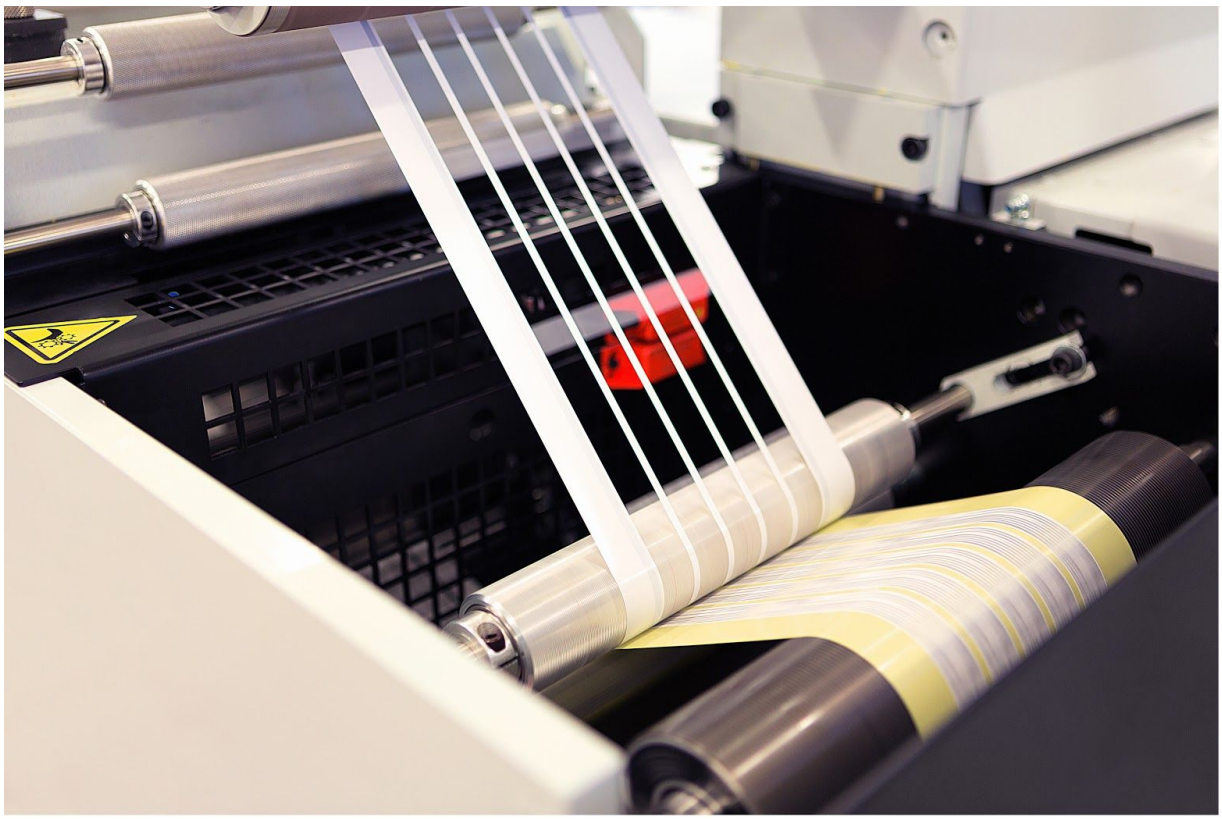
2018 Matrix Survey Report

Presented by TLMI



Labels. Packaging. Leadership.

BACKGROUND

In late 2017, TLMI commissioned a matrix survey in order to gather insights from its U.S. converter members on how much matrix waste they were generating annually and the ways in which it was being disposed. TLMI knew the options for disposition were primarily landfill, waste-to-energy, incineration, or repurposing but we did not have any information on what percentages were going where.

PROJECT OBJECTIVES

In this study, we focused on the pressure-sensitive label segment of our membership. Our primary objective was to estimate the amount of matrix waste converters generate based on the annual production data they submitted as well as their own calculations on matrix waste. In addition to the quantitative numbers, we also asked some qualitative questions in the survey; namely, what are the major obstacles that converters face that prevent them from using non-landfill disposal options.

PROJECT SCOPE and METHODOLOGY

The scope of the survey was all types of pressure-sensitive matrix waste generated by TLMI converter members in the United States.

A task force from TLMI's Environmental Committee, comprised of suppliers and converters, developed the survey questions. Industry Insights, a company specializing in survey research services, used their proprietary survey instrument to administer the questions to converter members. Each converter member was sent a discrete link to the survey questions (see Appendix A for the survey questions) and was asked to provide data for each manufacturing site. Each respondent was

identified by a numerical code provided by Industry Insights to maintain anonymity. Industry Insights compiled the data and provided it to TLMI in aggregate.

