottle-to-bottle recycling. 43 percent of MRF respondents indicated that at least some of their glass becomes cullet to be recycled into glass bottles, and this now represents a minority of responding facilities compared to 2017.

Table 6- Final destinations of glass processed by MRF respondents. Most "Other" responses named specific companies that may use the glass in multiple ways.

Glass End Use	% MRF respondents, 2018	% MRF respondents, 2017
Glass into cullet recycled into glass bottles	43%	58%
Other	23%	8%
Used as Alternative Daily Cover (ADC) in a landfill	21%	19%
Recovered for fiberglass	16%	23%
Recovered as road base (aggregate)	15%	15%

Any option for recycling glass is acceptable, as long as it isn't landfilled with garbage.	11%	23%
N/A: We don't accept glass in our recycling program	11%	19%
Recovered as sandblast medium	11%	12%
It goes to the landfill as garbage, although glass is still accepted in our recycling program	9%	Not asked in 2017

MRF respondents provided up to three factors determining where they sell their glass (Table 7). Like last year, the top factors selected suggest that respondents prioritize cost, although the percentage of MRF respondents that selected factors related to cost decreased 15 percentage points or more from 2017. While public-sector and glass industry respondents reported that people's desire to recycle glass is a primary reason that glass should be recycled, MRF respondents did not reveal a similar pressure in decision-making to act on customer's desires. In fact, only 5 percent of MRF respondents indicated that customer expectations for recycled glass to be used in glass manufacturing is a top consideration in determining where they sell their glass – despite 90 percent of MRF respondents reporting that their customers expect to recycle glass. Several of the MRF representatives who responded with "other" specified that they only have one outlet for their glass.

Table 7- Determining factors of where MRFs sell their glass

Determining Factor of Where Glass is Sold	% MRF Respondents, 2018	% MRF Respondents, 2017
Transportation cost	39%	54%
Highest price paid per ton/lowest cost per ton	28%	46%
Highest and best end use	27%	27%
Processor will take all glass I bring	16%	42%
Other	16%	15%
Any option for recycling glass is acceptable, as long as it isn't landfilled with garbage	15%	23%
Contractual obligations	15%	4%
Landfilling is most convenient or cheapest option	10%	8%
N/A: We don't accept glass in our recycling program	9%	4%
Landfill construction material substitution (ADC, road base, French drains) fulfills recycling obligation	7%	8%
Most glass yielded (recovered)	5%	8%
Customer expectations for recycled glass to be used in glass manufacturing	5%	8%

Who should cover costs?

Figure 18a illustrates which member(s) of the recycling value chain MRF respondents suggested should cover the cost of collecting and processing recyclables. As with the other two groups, about 80 percent of respondents believe that two or more entities should share these costs. Of the respondents that selected one entity to cover the costs of recycling, most selected packaging manufacturers. Figure 18b shows which groups MRFs who believe the costs of recycling should be shared should actually share these costs. Eighty-two percent of these MRF respondents indicated that residents should share the costs. MRFs were second-least often selected and privately run MRFs would expect to be compensated for service costs.

