

INCENTIVIZING THE CIRCULAR ECONOMY:

Financial and Other Incentives for Deconstructing Buildings and Infrastructure to Jump Start Construction and Demolition Waste Circular Economy



TABLE OF CONTENTS

02

Executive Summary

04

Current Policy Framework in New York State **40** European Unions Approach

49 Challenges and Barriers

53

08

Terminology and Definitions

10

Incentives for Deconstruction

Recommendations and Future Research

56 References and Appendix



02

Executive Summary

04

Current Policy Framework in New York State **40** European Unions Approach

49 Challenges and Barriers

08

Terminology and Definitions

53

ology and Definitions

10

Incentives for Deconstruction

Recommendations and Future Research

56 References and Appendix

Meet Our Team

Piper Cooper

Piper was born in St. Louis, MO and in 2011 moved with her family to Ketchikan, AK where she was raised. Moving back to the Midwest to complete her B.A. at Coe College, she earned a double major in political science and economics, with a minor in philosophy. Having a strong passion for government, community, data skills, and economic development, she enjoys expanding her knowledge and seeking opportunities to help others. Piper will complete her MPA with a concentration in Data Analytics for Public Policy and will be joining the State of New York in the Department of Agriculture and Markets to continue her career.

Brontë Dawkins-Yates

Brontë grew up in Perth, Australia and has lived across Europe over the last few years in the UK, Germany and currently France. With a bachelor's in International Relations, concentrating in International Climate Policy, and now an MPA, concentrated in Environmental Policy with Data Analytics, she's developed quality research skills currently being utilized in her funded graduate research on the intersection of sustainable urban development and public participation mechanisms. Following the completion of this project, Brontë is looking forward to returning to Paris and establishing her career as a climate policy analyst.

Mike Goodman

Mike was raised in Maplewood, NJ. After completing his Bachelor's at Ithaca College, Mike worked in southern Utah as a wilderness therapy guide mentoring at-risk youth. Mike moved to Syracuse to pursue a double-Masters in Sustainable Energy from SUNY ESF and Public Administration from Syracuse University. He will be moving to Montana in July with his family to work for the US Department of Energy.

Alexander Yerou

Alex is currently pursuing an MPA degree with a concentration in Government Finance at the Maxwell School at Syracuse University. He has gained a strong interest in the quantitative analysis of public policy, particularly around capital investments, structured finance transactions, and sustainability programs. Last year he received a Bachelor's degree from Le Moyne College where he majored in political science and minored in legal studies.

EXECUTIVE SUMMARY

Construction and Demolition Waste (CDW) is the debris generated during the construction, renovation and demolition of buildings, roads, and bridges. It represents a large portion of the waste stream in cities. Cities must create innovative strategies and develop incentives to divert CDW from landfills and engage in waste recovery efforts.

This report highlights the current policy frameworks guiding CDW management practices in NYC and NYS more broadly in order to frame the applicability of incentive implementation. Following, a survey of incentives pertaining to construction and demolition waste within the United States and Europe is conducted. This report provides examples of what incentives exist at state and local levels across the US, as well as an overview of how the European Union and other European countries have led the way in construction waste recovery and recycling.

We identify five sectors that have slowed recovery efforts in jumpstarting a circular waste economy. These obstacles to implementation include infrastructure, material integrity, workforce development, burdens and underdeveloped markets, and political environment.

This report recommends supporting regulation for the development of the circular economy, building capacity for deconstruction and calling for standardization of practices.

Introduction

Construction and Demolition Waste (CDW) is broadly understood as the debris generated during the construction, renovation and demolition of buildings, roads, and many other forms of associated infrastructure. CDW represents a significant portion of the waste stream in cities and thus requires a robust and self-facilitating management system to appropriately handle its life cycle from production and disposal. Cities must create targeted and innovative strategies as well as develop various incentive avenues to facilitate the diversion of CDW from landfills to engage in waste recovery efforts and furthermore facilities and circular economy practices.

The goal of this report is to identify and explain current policies and frameworks which shape the context of both New York City and New York State in their pursuit of a circular waste economy regarding CDW specifically. We have compiled a catalogue of over twenty incentive programs in effect across the United States at both the state and local levels of governance. These incentives are categorized by type such as being of an encouragement, financial or regulatory nature.