ANALYSIS

Analysis was undertaken by another cross-functional team comprised of suppliers and converters from the Environmental Committee, and TLMI staff members: John Crosby (Grand Rapids Label), Philip Coates (UPM Raflatac), Brian Hurst (Yerecic Label), Chris Gillespie (Precision AirConvey), Rosalyn Bandy (TLMI), Kyle Baldwin (TLMI), Dan Muenzer (TLMI). The team met in person at TLMI headquarters and reviewed the data in depth and collaborated on the conclusions that could be drawn from the data. The team also developed strategic next steps as the result of the data that would be implemented within the TLMI committee bandwidth.

Figure 1. 2018 TLMI membership by region

REGIONS

TLMI breaks down membership into four regions: northeast, north central, south, and west for purposes of the Management Ratio Report. Industry Insights also broke down the matrix survey data by these same regions for purposes of identifying potential concentrations of matrix waste for future pilot projects.

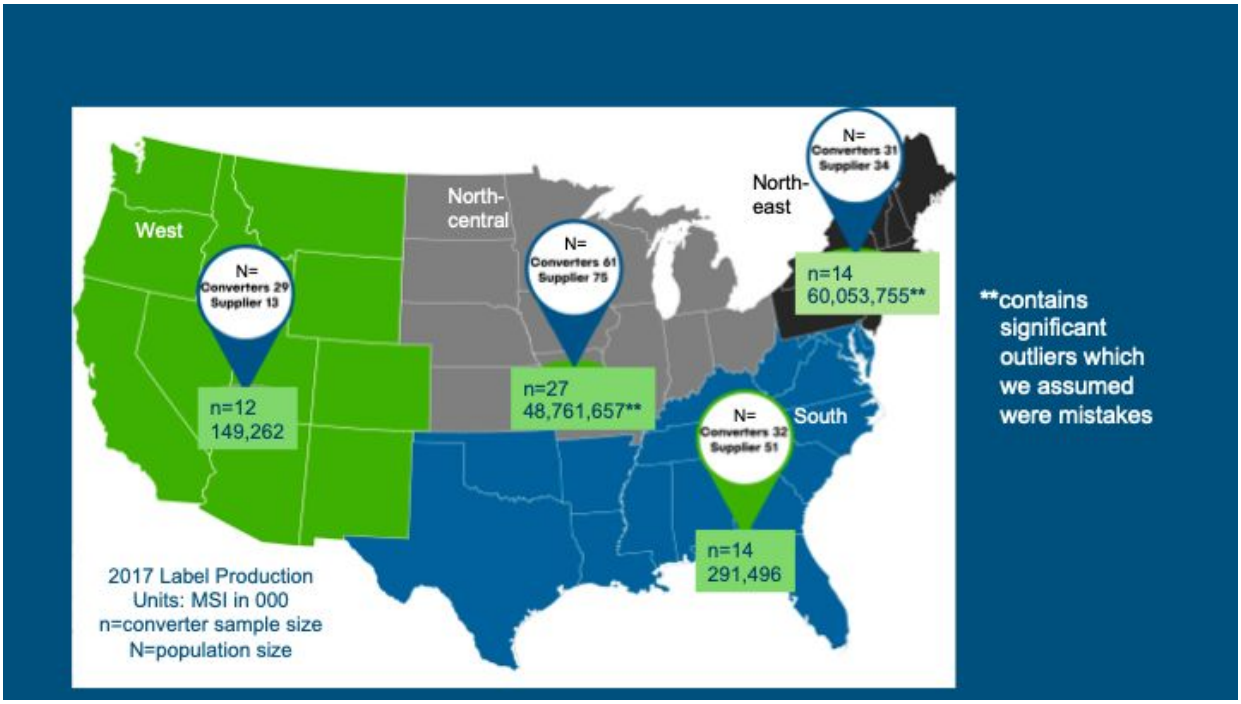
RESPONDENTS

The following figures, **Figure 2** and **Figure 3**, visually demonstrate by zip code the breakdown of survey respondents versus survey non-respondents. It is clear that there is significant data remaining that could be reported.

Figure 2. Survey Respondents

Figure 3. Survey Non-Respondents

Figure 4. MSI Production and Matrix Waste Generation Survey respondents were asked to report their annual production of pressure-sensitive labels in MSI (thousand square inches) and tons per year of matrix waste generated. N= total converters in region in 2018, n = converters reporting data.



