



URR.9: Urban Mining and the CDW Circular Economy
DYCD, 2 Lafayette, 14th Floor (Hybrid)
December 13, 2022, 9:00 a.m. to 11:30 a.m.

AGENDA

- 9:00 a.m.—9:15 a.m.** **Introduction and URR Working Group Update**
- Terri Matthews, Town+Gown: NYC
- 9:15 a.m. – 10:15 a.m.** **Urban Mining and CDW Circular Economy**
- Athanasios Bourtsalas, Columbia University/Department of Earth and Environmental Engineering
- 10:15 a.m.—10:30 a.m.** **Short Break**
- 10:30 a.m.—11:00 a.m.** **Cost-Benefit Analysis of Closing Concrete Material Loop for a Construction+Demolition Waste Circular Economy Model**
- NYU/Tandon-Management of Technology Capstone Team
- Christopher Policastro, Academic Advisor
- Capsone Team Presenters
Kaiweng Sou
Wenhao Tong
Runfei Mao
Junting Zhao
- 11:00 a.m.—11:30 a.m.** **Questions, Answers and Discussion**

Introduction. This event brings the Town+Gown community and the Urban Resource Recovery Working Group (URR WG) back together on the topic of closing construction + demolition waste (CDW) material loops since October 13, 2021 when we revealed the Working Group’s Closing Loops City Program Initiative (CLCPI) (see <https://www1.nyc.gov/assets/ddc/downloads/town-and-gown/AgendaandPrecis.Final10-12-21.pdf>). To recap, the CLCPI starts with the proposition that you can’t have zero waste without CDW and it outlines public policy and operational steps necessary for NYC to “lead by example” and leverage its capital projects to move from CDW as “waste” to CDW as a resource by increasing CDW recovery and re-use and closing CDW material loops.

We will begin this event by looking at the big picture and the interplay between “urban mining” and circular CDW economy concepts within NYC, which is a dense, building- and infrastructure-heavy place that is always under construction. We will conclude with the first capstone team presentation at a Town+Gown event that has developed a cost/benefit model for recycled concrete aggregate, using NYC DOT’s crusher operations for sidewalk projects as the case study. From this case study project, Town+Gown plans to expand cost/benefit analysis to direct re-use of concrete as the CLCPI envisions.

CDW Circular Economy. Material technology for low-carbon construction material production has been advancing rapidly. Some of which technologies have the potential to use recovered and processed CDW elements in new materials that can further reduce GHG emissions by taking advantage of embodied carbon in CDW as substitutes for virgin materials produced elsewhere and transported to NYC. Executive Order No. 23 of 2022, dated September 22, 2022 (Clean Construction EO) (see <https://www.nyc.gov/office-of-the-mayor/news/023-002/executive-order-23>), requires NYC capital project agencies to make best efforts to incorporate low-carbon concrete specifications for all batch plant ready-mixed concrete in NYC capital projects and concrete sidewalks (Clean Construction EO, Section 2) and to develop action plans aimed at reducing embodied carbon on capital projects that will become milestones in NYC’s long-term strategic sustainability plan. (Clean Construction EO, Section 7). The CLCPI has preliminarily identified five CDW elements, including concrete, for direct re-use, with no or minimal on-site processing, among NYC capital projects and seven CDW elements, also including concrete, for indirect re-use through interim processing facilities for indirect re-use. The CLCPI leverages the New York State Department of Environmental Conservation (NYS DEC) Part 360 beneficial use designation (BUD) regulatory scheme¹ as well as its requirement that local governments create and periodically update their solid waste management plans (SWMPs).

¹ See [2022 Analysis of Proposed Changes to Part 360 Regulations \(Brooklyn Law School\) Update](#) to [2021 Analysis of Part 360 Regulations \(Brooklyn Law School\)](#).

BUDs operate as a “safe harbor” for re-use of recovered CDW materials because a particular material meeting the conditions of a BUD designation is no longer deemed a solid waste subject to other state solid waste regulations and its re-use is permitted pursuant to the BUD requirements. In addition, NYS DEC requires local government (or Planning Unit) SWMPs to include the material flows of CDW in the prioritization of all waste reduction, reuse and recycling.² NYC DEC’s BUD and SWMP regulations are the foundation for systemic transformation of CDW from a waste into a material resource but they are insufficient on their own for industry transformation.