Across the United States, various incentive examples are found that reflect the political and environmental context of their geography. Additionally look to the incentive landscape across Europe, which has become a world leader in CDW recovery, in order to inform a better, more cohesive and comprehensive approach to CDW management.

We identify five barriers that have slowed recovery efforts in jumpstarting a circular waste economy, specifically in the US context. These obstacles to implementation include required infrastructure, material integrity after deconstruction, workforce development, burdens and underdeveloped markets, as well as the political environment of NYC and NYS.

Finally, this report recommends supporting regulation for the development of the circular economy, building capacity for deconstruction and calling for federal and industry-wide standardization of practices.

CURRENT POLICY FRAMEWORK IN NEW YORK STATE

At the state level, Governor Kathy Hochul is committed to achieving some of the nation's most ambitious climate requirements under the Climate Leadership and Community Protection Act (CLCPA). The CLCPA directs the DEC to establish GHG emission limits, requiring a 40% reduction in statewide GHG emissions from 1990 levels by 2030 and an 85% reduction by 2050. NYS's politicians contend that the diversion of waste from landfills and the establishment of supply chains for CDW materials are central to the CLCPA's mission. For context, the waste sector in NYS is responsible for 12% of statewide GHG emissions. With a total of 18.4 million pounds in 2018, CDW debris was the largest component of NYS's total waste stream. The graph below depicts the variation in disposal actions of CDW in 2018.



Allocating state funds to sustainability initiatives, like the CDW circular economy in NYC, will not only help NYS accomplish the CLCPA's ambitious climate requirements but also secure substantial contributions of federal funding. Billions of dollars in federal funds are available through the IRA, CHIPS and Science Act, and administered through EPA grants. Given New York's uniquely business-friendly environment for sustainability programs and commitment to the CLCPA's objectives, there is no place to go but up for the CDW circular economy. New York State's Solid Waste Management Plan (SWMP) is designed to guide collective efforts to reduce waste and the burden on communities from waste disposal, as well as to mitigate the emissions driving climate change. Signed by Governor Hochul and DEC Commissioner Basil Seggos, the SWMP identifies key strategies and methods to build a circular economy, and a more resilient supply chain, and provides policy recommendations to help achieve NYS's ambitious climate goals. According to the NYS DEC, "a circular economy supports processes, activities, and systems that make effective use of materials and prevent environmental degradation and economic loss by keeping valuable materials circulating within the economy." The SWMP defines CDW material as all wasted construction materials from new building construction, demolition, road construction, and construction excavation materials.

In addition to decreased GHG emissions through resource conservation, the private sector can benefit from the CDW circular economy under New York's public policy. By creating job opportunities through a new business model and ensuring materials with value stay within the economy, private corporations can capitalize on an entirely new market. These opportunities will primarily result from converting landfilled CDW material to recycled CDW material.

NYS DEC's Part 360 regulations operate as the primary legal mechanism that shapes NYC's local government activities around the CDW circular economy. Originally intended to integrate a waste management system to fix the city's landfill crisis in the late 1980's, the Part 360 series' regulatory framework focuses on registrations, permits, and authorization of activities for CDW material management facilities. Revisions were made in 2017 to reduce illegal disposal of CDW material and create a registration and waste-tracking document required for transporters of CDW material, including fill material originating in NYC.

Beneficial Use Designations (BUDs) were also created in the 2017 Part 360 revisions. A BUD is a designation made by the DEC pursuant to 6 NYCRR Part 360.12, that determines which CDW material is to be deemed viable for reuse. Once the Department grants a BUD, the waste material ceases to be considered solid waste when used as described in the BUD. Currently, the process to create or rescind predetermined BUDs suffers from administrative burden, therefore, slowing the DEC's ability to update BUDs that promote the CDW circular economy.

Commercial Waste Zones (CWZs) were established throughout New York City in 2019. The CWZ program is intended to create a safe and efficient commercial waste collection system that advances the City's Green New Deal and zero waste goals while providing high-quality, low-cost service to NYC businesses. Other intended benefits include reduced truck traffic associated with commercial waste collection, elimination of fuel use during heavy-duty truck transportation, and an updated regulatory framework. It is important to note that the City of New York's five boroughs are all within Region 2 of the NYS DEC.

