

## The Earth Engineering Center of The City College of New York

### The New York City Department of Sanitation on the 2026 Draft Solid Waste Management Plan

The Earth Engineering Center ([www.ccnyeec.org](http://www.ccnyeec.org)) has the goal of bringing rigorous engineering solutions that enable responsible use of materials and energy from waste for the advancement of society. Through industry collaborations and research sponsorship, EEC|CCNY develops novel solutions to some of the world's most pressing problems in waste management. EEC|CCNY routinely engages students with industry professionals, enabling a holistic approach to creative, realistic, forward-looking applications. The reach of EEC|CCNY is international in scope with many projects connecting international students and companies with a global presence.

The 2026 SWMP plan stands as an important source of data and puts forth valuable ideas for the near future of waste management. The Earth Engineering Center has taken the opportunity to provide comments to support a holistic approach to create realistic, forward-looking applications. Therefore, please consider the comments as observations based on our knowledge and an invitation to expand if there is interest. We understand that there are multiple constraints that DSNY must manage while maintaining their reputation as New York's Strongest. However, we think that the plan can be enhanced with greater alignment with established waste management hierarchies, focus on lifecycle greenhouse gas (GHG) impacts, and planning for system resilience.

The focus on management options at the top half of the pyramid is appropriate when higher-order strategies such as reduction and recycling are being executed with high capacity and efficiency. However, the Draft SWMP26 repeatedly and problematically treats landfill disposal and WTE as interchangeable rather than as distinct tiers within the EPA's waste management hierarchy. The hierarchy, included in the Draft SWMP26 as Figure 3-4 (and reproduced here as Figure 1), recommends reduction/reuse as most preferred followed by recycling/composting which is followed by energy recovery which is followed by the least preferred option: landfilling. The development of the hierarchy was in response to a growing interest in, and recognition of, the environmental impact of waste generated by society (i.e. municipal solid waste (MSW) or household garbage). The placement of each management solution was deliberate with the aim of informing the public about those practices that should be engaged to cause the least environmental impact. It was developed with a recognition that managing

waste requires energy, whether it is simply transported or separated such that valuable materials may be extracted and recovered (e.g. copper, aluminum, fiber, plastics, etc.).



**Figure 1: Waste Management Hierarchy (Figure 3-4 in Draft SWMP26)**

It is no mistake that the hierarchy starts with the waste generator, you and me, requesting us to reduce waste. It then moves to processes that are somewhat removed from the waste generator to reuse and recycle materials and components in the waste. The reuse and recycle solutions strive to maintain the waste components in their original form (reuse) or close to it (recycle) to minimize energy inputs. The next solution after recycle is recovery of energy and materials or “waste to

energy” (WTE). This solution does not require the waste generator to participate in the management of the garbage they generate. It is here that it is understood that waste that cannot be reused or mechanically recycled can be thermally processed to generate power and heat and recover materials from the ash. The power and heat offset or complement production of power and heat from other sources and the materials recovery offsets mining operations. The final solution for waste management is to dispose in a landfill. Disposal in landfills must be included in the hierarchy because all of the higher-order solutions will produce some amount of residual waste that cannot be further processed.

While New York City’s reported 17% diversion rate in 2022 provides a useful high-level performance signal, the Draft SWMP26 does not present the underlying data in a way that clarifies what remains in the refuse stream after source separation. Specifically, in Figure ES-2 of the Draft SWMP26 (and originally in the 2023 Waste Characterization Study), DSNY presents the residential waste composition using aggregated discards rather than refuse-only composition. This creates confusion among the public on the waste situation in NYC. That is, the aggregate pie charts obscure how much recoverable material is not properly source-separated, and readers cannot then discern how much of the 17% diversion rate value is attributable to behavioral failure from how much is attributable to DSNY’s system’s limits and/or market forces. In fact, our research has demonstrated that DSNY’s recycling collection program is one of the best in the world, but our findings also revealed that only 49% of plastic that went in to the proper bins and was sent to SIMS facilities was actually recycled<sup>1</sup>. Further,

DSNY should be sure they balance education/outreach resources appropriately because reuse will only impact 1.2% of the municipal waste stream and will not increase much more<sup>ii</sup>.

Nationally, source separation outcomes are persistently weak<sup>iii</sup>. That is, decades of education and outreach have yet to yield meaningful results (see Table 1). For this reason, the projections presented for commercial waste, for example, in Table 7-11 of the Draft SWMP26 (and reproduced here again as Table 2) are unrealistic and set DSNY up to fail to reach diversion goals yet again. Thus, non-source separated refuse will remain a dominant fraction of the City’s total waste generation, and system performance and resulting GHG emissions will depend heavily on how those residuals are managed.