In NYC’s July 1, 2022 comments on New York State Climate Action Council’s Draft Scoping Plan (Draft Plan Comments) pursuant to the Climate Leadership and Community Protection Act,³ the city suggested the state add horizontal infrastructure to its final plan in order to increase the total GHG emissions captured from all construction activities in the state and support a holistic GHG reduction baseline and framework. Adding horizontal infrastructure to vertical buildings in the final plan would increase opportunities for optimize GHG reduction. (Draft Plan Comments, p. 10) Additionally, the city recommended that the state address, in its final plan, efforts to reduce CDW, which nationally accounts for 25% to 45% of the total solid waste stream, also by leveraging NYS DEC’s BUD regulatory scheme as a starting point to increase the direct reuse of construction and demolition debris. (Draft Plan Comments, pp. 17-18)

The CLCPI focuses on the ability of New York State local governments, such as NYC, to leverage their construction activities⁴ to activate and drive the potential of the NYS DEC BUD regulations and the State’s local government SWMP requirement, which assume and rely on an efficient and functioning “market” to generate sufficient private investment to expand and build new facilities in or near localities generating significant amounts of CDW. The roadmap for local government action links public capital programs to the BUD regulations and SWMP requirement to change the market “calculus” so that contractors’ failure to recover and re-use CDW is no longer the economically rational choice.⁵ The CLCPI’s policy development roadmap, within the authority of any New York local government for adaptation to address local conditions, begins with a local CDW material flow analysis, including data from public capital projects; identifying the CDW materials for a pilot initiative; cost-benefit analyses, where

² See <https://www.dec.ny.gov/chemical/70915.html>.

³ See <https://www.nyscrda.ny.gov/About/Newsroom/2022-Announcements/2022-06-01-CAC-Extends-Deadline-for-Public-to-Comment-on-Draft-Scoping-Plan-to-July-1>.

⁴ The role of local governments is important because in many local construction markets, public construction spending often functions as a market maker.

⁵ Hockett, Robert, “Recursive Collection Action Problems: The Structure of Procyclicality in Financial and Monetary Markets, Macroeconomics and Formally Similar Contexts,” *Journal of Financial Perspectives*, Vol. 3, No. 2, 2015, p. 24.

possible due to a dearth of usable CDW data, to estimate the potential for public capital cost savings;⁶ assess the impact of local law, if any, that would operate as an impediment to direct re-use, permitted by the BUD regulations, among a local government’s capital project portfolio;⁷ develop public construction contract specifications to support recovered CDW material supply⁸ and demand for construction materials made with recovered CDW materials;⁹ and, local government private market support mechanisms beyond supply and demand contract specifications. These additional market support mechanisms, which do not include any new government subsidies to make the private circular CDW economics work, include the creation of a virtual CDW matching digital platform to optimize efficient public capital project operations in a CDW waste-to-resource environment¹⁰ and utilizing existing tax-exempt industrial development bond (IDB) authority to support private sector investment in expanding existing or creating new interim processing and manufacturing facilities and implementing new technologies.

The city also noted in its Draft Plan Comments that its high rate of construction and demolition activities presents a significant opportunity to increase the recovery of CDW materials, with their high embodied carbon content, and thus reduce GHG emissions associated with the production and transportation of virgin elements for new construction materials. Land use impediments to increased siting or expansion of industrial facilities for interim processing of recovered BUD CDW as feedstock for new material manufacturing and for the manufacturing of new materials were also, however, noted. (Draft Plan Comments, pp. 17-18) NYC DEC BUD regulations cover interim processing of BUD CDW, which is not considered as solid waste,¹¹ and such facilities are governed by NYS DEC regulations on exempt, registered and permitted facilities, including construction and demolition debris handling and recovery facilities.¹² Under NYS DEC proposed BUD regulation amendments, however, concrete and other masonry products will not be considered waste when received at a ready-mix plant for incorporation

⁶ This type of cost benefit analysis could be replicated on private construction projects.

⁷ The direct re-use of BUD CDW among city capital projects is currently prohibited by 1994 DSNY interpretive memo incorporated in all NYC construction contract specifications. DNYS rules were adopted before the NYS DEC BUD regulations were enacted in 2017, which arguably presents a state law pre-emption issue for the DSNY rules and its interpretive memo.

⁸ For example, specifications to incentivize, through cost savings sharing, contractor on site project deconstruction/source separation.

⁹ For example, performance-based departmental materials specifications.

¹⁰ Which could be expanded to include use by private construction project owners and contractors.

¹¹ See pp. 13-18 of [2022 Analysis of Proposed Changes to Part 360 Regulations \(Brooklyn Law School\) Update](#).