Industrial Business Zones (IBZs) are geographic areas in NYC that serve as designated safe havens for manufacturing and industrial firms. NYC has guaranteed that IBZs will not be rezoned for residential use. The IBZs, shown in the map below, are important to identify where new CDW transfer facilities could be located to create the CDW circular economy. Furthermore, businesses in these zones can benefit from several incentive programs including the NYCIDA Industrial Program, NYC Industrial Developer Loan Fund, and Industrial Business Service Providers Network.

LEED is a national certification system, administered by the U.S. Green Building Council (USGBC), that the City's local law mandates certain City public building construction projects follow and achieve a minimum LEED rating of Certified or Silver and, in many cases, use energy and water more efficiently than current City codes require. LEED scores were particularly important to many of the domestic CDW policies collected for the international survey. NYC's construction contract specifications for LEED requirements of CDW management, performance, and diversion are the primary implementation tool for sustainable CDW practices. Nonetheless, LEED certifications do not necessarily create a market-based incentive for the CDW circular economy.

Town+Gown:NYC, the citywide built environment research program, resident at the NYC Department of Design and Construction, and its Urban Resource Recovery Working Group (URRWG) have focused on local government incentives to recover and reuse CDW materials and identify mechanisms for local governments to jump-start the CDW circular economy. The international survey of financial and other incentives in this report is intended to advance their research by finding parallels with the state's SWMP, as well as identify areas where the state's SWMP can improve.





TERMINOLOGY AND DEFINITIONS

For the purposes of this project and report, there are classifications on terminology, and definitions that are relevant to the discussion. The aim is to provide an understanding of the complex nature of this subject and provide a guide to the industry abbreviations and explanations used.

Built Environment

The Built Environment is a multi-disciplinary field modified by Town+Gown:NYC as consisting of six disciplines: management, geography, economics, law, design, and technology. Generally, built environment refers to man-made or modified structures that provide people with living, working, and recreational spaces.

CDW

Construction and demolition waste, sometimes also referred to as C&D Materials, consists of the debris generated during the construction, renovation and demolition of buildings, roads, and bridges. At this time in the U.S., there is no standard or consistent list available to define what specific types of materials are considered CDW or C&D.

Circular Economy

Based on three principles, it seeks to eliminate waste and pollution, circulate products and materials, and regenerate nature. The model promotes the maximization of material reuse and recovery, helping provide a framework to optimize deconstruction practices and close CDW material loops.

CLCPI

The CLCPI--Closing Loops City Program Initiative—is a work product of the URR WG in the form of a pilot initiative that aims to change City agency construction practices and policies that would leverage the City's capital program to help close the CDW material loops, focusing on direct and intentional indirect re-use of CDW materials in NYC's capital projects.

Deconstruction

The systematic process of dismantling and removing of a structure or its parts to reverse the order of construction, for maximum value through salvaging and harvesting the components of the structure, primarily for reuse of materials or recycling.

Demolition

The efficient tearing down of a structure or its parts to clear a site as quickly as possible, resulting in debris suitable for some bulk, mixed commodity recycling and disposal.

Industrial Business Zones

Industrial Business Zones (IBZs) are geographic areas that serve as safe havens for manufacturing and industrial firms, under which the City of New York guarantees not to support the rezoning of properties to allow residential uses. Currently, there are 21 IBZs throughout the City:

- Brooklyn: Brooklyn Navy Yard, East New York, Flatlands/Fairfield, Greenpoint/Williamsburg, North Brooklyn, Southwest Brooklyn
- Bronx: Bathgate, Eastchester, Hunts Point, Port Morris, Zerega
- Queens: Jamaica, JFK, Long Island City, Maspeth, Ridgewood, Steinway, Woodside
- Staten Island: North Shore, West Shore, Rossville

Town+Gown:NYC

A city-wide Built Environment research program, resident at the NYC Department of Design and Construction (NYC DDC). This is a university-community partnership, operating as an open research platform for Built Environment research projects.

URRWG

Urban Resource Recovery Working Group, which was created by Town+Gown:NYC to support research focus on closing CDW material loops leading to a circular CDW economy.

Waste Diversion

Defined by the Environmental Protection Agency (EPA) as the prevention and reduction of generated waste through recycling, reuse, and composting.