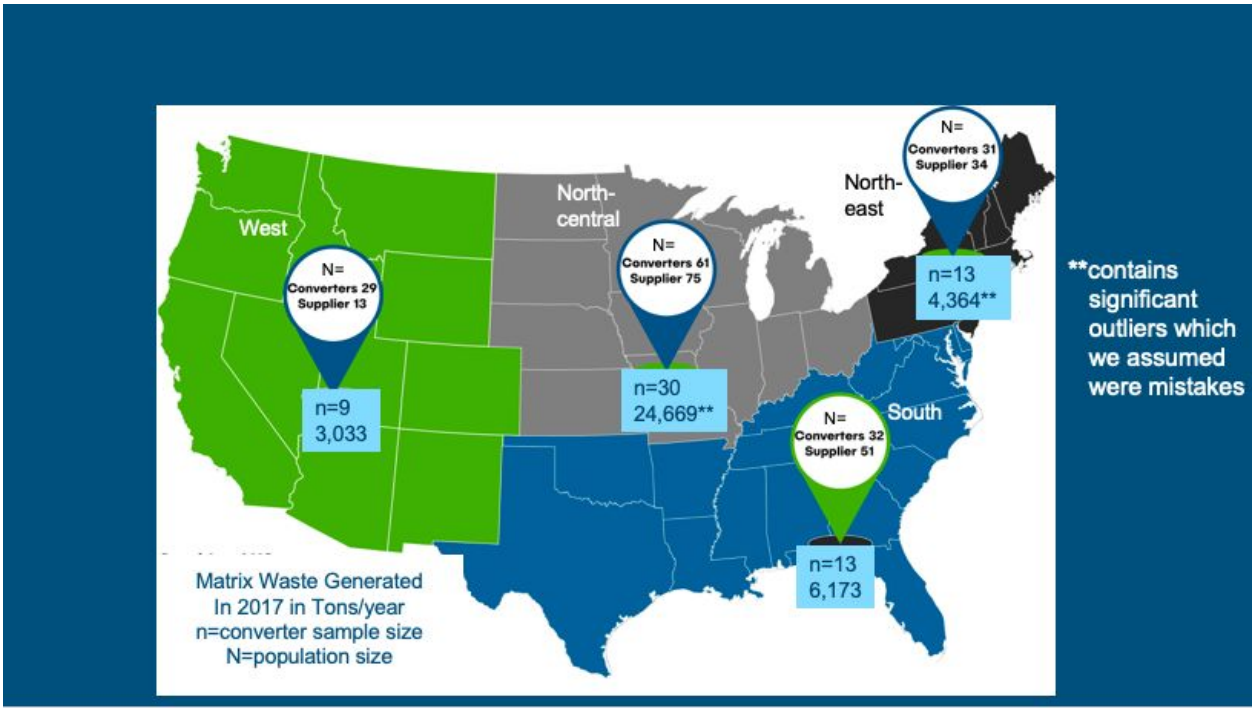


Figure 5. Understanding the Data TLMI made certain assumptions in order to make calculations and extrapolate the data into an overall understanding.

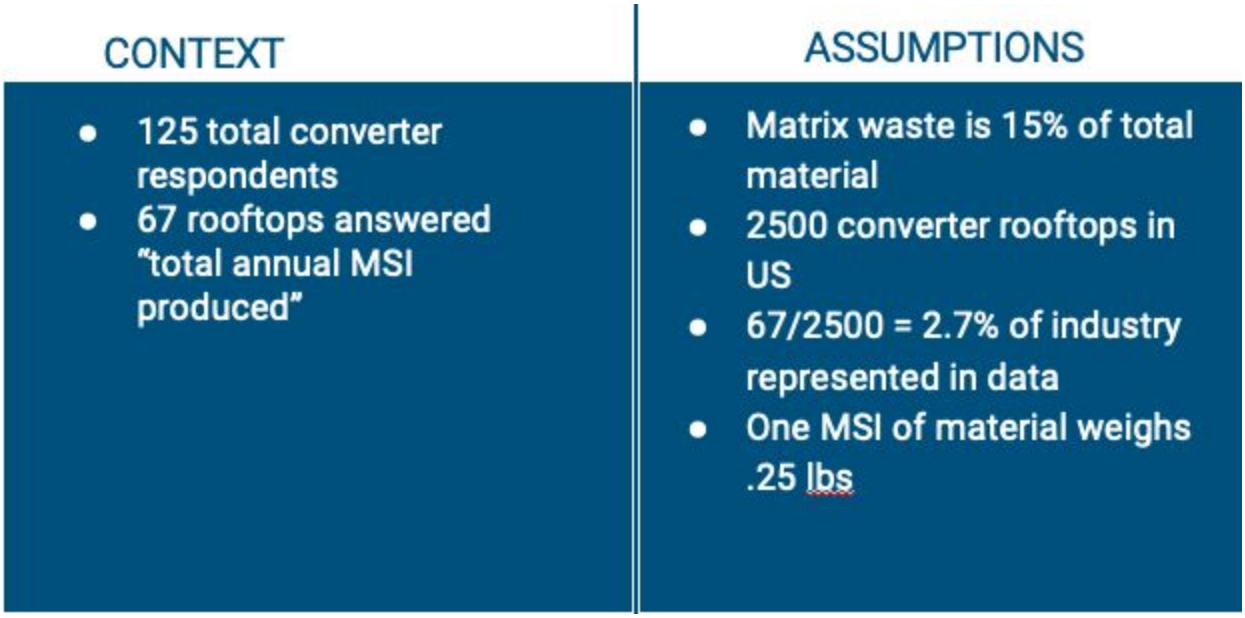


Figure 6. Calculations Based on the above assumptions and the following calculations, we estimate that there are approximately 133,250 tons of matrix waste generated in the U.S per year.

