

# Examining New York City's Zero Waste Goals Within the Context of the Green New Deal

## A Case Study of Construction & Demolition Waste

Cities hold an important role for enabling the transition towards sustainable production and consumption of materials and resources. Today's building industry has great opportunities to transform from a linear take-make-waste approach, to a more circular model of prolonging materials' lifespans and keeping them out of landfills. In 2017, 569 million tons of Construction & Demolition (C&D) debris were generated, equivalent to twice the amount of municipal solid waste generated (EPA 2017). Existing challenges in decreasing C&D waste include the sheer tonnage of such waste materials, complicated transporting processes, and difficulties in sorting on-site. The broad range of materials and the conservative nature of the construction industry means that it is risk averse to adapting novel approaches and tries to avoid the difficulties associated with recycling and reusing materials such as concrete (Pasquale 2019). Finally, standard waste management and recycling systems are often unable to process the toxic elements found in the debris. There are many ways to transition the C&D waste management system to a more circular approach.

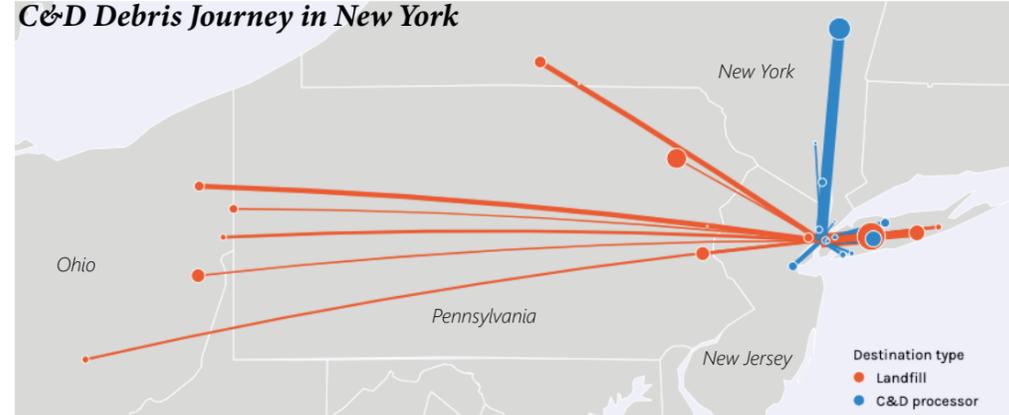
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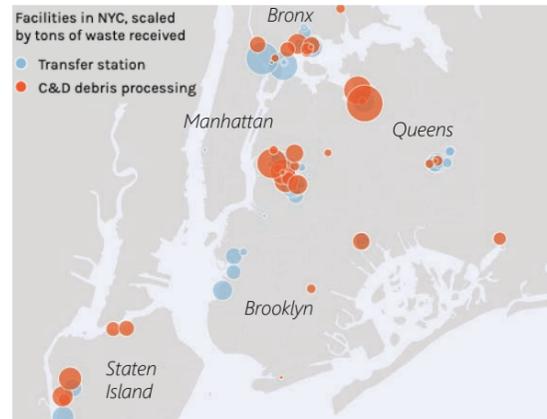
### 95% of C&D Waste is Recyclable

Material	% of Stream (by weight)	End Use	
Rock, brick, concrete, tile	22%	Rock & concrete	Aggregate – approved DOT road-base
		Red brick	Landscaping, baseball field clay
		White brick, tile & porcelain	Aggregate – not approved road-base
Wood	25%	Clean dim. lumber (CDL)	Mulch, landscaping
		CDL + glued wood wood	Biomass / alternative fuel
		Non-lead painted wood	RDF
Plastic	3%	LDPE / Film	LDPE / Film
		HDPE / Rigid	Paint buckets, garbage cans, auto parts
		PP	Auto parts, tool cases, industrial plastic
		PVC & Vinyl	Not recyclable - landfill
Paper & Corrugated	2%	Paper and cardboard boxes	
Metal	8%	Ferrous	Re-used as scrap metal
		Non-Ferrous	Re-used as scrap metal
Screenings	35%	Alternative Daily Cover	
Landfill	5%	Treated wood, PVC, nylon tarps, roofing material, insulation	

### C&D Debris Journey in New York

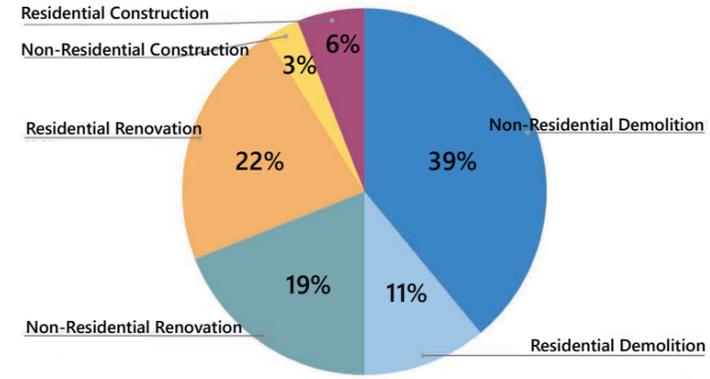


C&D Debris Destinations (Open House New York).