Zero Waste

The goal of ethical, economical, efficient, and visionary practice emulating sustainable natural cycles, where all discarded materials and products are designed to become reusable resources. New York City has set Zero Waste Goals for municipal solid waste with DSNY in collaboration with governmental and non-profit partners guidelines, as well as strategic resources to help individuals and larger organizations identify ways they can improve the City's zero waste objectives.

INCENTIVES FOR DECONSTRUCTION

When it comes to supporting the CLCPI, incentive programs can be critical to help promote deconstruction practices for all levels of government. Incentive programs are mechanisms that encourage deconstruction and require stakeholders to opt in to participate. Along with policies that can act as an enforcement mechanism, incentives offer flexibility and different motivations for local governments, depending on their respective capacity and support for deconstruction infrastructure. This section identifies the major incentive types in the U.S. and how these different incentives are shaping deconstruction programs and working to close the CDW loop.

The incentives have been organized into three main categories: financial, regulatory, and encouragement. Many of these incentives operate to achieve one or all of these categories but have a primary method motivating the opportunity for governments to integrate these incentives long-term. Before going into some of the incentives that currently exist, it's important to understand what exactly each incentive is, and what role it plays to move closer to the goals of the CLCPI.

FINANCIAL INCENTIVES

Financial incentives are designed to provide monetary benefits or cost savings to entities engaged in deconstruction and reuse activities. Examples of financial incentives include grants, low-interest loans, tax credits, and rebate programs. These types of incentives aim to offset the costs associated with deconstruction and encourage stakeholders to prioritize the reuse of CDW materials. By providing financial support, governments and private actors can alleviate financial burdens on stakeholders, making deconstruction and reuse an economically viable option.



REGULATORY INCENTIVES

Regulatory incentives involve policies, regulations, and standards that promote deconstruction and reuse practices. These incentives create a regulatory framework that encourages or mandates the diversion of CDW materials. For instance, governments may implement requirements such as city, county, or state-wide ordinances requiring waste management's plans, deconstruction permitting specifications, and adhering to CDW diversion and recycling rates. These regulatory mechanisms are popular incentives for governments to incorporate in their regular services and operations since it then becomes an integral component of construction and infrastructure for a respective area.



ENCOURAGEMENT INCENTIVES

Encouragement incentives focus on a different aspect of the incentive process, focusing on raising awareness, providing education, and offering technical assistance to support and motivate stakeholders to adopt deconstruction and reuse practices voluntarily. These incentives can take the form of public outreach campaigns, workshops, training programs for contractors and waste specialists, and the establishment of resource centers. Through fostering knowledge sharing and capacity building, an encouragement incentive seeks to empower stakeholders with the necessary skills and information to embrace deconstruction and reuse practices, contributing to closing the CDW loop. This incentive category is by far the broadest, ranging from government facilitated encouragement incentives to non-profit organizations working to create the culture of deconstruction and reuse policies and practices in the construction industry.



The next sections overview each incentive category, specified by whether it's applied country-wide or state-specific, and what level of government the incentive is managed by. The programs listed are the strongest examples of each incentive, demonstrating how the various incentives have been implemented across the different regions in the country. It should be noted that this is not currently an exhaustive list, as more governments are continuing to apply these incentives to their communities to encourage better CDW material disposal practices. These examples provide insight into the incentives that have been adopted, and how different regions across the U.S. are embracing these practices into their daily operations.

ENCOURAGEMENT PROGRAMS

MIAMI-DADE, FLORIDA



In 2000, Miami-Dade County adopted Ordinance 00-98, the Targeted Jobs Incentive Fund Program. This program offers incentives for companies that relocate to Miami-Dade County and create jobs. A company can receive up to \$1,000 if they operate their business out of a building or facility that is LEED-certified. The Targeted Jobs Incentive Fund (TJIF) offers cash incentives for existing Miami-Dade companies in select industries undertaking a business expansion that creates at least 10 new above-average paying jobs and makes a capital investment of at least \$3 million.

PORTLAND, OREGON

The Construction Salvage and Recycling Toolkit does not contain a complete listing of all recycling and reuse facilities in the Portland metropolitan area. Metro has not undertaken any independent review of the facilities listed and does not make any warranty, express or implied, or assume any legal liability for the same. The listing of any business or program does not constitute an endorsement or recommendation by Metro. This document discusses C&D materials and who recycles them in the area.