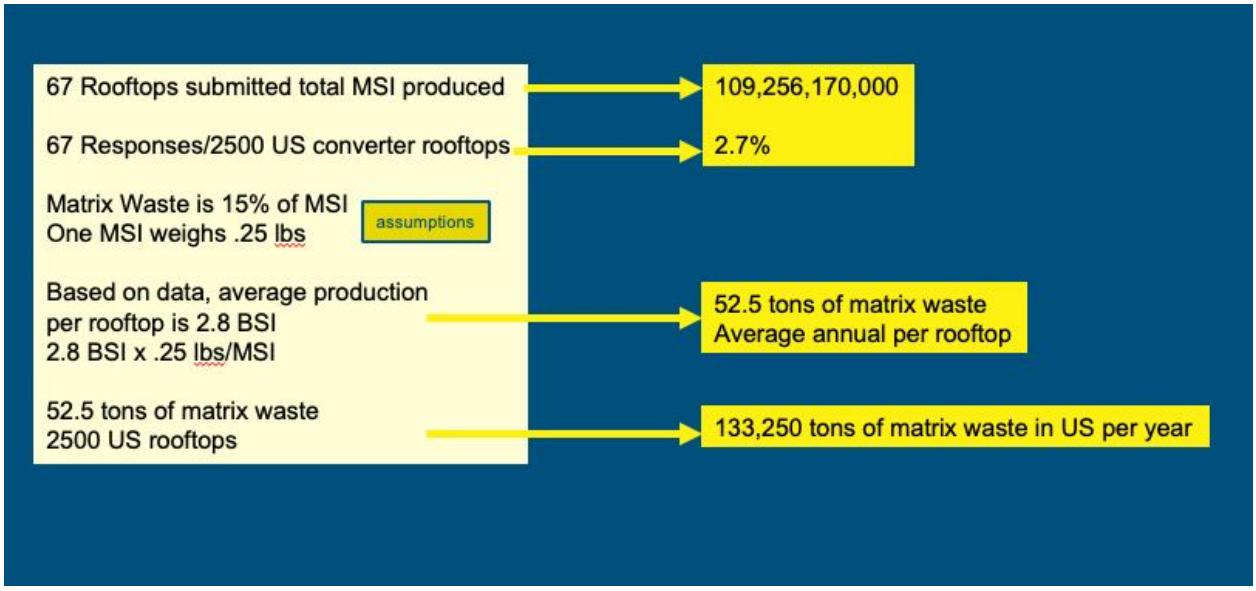
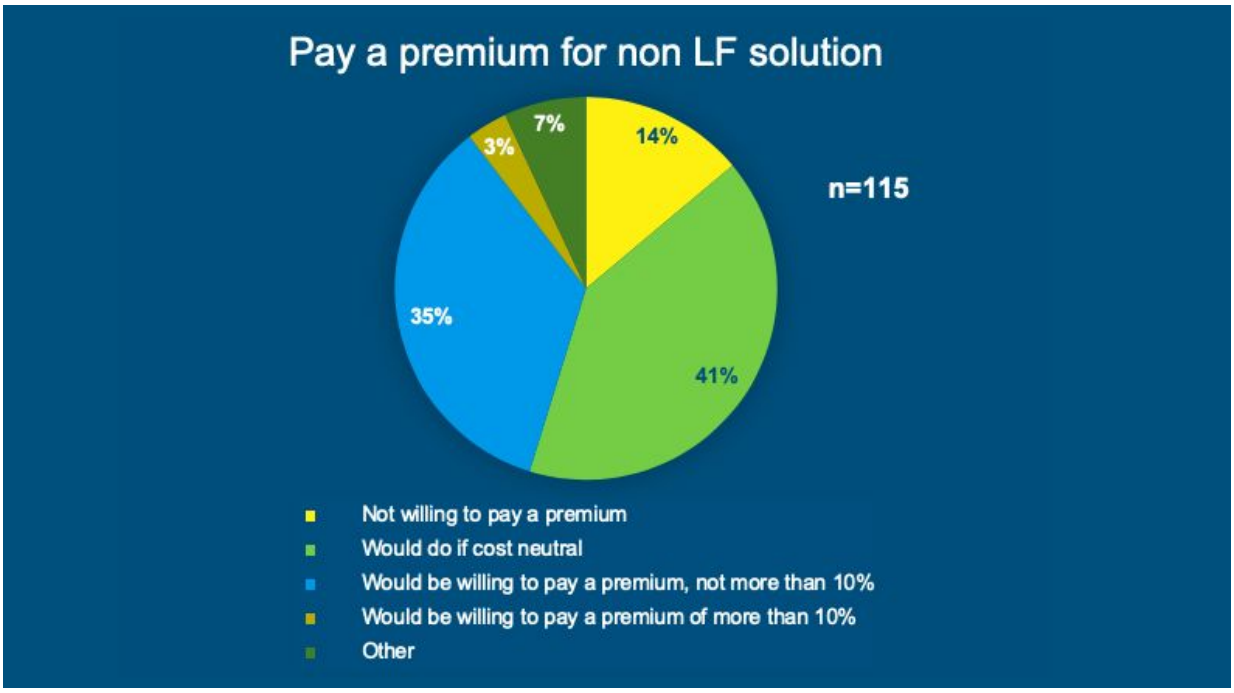


Figure 7. Pay a Premium for Non-Landfill Disposal 115 Respondents indicated that the majority (41 percent) would consider a non-landfill disposal option if it were similar in cost as landfill. 35 percent were willing to pay a maximum of 10 percent more than landfill costs, also known as tipping fees.