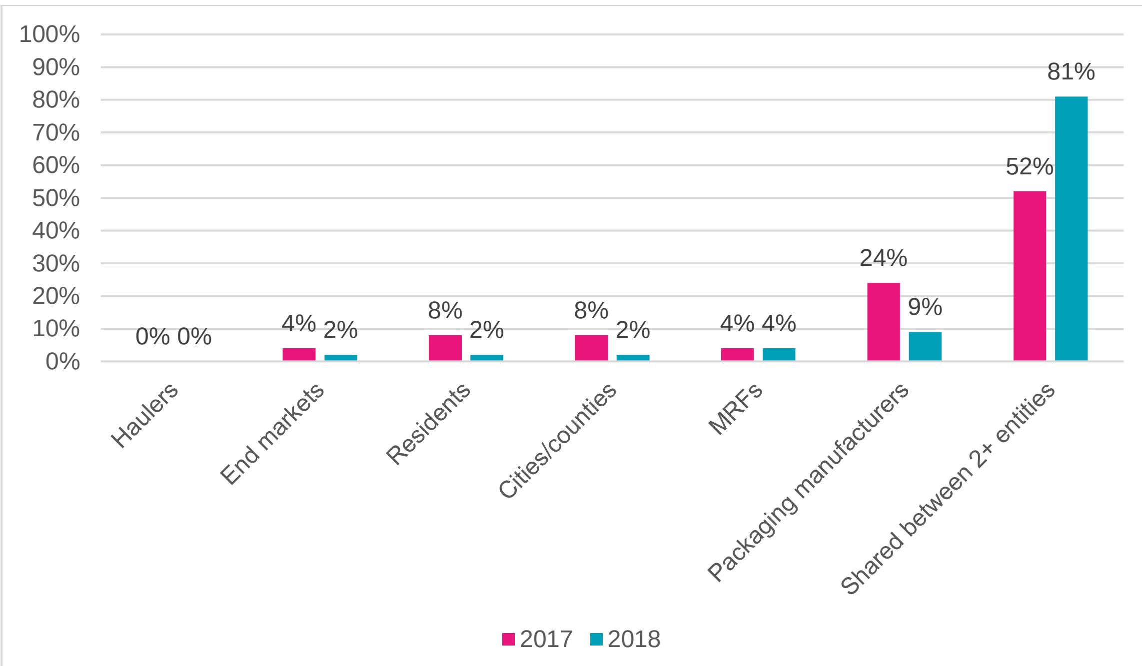


Figure 18a- Breakdown of MRF respondents' choices of which group(s) should cover the costs of recycling

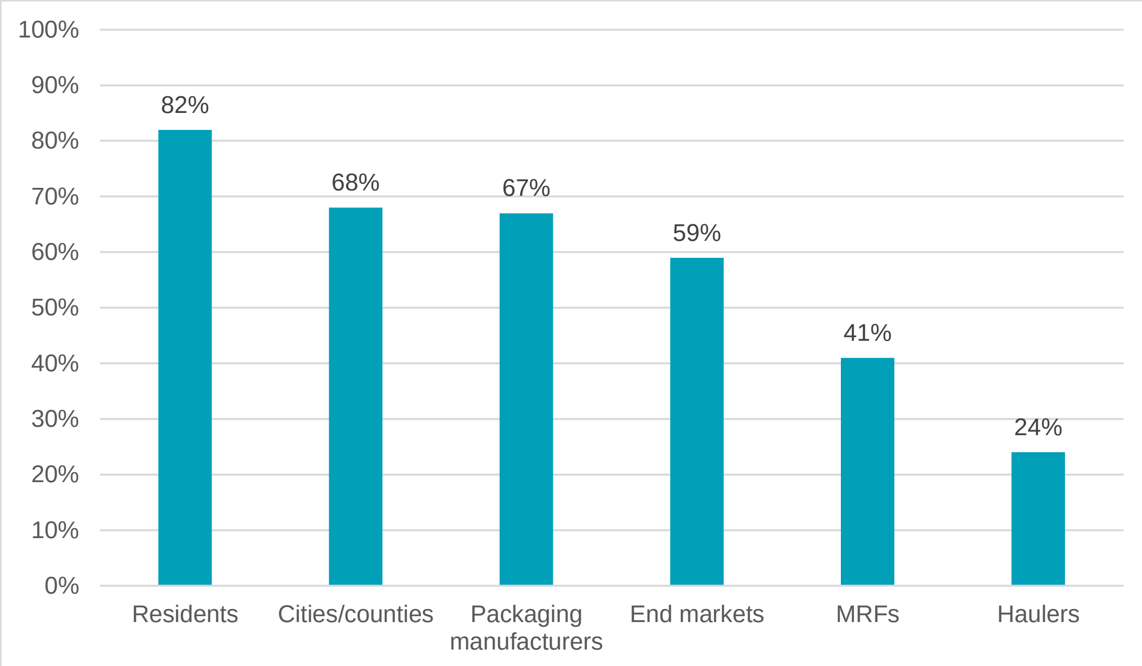


Figure 18b- Breakdown of MRF respondents' choices of which groups should share the costs of recycling

Conclusion

Values and vision about glass recycling are shared among the public-sector, MRF operators, and glass industry respondents who participated in this survey. All three groups face high expectations from their customers to recycle glass. Public-sector and glass industry respondents agree that the end use of recovered glass is important, but more than half of these respondents expressed concerns with glass recycling. Generally, both groups face glass recycling challenges pertaining to end markets, contamination and cost-effectiveness, and indicated that financial resources such as public-private partnerships and grants could be beneficial in addressing these concerns. Lastly, a large share of all three groups believe that costs associated with recycling should be shared among the members of the glass recycling value chain. These overall attitudes are similar to responses in the 2017 survey. GRC will continue to observe changes in perceptions on end markets, MRFs not taking glass (which should be monitored), and more transparency about who should pay for glass recycling services to see where trends may be developing.