SEATTLE, WASHINGTON

In 2009, the City of Seattle created the Priority Green Expedited Permitting Program, which provides priority scheduling and expedited initial review and permitting to commercial and residential projects that earn LEED Gold or Platinum certifications. To qualify for the incentive, projects must also achieve Priority Green requirements for energy and water conservation, waste reduction, and indoor air quality including demonstrating at least 15% lower annual energy use than the 2015 maximum energy use allowed by the 2015 Seattle Energy Code

FINANCIAL INCENTIVES



Since 1995, the EPA's Brownfields and Land Revitalization Program has grown and expanded on how communities can learn about cleanup, deconstruction, and redevelopment. The program is designed to empower states, tribes, communities, and other stakeholders to work together to prevent, assess, safely clean up, and sustainably reuse brownfields. Brownfields are generally understood to mean real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties protects the environment, reduces blight, and takes development pressures off greenspaces and working lands. Among the various benefits of Brownfield grants, the program contains several grants that support direct funding for assessment, cleanup and deconstruction, revolving loans, environmental job training for construction, technical assistance, as well as training and research. These are the main grants available:

- Assessment Grants
- Revolving Loan Fund (RLF) Grants
- Cleanup Grants
- Multipurpose (MP) Grants
- Job Training (JT) Grants
- State and Tribal Response Program Grants

In particular, the RLF, Cleanup, MP, and JT grants from the program seek to provide financial and technical support for deconstruction and reuse in all stages of the construction process. These grants are available to all states, upon approval of an application by the requesting government or developer responsible for the brownfield request.

OAKLAND, CALIFORNIA

Started in 1993, the 501(c)3 nonprofit offers assistance for green services and products, focusing on keeping reusable and recyclable building materials out of landfills. Based in Oakland, California, the organization offers its services across the country. Offering many services, they assist in building materials donation and deconstruction options, building materials collection and distribution, project management, training programs, consulting services, as well as reuse and recycling plans. TRP offers free IRS appraisers for residential building deconstruction and a free deconstruction bid from a TRP-Certified Deconstruction Contractor. For commercial deconstruction, TRP offers a no-cost onsite deconstruction survey to identify all salvageable materials for reuse, as well as providing IRS appraisers with assistance in finding any tax deductions that may be available.

SAN DIEGO, CALIFORNIA

The city-level financial incentive requires applicants for all building permits or demolition/removal permits issued by the City of San Diego to submit a properly completed Waste Management Form (WMF) Part I with the application where the WMF must be in accordance with the requirements set forth in the Land Development Manual. All applicants, including the City of San Diego, shall pay a refundable deposit at the time building permits or demolition/removal permits are issued. Without properly completing the WMF Part I and paying the required deposit, applicants are not issued permits.

MIAMI-DADE, FLORIDA



In 2005, the Miami-Dade County Board of Commissioners adopted Ordinance 05-115, authorizing the County Building Officials to implement a program to expedite the review and approval of permit applications for green buildings. For Miami-Dade County, Green buildings are defined as buildings where the design, construction and operation promote the preservation of resources and environmentally sensitive construction practices, systems, and materials. The Building Official should also consider if the building is certified by a rating agency, including the U.S. Green Building Council.



HENNEPIN COUNTY, MINNESOTA

Implemented in January 2020, Hennepin County applicants can apply for funding for their projects that reuse and recycle building materials. The Environment and Energy Department in the county allocates \$100,000 for this program each year. Applicants must be a homeowner or developers of property within the county, and publicly-owned properties are not eligible for funding. Grants are specified by project type:

- Residential deconstruction grants: Funding for residential properties built prior to 1970 to deconstruct building materials for reuse. Up to \$5,000
- Commercial deconstruction grants: Funding for commercial properties, including multifamily apartment buildings, to deconstruct building materials for reuse. Up to \$10,000
- Structural move grants: Funding to physically relocate a building to another location, avoiding demolition waste and preserving the cultural and historical integrity of the building. Up to \$15,000
- Used building material installation grants: A new grant to "close the loop" by funding remodeling, renovation, and new construction projects that incorporate used building materials. Up to \$5,000 All the grants are available until funding runs out. Applicants must apply for their project type and follow the reuse criteria for that grant type. Hennepin County provides an approved materials list, as well as construction and demolition recycling facilities in the area.