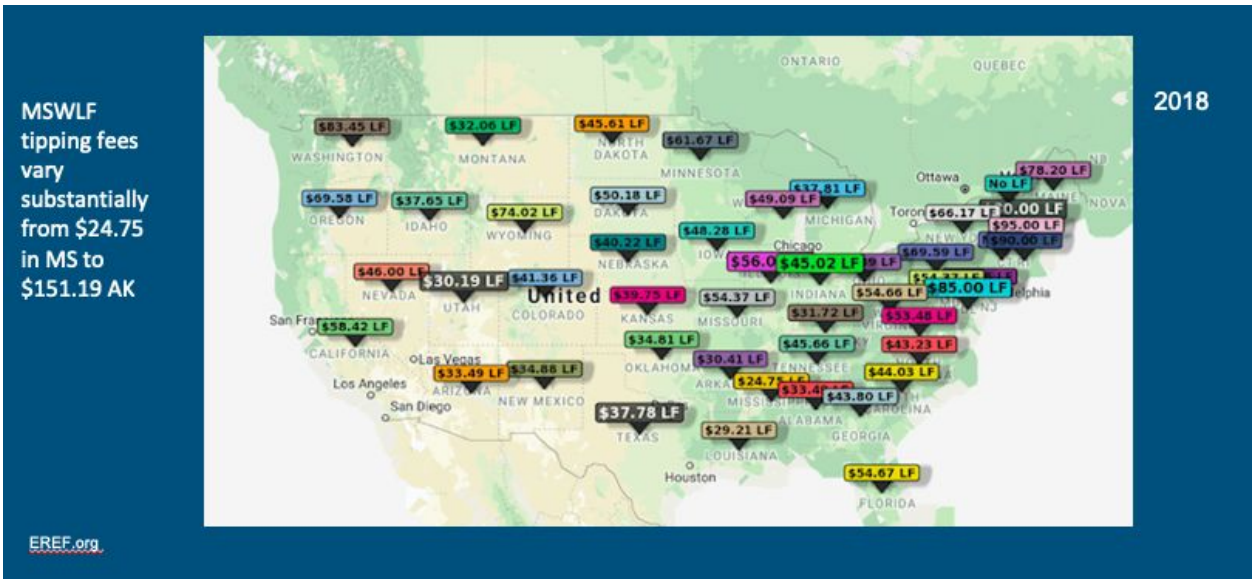
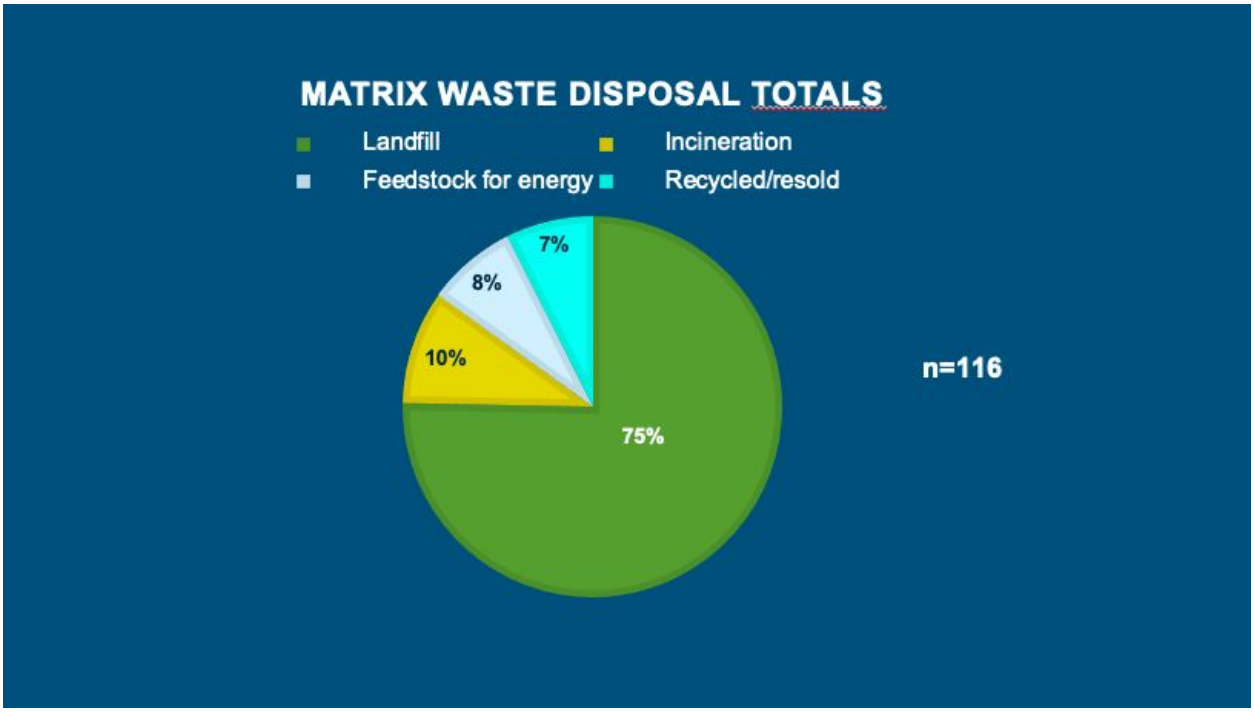