**Table 1: Comparison of 2006 goals with 2015 and 2022 reality diversion rates**

| <u>2006 goal for 2015</u> | <u>2015 diversion rate</u> | <u>2022 diversion rate</u> |
|---------------------------|----------------------------|----------------------------|
| 70%                       | 16%                        | 17%                        |

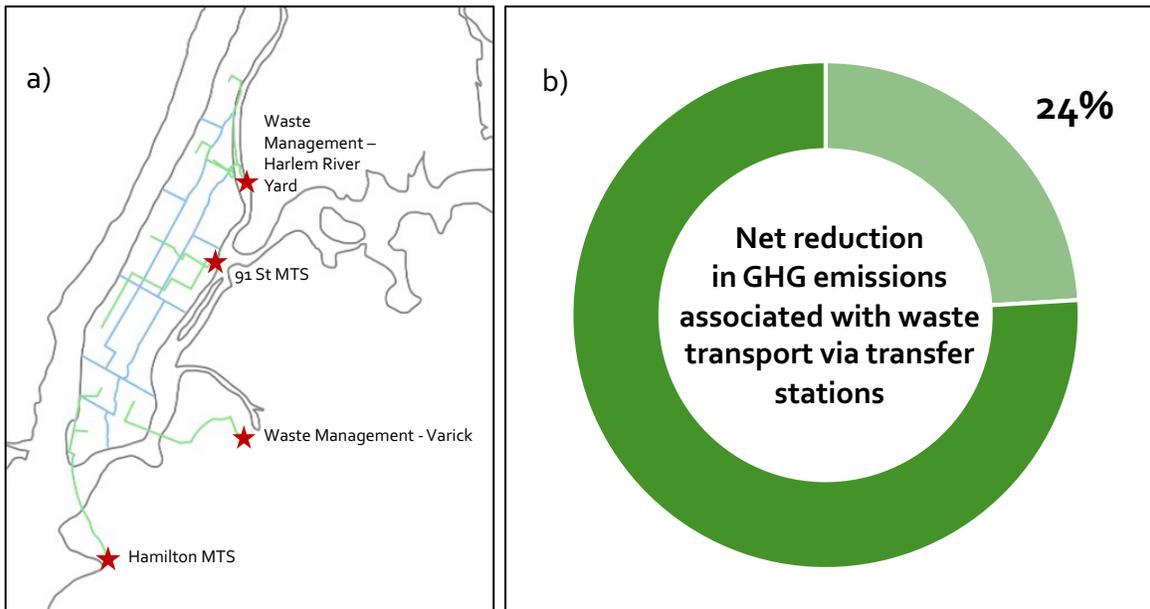
**Table 2: Table 7-11 from Draft SWMP26**

| <b>Commercial Waste Material Type</b> | <b>Diversion Rate in 2023</b> | <b>Projected Diversion Rate by 2036</b> |
|---------------------------------------|-------------------------------|---|
| Paper                                 | 40.61%                        | 65.61%                                  |
| Metal                                 | 47.59%                        | 72.59%                                  |
| Plastic                               | 47.54%                        | 72.54%                                  |
| Glass                                 | 47.53%                        | 72.53%                                  |
| Organics                              | 9.85%                         | 39.85%                                  |
| Textiles                              | 5.50%                         | 30.50%                                  |
| Miscellaneous                         | 13.31%                        | 38.31%                                  |

According to chapter 5 of the Residential Municipal Solid Waste program outlined by SWMP26, “the contract with the Reworld waste-to-energy facility in Essex will expire in the Fall of 2032, and there are no renewal options.” Even though this plant is responsible for the processing of an average of 379,326 tons of refuse per year alone (more than 12% of DSNY-managed refuse), there was no specified plan for the re-allocation of this capacity nor of a lower carbon disposal pathway alternative.