ARLINGTO N COUNTY, VIRGINA

In 2003, the program was updated to allow the County Board to consider density bonus requests from all types of site plan developments (office, residential and mixed-use) at all four levels of LEED certification. The financial incentive also established the County's Green Building Fund which provides education and outreach on green building issues. Developers who do not commit to LEED certification contributed to the Fund at a rate of \$0.03 per square foot. If the developer later achieved LEED certification, the contribution would be refunded.

In 2012, the program was updated so that projects could request bonus density in exchange for a commitment to a minimum level of energy savings and LEED Silver certification or higher. Projects were also asked to report energy usage to the County for 10 years. Additional density may be requested if a project earns a Net Zero Energy building certification. The program is enforced through a bond based on the size of the project; 75% of the bond is held until the LEED certification is achieved.

In 2020 the policy was amended again to require projects to earn LEED Gold certification to earn a density bonus. The policy stipulates that it will be reviewed (and updated if appropriate) every three to five years or when the LEED green building rating system is updated to ensure that the program remains current with emerging green building technologies, national trends, and the needs of the community.

SEATTLE, WASHINGTON

<image>

Starting in October 2022, Seattle Public Utilities, along with the Seattle Department of Construction & Inspections, started a pilot deconstruction incentive program to increase deconstruction projects and build familiarity with the process, gather data, and identify innovations. Deconstruction has multiple benefits such as reduced greenhouse gas emissions, reduced waste disposal, job creation, reduced stormwater pollution, and reuse of valuable building materials.

REGULATORY INCENTIVES

DANVILLE, CALIFORNIA

In 2009, the City of Danville adopted Ordinance 2009-05, requiring all new developments and renovation projects larger than 1,000 square feet or totaling more than \$50,000 to recycle at least 50% of their construction and demolition debris. Covered projects must submit a Waste Management Plan (WMP) as part of the permit application. Projects pursuing LEED certification may be exempt from submitting a WMP, provided that the credits achieved satisfy the city's waste requirement. This policy was later repealed.

EL MONTE, CALIFORNIA

In 2007, the City of El Monte adopted Ordinance 2701, establishing a requirement for construction and demolition (C&D) waste collection, removal, disposal, and diversion. All projects requiring a permit must divert 50% of C&D materials from entering a landfill. Projects failing to comply with the requirement will have their performance security withheld proportionate to the shortcoming of the diversion requirement. The partial performance security refund to non-compliant projects may be increased if the project achieves LEED certification.

There is a requirement of 65% waste diversion, or the State-mandated construction and demolition diversion percentage established in the California Green Building Standards Code, whichever is greater, applies for covered projects. As a means of confirming compliance, the diversion of C&D materials is calculated by dividing (1) the total weight of C&D materials generated by but diverted from a covered project; by (2) the total weight of all wastes generated by the covered project.

Performance security, in the sole discretion of the Chief Building Official, may also include a corporate surety bond or instrument of credit including a letter of credit. If the Chief Building Official determines the applicant has complied with the diversion mandates, the performance security will be released to the applicant within thirty days. If the Chief Building Official determines the applicant has failed to comply, the applicant is required to forfeit the percentage of the total deposit equivalent to the percentage by which the applicant has failed to meet the mandated diversion requirements. Additionally, the applicant shall also pay a nonrefundable administrative fee in an amount equivalent to one percent of the covered project's value.

LOS ANGELES, CALIFORNIA

On March 5, 2010, the Los Angeles City Council approved Council File 09-3029 pertaining to a Citywide Construction and Demolition (C&D) Waste Recycling Ordinance that requires ALL mixed C&D waste generated within city limits be taken to City certified C&D waste processors. LA Sanitation (LASAN) is responsible for the C&D waste recycling policy.

All haulers and contractors responsible for handling C&D waste must obtain a Private <u>Waste Hauler</u> <u>Permit</u> from LASAN (L.A, Sanitation Solid Resources Haulers and Facilities Portal) prior to collecting, hauling and transporting C&D waste, and C&D waste can only be taken to City certified C&D processing facilities.