Figure 8. Respondents' Reported Disposal 75 percent of total respondents report that matrix waste is landfilled. Broken down by region, the high is 89 percent in the west and 87 percent in the south. This correlates to lack availability of waste-to-energy and engineered fuel plants in those areas.



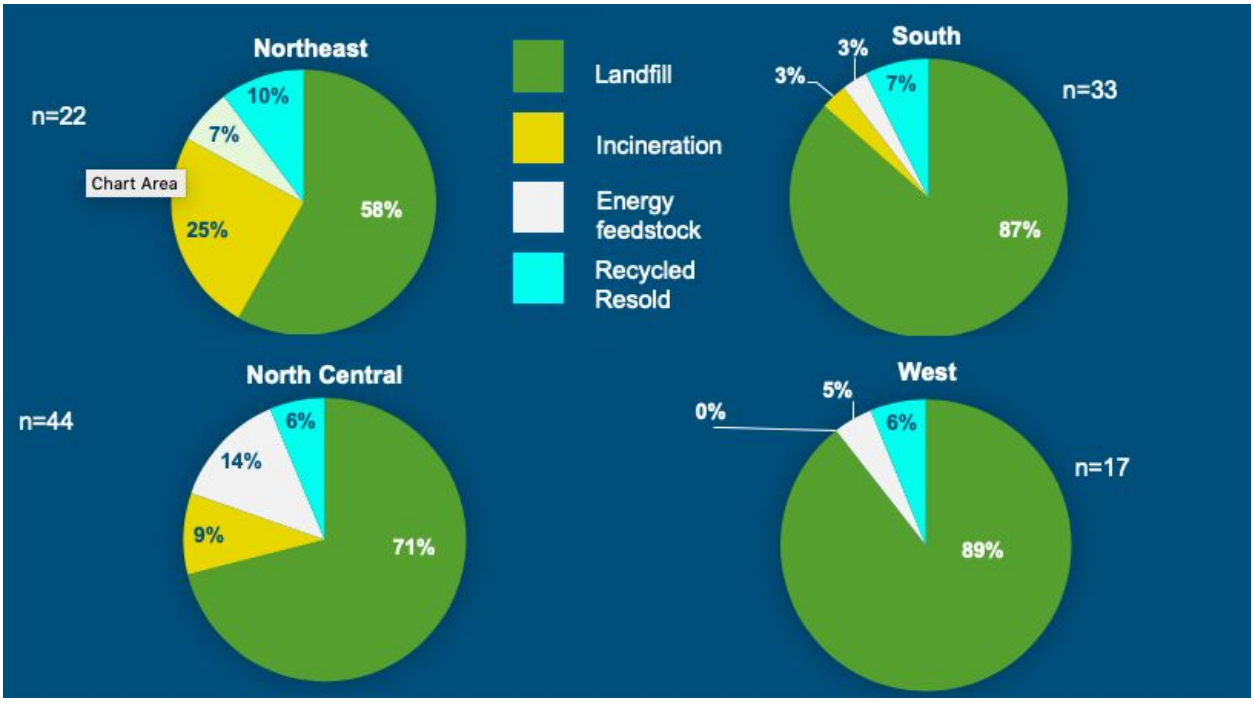


Figure 9. Ranked Obstacles to Non-Landfill Disposal Respondents were asked to rank the primary obstacles to utilizing non-landfill disposal for their matrix waste. 47 percent ranked space for equipment and storage as their number one obstacle; 36 percent ranked distance to non-landfill options as their number one obstacle; 27 percent ranked cost as their number one obstacle; and 15 percent ranked cost of new equipment as their number one obstacle.