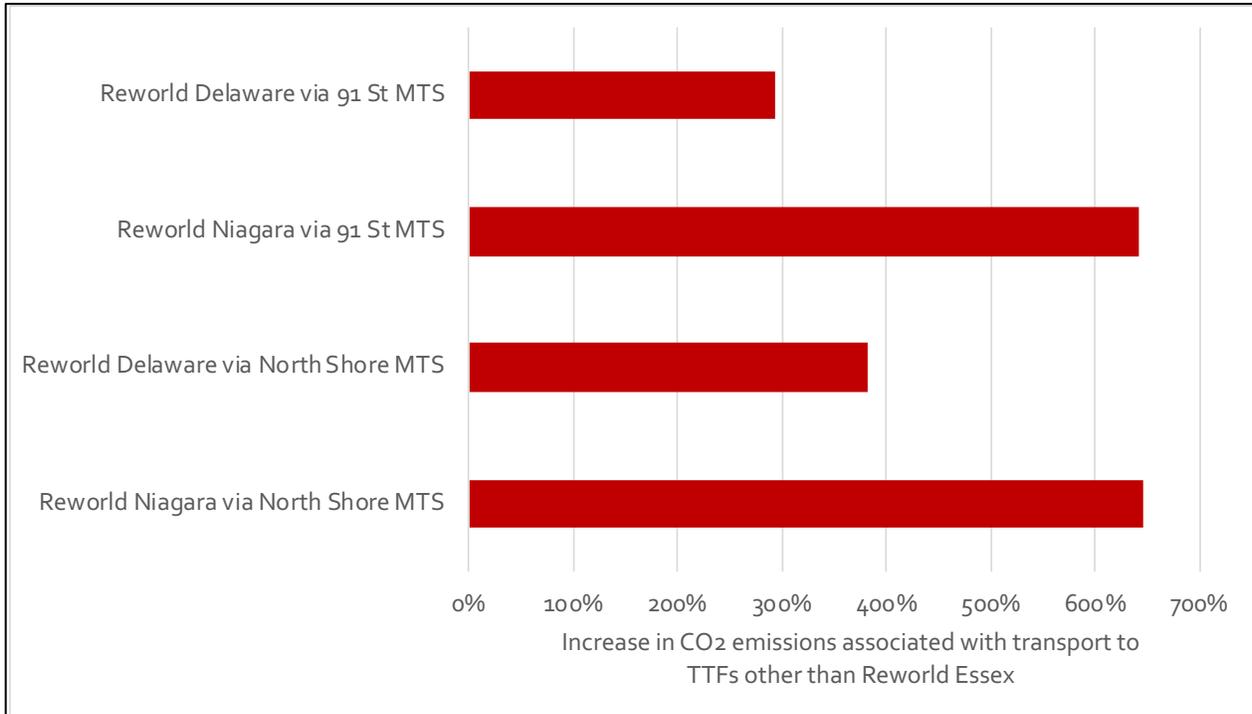
Our analysis finds that continued use of the Essex waste-to-energy facility is currently the least CO<sub>2</sub>-intensive disposal option available to DSNY for managing residual municipal solid waste.

Some modest reductions in transportation-related GHG emissions may be achieved by routing Essex-bound tons through transfer stations, but regardless of transfer station used, Essex’s proximity renders it the most attractive option for managing NYC’s waste that is unsuitable for recycle or compost. Specifically, it is shown in Figure 2 that routing Essex-bound tons through the nearest available transfer stations results in a 24% net reduction in lifecycle transportation-related GHG emissions relative to current disposal strategy (sending collection vehicles to Essex). By contrast, Figure 3 shows that diverting these same tons to more distant waste-to-energy facilities—via transfer stations currently used for long-haul export results in a substantial increase in transportation-related GHG emissions.



**Figure 2: a) Map of routes used to estimate b) net reduction in GHG emissions associated with waste transport via nearest transfer station (compared to current scenario in which collection vehicles go to Essex)**

WTE facilities have been demonstrated to reduce CO<sub>2</sub> emissions. It has been proven through scientific carbon-14 methods (ASTM D6866 protocol) that typical MSW WTE stack emissions, that routinely meet the Maximum Achievable Control Technology (MACT) standards, contain between 40-65% biogenic CO<sub>2</sub>, i.e. renewable bio-carbon. This scientifically proves that nearly ½ of the CO<sub>2</sub> emissions from a WTE facility are from renewable sources. If the GHG savings from recycling 50 pounds of metal from every ton of MSW processed in a WTE facility are included it is evident that every ton of MSW processed in a WTE facility avoids a ton of CO<sub>2</sub> equivalent emissions <sup>iv</sup>.



**Figure 3: Relative increases in transport-related GHG emissions if formerly Essex-bound tons are routed to Delaware or Niagara facilities via transfer stations currently used for long-haul export**

A large body of literature employs life cycle assessments (LCA) to calculate the potential GHG savings when using WTE versus other MSW management options. This is also widely recognized by the scientific and engineering communities as well as numerous state legislatures and non-profit organizations. Some examples include the Intergovernmental Panel on Climate Change (“IPCC”), the World Economic Forum (ref), and the Center for American Progress as well as the various states, including Pennsylvania<sup>vi</sup>, New York<sup>vii</sup>, Maine<sup>viii</sup>, and Florida<sup>ix</sup> virtually zero waste-to-landfills. WTE plants currently recover nearly 700,000 tons of ferrous metal for recycling annually, which avoids CO<sub>2</sub> emissions and saves energy compared to the mining of virgin materials for manufacturing new metals. A recent UNEP report “District Energy in Cities: Unlocking the Potential of Energy Efficiency and Renewable Energy” states that Paris currently meets 50% of its heating needs by three WTE plant that results in avoidance of 800,000 tons of CO<sub>2</sub> emissions each year. These savings arise from electricity produced from the WTE that offset electricity production from facilities that rely on fossil fuels. Ultimately, WTE efficiently recovers energy and materials while decreasing the need for landfill capacity and consequent methane emissions, and it offsets fossil fuel energy with raw material extraction. Therefore, failing to renew the Essex contract is inconsistent with NYC’s climate objectives.