Failure to follow these regulations elicits non-compliance penalties of up to \$5,000, which will be assessed for every load of C&D waste not taken to City certified processors. There are no longer any C&D rebates available.

SAN FRANCISCO, CALIFORNIA

Under the ordinance, C&D debris material removed from a project in San Francisco must be recycled or reused. No C&D debris can be transported to or disposed of in a landfill or incinerator or put in a designated trash bin. The following specifications are required for the different types of C&D debris:

Mixed C&D debris

Can only be transported off-site by a transporter that has obtained a permit, issued by the Department of the Environment, for each debris box or vehicle used to transport it. Must be transported to a city registered C&D facility (Registered Facility) that processes all mixed C&D loads for recycling.

Separated C&D debris by material type (source-separated)

Must be taken to a facility or end use that reuses or recycles C&D materials. Companies hauling only source-separated material directly for reuse or recycling are exempt from the transporter C&D permit requirements. Any person or company found in noncompliance with the ordinance may incur substantial civil and/or criminal penalties, including fines up to \$1,000 per day and suspension of their permit or registration.

DENVER, COLORADO

In 2013, the Mayor of Denver issued Executive Order 123, requiring new municipal building construction to earn LEED Gold certification, with a goal of achieving LEED Platinum where economically feasible. The EO also requires all existing and future municipal facilities to be maintained and operated using LEED for Existing Buildings principles. The EO also requires project teams to use LEED for guidance in construction and demolition waste recycling and the use of recycled materials.

DENVER, COLORADO

In 2022 a ballot initiative passed and is still being implemented. The following description outlines the ballot initiative language:

(a) All construction and demolition activities subject to city permit should separate and recycle, at a minimum, all readily recyclable concrete, asphalt, clean wood, scrap metal and corrugated cardboard. Other materials may be added to this list by the Department of Transportation and Infrastructure as recycling opportunities expand, effective June 1, 2023.

(b) A rules and regulations process shall establish penalties and fines for noncompliance based on the square footage of the project. Penalties may include loss of license.

(c) All parties seeking a demolition permit must have a recycling and reuse plan approved by the Department of Transportation and Infrastructure prior to the issuance of the demolition permit.

(d) Projects under 500 square feet, projects requiring only mechanical, electrical, plumbing or HVAC permits, quick permits, and other applicable projects determined through rules and regulations are exempted.

MIAMI-DADE, FLORIDA



In 2007, Ordinance 07-65 established the Miami-Dade County Sustainable Buildings Program. The program required all county-owned, -financed, -leased, and -operated buildings to incorporate, green building practices into the planning, design, construction, management, renovation, maintenance, and decommissioning of infrastructure projects and buildings wherever possible. Furthermore, the county-level policy suggests LEED Silver as the standard on which to base green building practices.

COOK COUNTY, ILLINOIS



Beginning in 2017, demolition debris diversion is required for all demolition activities affecting any structure (except for garages, sheds, utilities, and projects not demolishing any load-bearing walls. The ordinance specifies a minimum of 5% by weight reuse requirement and a minimum of 70% by- weight diversion requirement for any residential structures; for any non-residential structures, the requirement is a 70% by weight recycling requirement, with reuse encouraged whenever possible. Demolition permit holders must also submit a Demolition Debris Diversion plan and Demolition Debris Diversion Report, within the assigned timeframes in the ordinance and from the Department of Environment and Sustainability.

SPRINGFIELD, MISSOURI

In 2008 the Springfield City Council adopted Resolution 9573, establishing the Springfield Green Building Policy, which requires all city-owned buildings intended for human occupation to earn LEED Silver certification. The policy also requests that projects strive for the highest certification possible if conditions permit. At a minimum, all projects must earn seven LEED points for energy performance, two points for water use and waste reduction, and one point for construction waste management. New buildings not intended for human occupation are required to incorporate as many LEED points as possible. The policy also stipulates that any future renovations to city buildings must use performance benchmarks from LEED for Existing Buildings.

PORTLAND, OREGON

All mixed waste generated within the Metro boundary must be delivered to a Metro-authorized material recovery facility whether it is to be recycled or disposed of. This applies to all haulers and generators in the region – whether using disposal facilities inside or outside the region boundaries. Hauling solid waste from within region boundaries to a non-approved facility may result in prosecution by Metro for recovery of unpaid fees and taxes plus civil penalties of up to \$500 per violation.