C&D debris processing facilities and transfer stations in NYC, by tons received (Open House New York).

### C&D Debris Breakdown in the U.S.



C&D Breakdown in the U.S. Modified from "Waste Management at the Construction Site" (Joseph Laquatra and Mark Pierce 2011).

Current recycling rates for C&D debris are difficult to determine, as the collection and disposal are entirely handled by more than 1,000 private actors. Reporting requirements, formatting, and data availability vary across states, thus regional movements of C&D debris can result in errors in measurement. Debris often changes hands between processors, making tracking difficult. Various studies by the City have estimated varying recycling rates -- some estimate a 40 percent recycling rate for non-fill C&D materials, while estimate from fill material can range from 60 to 100 percent (OHNY 2017). The majority of materials recycled from C&D debris in the US are metal, concrete, and masonry.



### 1. Generation & Categorization

C&D debris is generally divided into two main legal categories — first is clean fill, comprised of excavated art, concrete, and stones, second is a category for all other debris (OHNY 2017). Clean fill has the potential to be used to grade or level other construction sites for no fee and is less regulated by the State than other types of C&D debris according to New York State Department of Environmental Conservation, Subpart 360-8.2(1)(a) (OHNY 2017).



### 2. Source Separation

Some contractors voluntarily separate debris on the job-site into an array of materials including metal, wood, masonry, and cardboard, while others commingle all materials. Source separation increases recycling rates and generates the best prices for materials, but capacity for source separation depends on factors such as space for different containers and phasing of demolition and construction work (OHNY 2017). In New York City, source separation is rare due to space constraints on job sites.

### 3. Contractor & Hauler Collection

Contractors collect clean fill and other debris in containers rented from private haulers on the job-site, which can range from 1 to 20 yards in length. C&D debris collection and disposal is handled by over 1,000 C&D private haulers and other companies in the region with service permits in New York City (OHNY 2017).

### 4. The Mini Container

The "mini container" is a compact, yard-wide container for source-separated metals, a material with high recycling value that is collected by private haulers. Rear-loader collection trucks usually have cables or mechanical arms that tip the containers (OHNY 2017).

### 5. Arriving at a Processing Facility or Transfer Station

Collection trucks head to C&D debris processing facilities after they reach full capacity. Processing facilities either receive a single type of material or mixed materials, from which they will recover certain recyclables (OHNY 2017). Clean fill can be taken directly to other construction sites to grade the terrain. C&D debris may also be taken to transfer stations, which can accept C&D debris that's mixed with other types of solid waste, which processing facilities don't accept (OHNY 2017). Their fees are higher as a result and they often don't recover materials for recycling, sending most materials to landfills or incinerators. Hauler in New York City use more than 40 C&D processing facilities located in the city, facilities in Long Island, Upstate New York, or New Jersey.

### 6. Processing: Separating Materials & Recycling

Workers inside the facility direct drivers to debris unloading areas to keep different materials separated so that recyclables can be recovered and sold.



**Cooper Recycling** in Brooklyn operates the largest C&D debris recycling facility in NYC with over one mile of conveyor belts connecting more than a hundred pieces of machinery designed to process 2,000 tons per day and recycle 95% of incoming material to beneficial end uses.

### Recommendations & Future Work

- 1. Source reduction:** preserve and prolong existing buildings, optimize new build sizes
- 2. Salvage and reuse:** standardize the use of C&D waste, and researching new ways to repurpose and upcycle materials
- 3. Waste separation:** efficiently separate and transport to the correct recycling facilities for processing. Mobile robotic sorting and reprocessing machines with innovative technologies, such as artificial intelligence and internet of things can help the transition
- 4. Recycling:** recycle materials to be reused in the C&D industry with new processes designed specifically for this industry.
- 5. Workforce development:** train in the O&M of energy efficient design, construction, retrofitting, and auditing.
- 6. Collaboration for research:** Effective collaborations to expand the scale and the quality of C&D waste recycling.
- 7. Regulation:** introduce a law for companies to meet specific re-use/recycling targets to provide reasons for them to invest into waste management solutions. Regulations around transparent reporting should be instituted to make a stronger case for investment in C&D waste reduction and diversion.
- 8. Promotion and education:** targeted dissemination to increase public and industry awareness.

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