More specific to plastics and recycling, the draft plan rightly identifies that more plastic will be found in the MSW stream in the future. That is because plastic is the replacement for metal and glass components, containers, etc.<sup>x</sup>. In addition, mixed plastic waste has gotten considerable attention over the past decade because technologies exist to convert plastic waste back to plastic feedstock. EEC|CCNY in partnership with BASF has demonstrated that using existing plastic manufacturing assets such as fluid catalytic crackers that up to 50% of mixed waste plastic can be returned to feedstock to make plastic products<sup>xi</sup>. The plan to continue to monitor developments of thermal treatment technologies is a good one, however, it is past time to monitor and perhaps time to pilot a project that couples DSNY's plastic waste stream with a proven technology, such as that from Nexus and others.

The draft SWMP2026 plan also does not discuss the use of mixed waste processing despite previous unmet goals for diversion rates and potential increases in landfill reliance. Mixed waste processing, sorting collected municipal waste to recover recyclables such as metals, plastics, and paper, was tested by DSNY in low-diversion districts and could increase diversion by recovering valuable materials from what would otherwise be residual waste<sup>xii</sup>. As such, mixed waste processing should be identified as a complementary tool within the SWMP2026 to recover additional materials from residuals, reduce additional landfill usage, and improve overall system performance rather than relying solely on source separation and traditional recycling alone.

The SWMP2026 plan places a heavy emphasis on increasing composting as the primary recovery method for source-separated organics, yet does not intend to recover materials or energy from other fractions of the MSW stream. However, composting requires high-quality source separation to prevent the accumulation of both physical contaminants (e.g., glass, plastic, and metal) and chemical contaminants (e.g., toxic organic compounds such as PCBs and dioxins, and heavy metals such as lead and mercury)<sup>xiii</sup>. The draft plan states that due to contamination collected organics still go to landfill or a third-party, which likely sends it to landfill. As the system currently stands, source separation quality remains inconsistent, with non-compostable material detected in 57 % of source separated food waste<sup>xiv</sup>. Additionally, composting results in the emission of GHGs and other pollutants directly to the atmosphere, with no opportunity for energy recovery.

Anaerobic digestion (AD) of both biosolids and source-separated organics offers a more effective strategy for maximizing net energy production while minimizing GHG emissions and odor. According to Lin L. et al., AD converts over 50% of degraded carbon into methane, which is captured as biogas and used for renewable energy, offsetting fossil fuel use<sup>xv</sup>. Although composting degrades up to twice as much total carbon, AD converts more than 50% of degraded carbon into methane, a usable energy carrier<sup>xv</sup>. Finally, because AD operates in closed systems, odor emissions to nearby areas are significantly reduced. AD can also tolerate

more variable feedstock, as it can process harder-to-digest organic waste, making it a more flexible system in the long term. Overall, it is worth considering more concrete planning towards AD efforts alongside plans currently outlined.

Finally, we raise concerns about the Draft SWMP26's reliance on the land application of compost. Specifically, the Draft SWMP26 fails to consider the challenges associated with managing PFAS-contaminated waste. PFAS (per- and polyfluoroalkyl substances), a group of man-made chemicals present in consumer goods and food packaging, are known to bioaccumulate in humans, animals, and the environment, giving rise to cancer, liver damage, weakened immune systems, and other serious health problems<sup>xvi</sup>. For this reason, regulatory agencies are working to detect, understand, and regulate the handling of PFAS-containing waste streams<sup>xvii</sup>. This may soon render land application of certain kinds of compost illegal, and without contingency planning, result in increased reliance on landfilling. This risk reinforces the need for diversified recovery pathways (e anaerobic digestion with incineration of dehydrated digestate).

We provide these comments for consideration when finalizing the waste management plan. We would welcome the possibility to further engage with DSNY to provide more details on the information we have assembled through our research and in collaboration with global partners over the past 20 years. We have highlighted some of the aspects that we think are in most need of improvement. However, we think there are other areas that can be refined. The management of waste in NYC will take a concerted effort between DSNY and the waste generators (i.e. the public, institutions, construction companies, etc.). Therefore, a solid waste management plan that is clear, with transparency in the data and ease of understanding, is imperative to ensure all involved understand the goals of DSNY. The draft has excellent information and provides an important source of data and ideas on how NYC does and will manage its waste and, with some improvements, can be the template for cities worldwide to follow.

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