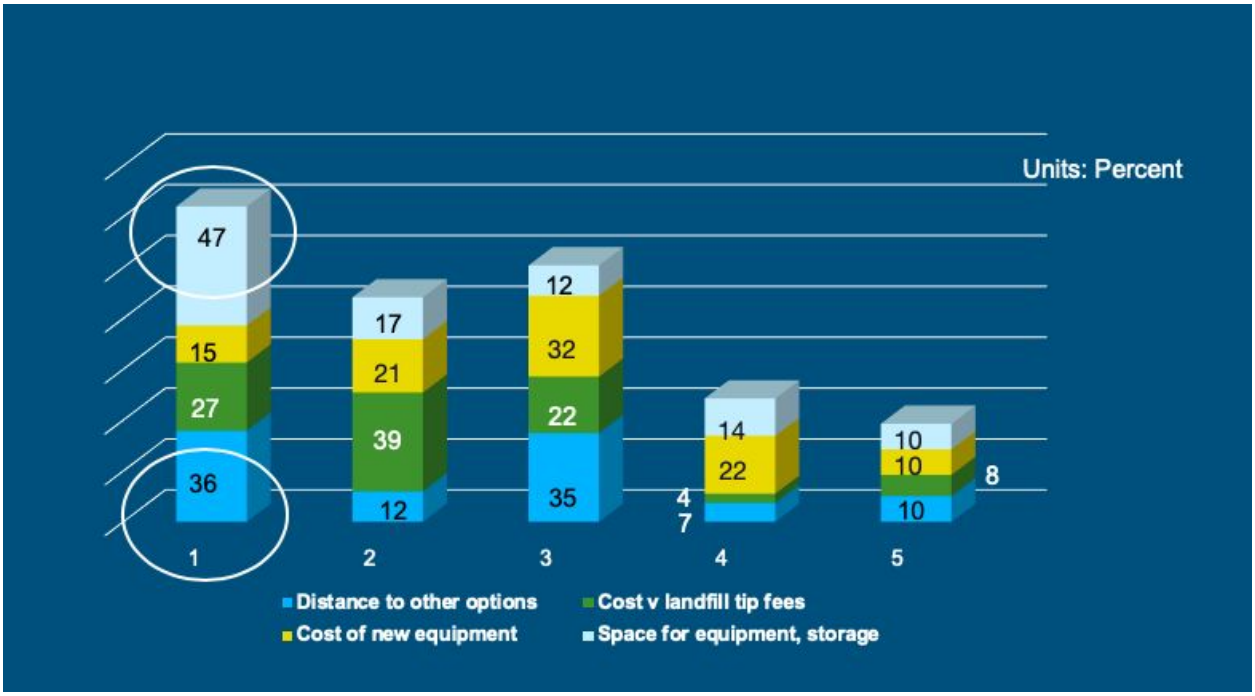
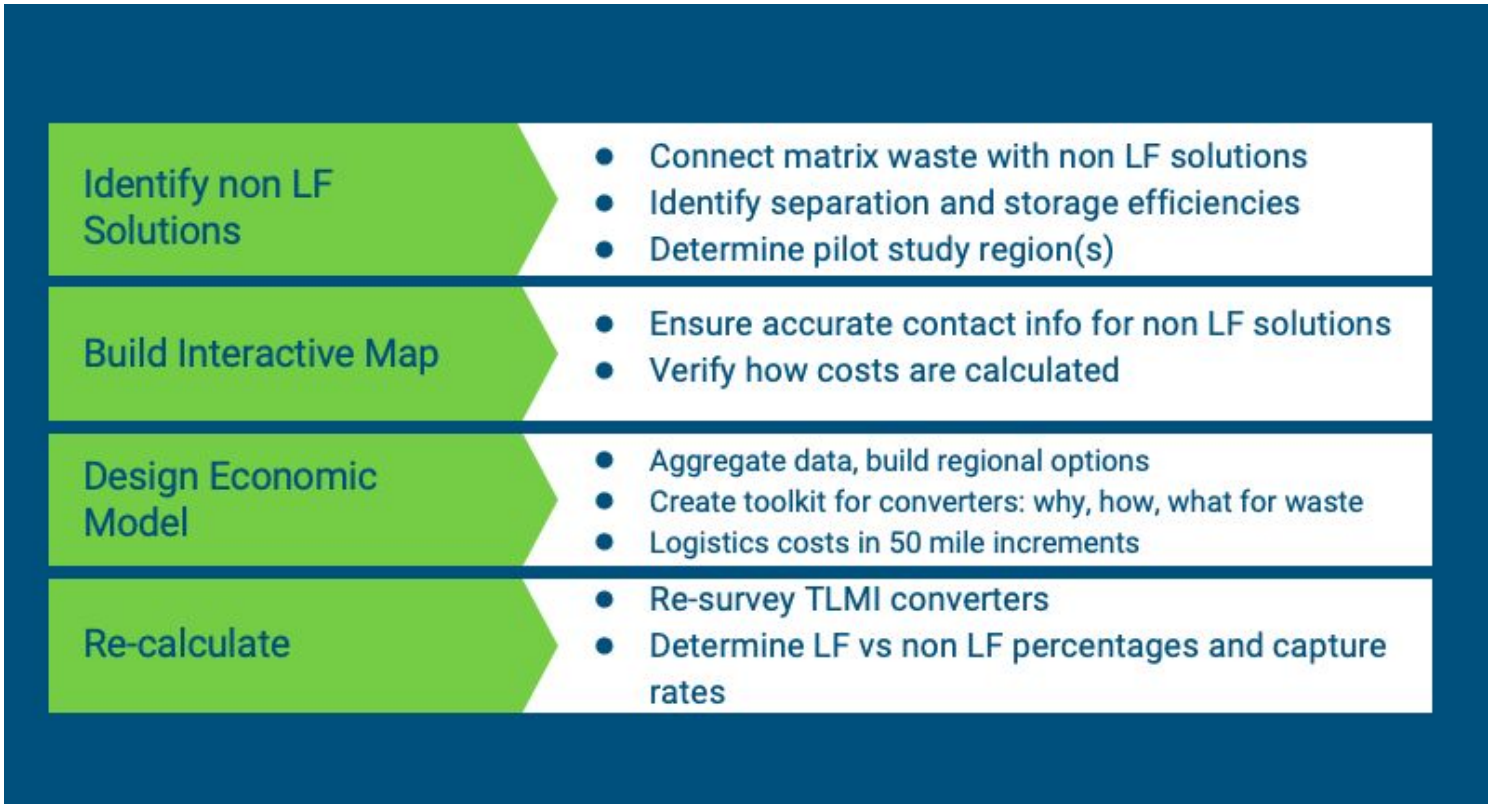