¹² See pp. 24-42 of See pp. 13-18 of [2022 Analysis of Proposed Changes to Part 360 Regulations \(Brooklyn Law School\) Update](#).

into a concrete product.¹³ Concrete production is a local industrial manufacturing use because concrete must be made to be available for use within 20 minutes of production. NYC’s current zoning regulatory scheme is based on the 1961 Zoning Resolution that embeds the concept of incompatible uses, which results in industrial and residential use separation “to ensure safety and insulate residential communities from industrial traffic and other irritants, and to shield industry from nuisance-generated complaints.”¹⁴ There are three types of manufacturing districts—M1, M2 and M3—where no residential uses were originally permitted, other than pre-existing residences that were deemed pre-existing non-conforming uses.¹⁵ Light manufacturing is permitted in all three district types, while the “more potentially noxious uses are limited to M3 districts with some exceptions in the other two districts.”¹⁶ Since 1961, national and global economic forces rendered industrial and manufacturing uses less economically feasible, causing NYC to make zoning changes to permit new residential developments and conversions in certain M1 districts with a significant residential use presence and create paired districts combining mapped mixed use districts and M1 districts.¹⁷ In 2018, the Department of City Planning explored industrial mixed-use building typologies for future development of industrial space within office, residential and self-storage space construction.¹⁸ For an NYC-based CDW circular economy that provides economic opportunities¹⁹ while optimizing GHG reductions from direct and indirect re-use of recovered CDW materials, creative land use reforms will be necessary to support private industry investment.

NYU/Tandon-Management of Technology Capstone. The original scope of the fall 2022 NYU/Tandon Management of Technology capstone project from Town+Gown:NYC and the URR WG was to develop a cost/benefit model for the recovery and direct re-use of CDW materials among NYC public capital projects as well as the indirect re-use as envisioned by the URR WG’s CLCPI, using data from NYC’s construction agencies that Town+Gown obtained from the agencies. Of all the available NYC agency data received, only NYC DOT’s recycled concrete aggregate (RCA) data from NYC DOT’s crusher operations was sufficient to enable the capstone team to develop a cost/benefit model, so the project scope was modified to focus the cost/benefit analysis of recovering and reusing the concrete element of CDW.

¹³ See NYS DEC regulations § 360.12(c)(3)(xi); proposed parts 360-366, 369, 371, 377 from p. 24 of See pp. 13-18 of [2022 Analysis of Proposed Changes to Part 360 Regulations \(Brooklyn Law School\) Update.](#)

¹⁴ See <https://www.nyc.gov/site/planning/zoning/districts-tools/mfg-districts.page>.

¹⁵ *Idem*

¹⁶ *Idem*

¹⁷ *Idem*

¹⁸ See <https://www1.nyc.gov/assets/planning/download/pdf/planning-level/housing-economy/can-industrial-mixed-use-buildings-work-in-nyc.pdf>. See also <https://www.nyc.gov/site/planning/plans/city-of-yes/city-of-yes-carbon-neutrality.page>.

¹⁹ See <https://www.nyserda.ny.gov/ny/disadvantaged-communities>; see also pp. 17-18 of Draft Plan Comments.

NYS DEC's Part 360 Series Waste Tracking Document-Construction & Demolition Debris (https://www.dec.ny.gov/docs/materials_minerals_pdf/cdtracking.pdf) records all CDW generated at a construction project site. This form is signed by the transporter, the generator or its authorized representative, likely the generator's general contractor, and the receiving facility. The completed form for all waste types is to be sent to the generator within two weeks of receipt of waste, and, for CDW generated in NYC, to NYS DEC.²⁰ A recent state law enacted in 2020 and amended in 2021²¹ requires generators within NYC to "provide waste transporters with a waste tracking document for each construction and demolition debris shipment, in a form prescribed or approved by the department, specifying the quantity and type of construction and demolition debris, and *signed and dated by an authorized representative of the generator and with a certification in a form prescribed by the department*, which shall contain a certification by the generator that the information therein is true, accurate and complete." The term "generator" in the Part 360 tracking form, which now requires certification for NYC projects, is defined in Section 360.2(b)(122) of NYS DEC regulations as "any person [as defined in 360.2(b)(198)] whose act or process produces a waste or whose act first causes waste to be subject to regulation under this Title," which in the case of NYC public construction projects would be the NYC construction agency. As these forms are likely part of an agency's contractor's files, which are available to the construction agency under NYC's standard construction contract, NYC capital project CDW material and volume data appear to be currently available for the next iteration of this capstone cost benefit model, which can be expanded to include all project CDW.

²⁰ This report is not yet publicly available from NYS DEC.

²¹ Environmental Conservation (ENV) CHAPTER 43-B, ARTICLE 27, TITLE 31, § 27-3101. Waste tracking documents.