Figure 10. Next Steps for TLMI Committees. TLMI's goal is to connect members' matrix waste with non-landfill solutions. While TLMI cannot necessarily generate new solutions, we are actively exploring potential solutions for non-landfill disposition, ways to address the qualitative obstacles, and ways to make current solutions more attractive to converters. The data from this report shows that roughly 25 percent of TLMI converters are avoiding landfill disposal. We want to help motivate the remaining 75 percent to explore solutions and generate continued industry momentum.



CONCLUSION

The importance of diverting waste from landfills cannot be overstated. Materials going into landfills represent lost opportunities for raw materials, energy recovery, innovation, and jobs. In addition, the breakdown of paper materials releases methane and other greenhouse gases which contribute significantly to climate change. By the time a landfill is sealed, nearly all of the greenhouse gases have already been released. According to the EPA, landfills were the third largest source of U.S. anthropogenic methane emissions in 2016 accounting for 108 million metric tons CO2 -equivalent emissions, about 1.7% of total GHG emissions. Landfills require enormous swaths of land and can lead to pollution of soil, surface water, and groundwater.

This is a particularly challenging time for landfill avoidance due to China's closure of its market for accepting waste materials from other parts of the world. This situation has precipitated a growing crisis in the recycling industry. The other growing crisis is the highly under-reported shortage of landfill capacity in the U.S.. In a May 2018 article in Waste Business Journal, the alarming reduction in landfill capacity is spelled out:

"Based on data collected by Waste Business Journal, over the next five years, total landfill capacity in the U.S. is forecast to decrease by more than 15%. This means that by 2021 only 15 years of landfill capacity will remain. However, in some regions it could be only half that. Yet, even this grave forecast may be optimistic. Because of China's new rules, the bottom has dropped out of the recycling market and is expected to remain in the doldrums for several years while new infrastructure is developed. As a result, material recovered in curbside recycling programs increasingly is being diverted to landfills or incinerators. Landfilling even half of the recovered materials would result in just over 10 years of remaining landfill capacity by 2021."

The full article can be found here. The same research also indicates that the two areas of the country that are facing imminent loss of landfill capacity are the Northeast, with an anticipated loss of 30 percent of landfill capacity by 2022, and the Midwest with an estimated 24 percent capacity loss in the same timeframe. Thus, these are the areas of concentration for TLMI on creating pilot studies and working on possible cost reductions for members based on guaranteed volume of materials.

While diversion of matrix waste materials from landfill is important, efficiency in handling materials throughout the value chain is a key step in the process to reduce the amount of waste generated. TLMI will continue to work toward finding a way to recycle these materials into a product that can be part of the circular economy and contribute to reduction in carbon emissions through recycled content.

APPENDIX A

Survey Questions

1. What is total waste generated (tons).
2. What is total waste hauled - not including recycled materials (tons).
3. What is total recycled waste hauled - not including matrix waste (tons).
4. What is total label production (MSI in 000s).
5. How do you dispose of your matrix waste?
    a. Landfill
    b. Incineration
    c. Feedstock for energy
    d. Recycled/resold
6. Rank obstacles needed to overcome to reduce reliance on landfills. Rank highest (1) to lowest (5) priority
    a. Floor space/dock space for waste equipment
    b. Cost versus landfill tipping fees
    c. Distance to other options
    d. Cost of new equipment
7. Would you be willing to pay a premium for a non-landfill solution to matrix disposal?
    a. Not willing to pay a premium
    b. Would do if cost-neutral
    c. Would be willing to pay a premium of not more than 10 percent
    d. Would be willing to pay a premium of more than 10 percent
    e. Other