PHILADELPHIA, PENNSYLVANIA

<image>

Effective in 2010, Chapter 17-100 of The Philadelphia Code, entitled "Procurement Contracts," sustains that any contract for the construction, extension, or major renovation of certain buildings, paid for with public funds, contains a provision requiring the contractor to certify that a certain level in energy and design efficiency will be achieved, in accordance with the Leadership in Energy and Environmental Design (LEED) Rating System. These capital-building projects are required to attain a Silver-level LEED rating. Contractors are expected to provide the Philadelphia Procurement Department information concerning financial resources; plant and equipment facilities; organization and personnel; prior experience; and record of performance of prior contracts.

SAN ANTONIO, TEXAS



Adopted by San Antonio City Council in September of 2022, and going into effect as of October 2022, the ordinance includes code language that requires certain projects seeking a demolition permit to be fully deconstructed. All small-scale residential structures (single family, duplex, triplex, fourplex) and rear accessory structures (garages, carriage houses, accessory dwelling units) are subject to the deconstruction ordinance if:

- The structure was built on or before December 31, 1920, and located anywhere in San Antonia City limits; or
- The structure was built on or before December 31, 1945, and is designated historic and/or is located within a Neighborhood Conservation District

Among these specifications, the ordinance also requires a certified deconstruction contractor must be employed to perform the deconstruction work. A resource page is provided to include certified deconstruction contractors in the area, as well as information on where to get training to become certified.

COMMONWEALTH OF VIRGINIA



In 2010, the Governor of Virginia issued Executive Order 19, directing all state agencies to conserve energy, water and reduce waste by requiring that all new or renovated buildings conform to LEED Silver standards or a state-approved alternative standard. The EO also mandates those agencies only lease LEED-certified office space.

limited additional information exists



MILWAUKEE, WISCONSIN

Going into effect in January 2018, the ordinance covers structures built in 1929 or earlier, designated historic structures, and structures in historic districts. Any of these structure types are required to be deconstructed instead of demolished. Per the ordinance, it is then the responsibility of a certified Deconstruction Contractor and/or Deconstruction Consultant to deconstruct the structures and strive to meet the 85% landfill diversion rate by weight per ordinance. This process also requires a demolition permit as well as a completed Deconstruction Project Assessment form.

EUROPE'S APPROACH TO DECONSTRUCTION

The approach taken to all categories of waste management in the European Union (EU) occurs under a substantially different political and governmental framework. The respective bodies of the EU, including but not limited to the European Commission, the European Parliament, and The Council of the European Union, navigate region-wide strategies and regulations to set mandated standards of compliance. Member States hold a flexible level of autonomy to implement policy and market-based incentives, consistent with their political and cultural contexts, to meet the mandated waste management restriction. A combination of country- specific regulatory policy and market-based incentives are employed across EU member states, however, the EU itself has formulated several pieces of legislation to regulate the parameters and responsibilities of the industry.

Industry definitions as defined by the European Union

In order to maintain continuity across countries regarding the definition and categorization of materials and practices the EU has taken strides to formulate these definitions. In 2000, 2008 and 2014 legislation has been passed that provide comprehensive parameters for these concepts and terminology in the CDW industry. First, Commission Decision 2000/532/EC provides an exhaustive list of materials classified un CDW including the primary examples of concrete, asphalt, wood, glass, soil, and metals with additional breakdowns of relevant subcomponents (see appendix 2). This overview is central to the industry's management of its waste as of 2008 when Directive 2008/98/EC was passed, also referred to as the Waste Framework Directive. This directive provides the first set of clarifying terms relevant to the industry-specific mandates including the following:

Definitions

Re-use: "means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived".

Recovery: "means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.

Recycling: "means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations".

Backfilling: "means any recovery operation where suitable nonhazardous waste is used for purposes of reclamation in excavated areas or for engineering purposes in landscaping. Waste used for backfilling must substitute non-waste materials, be suitable for the aforementioned purposes, and be limited to the amount strictly necessary to achieve those purposes".

Waste hierarchy: "The following waste hierarchy shall apply as a priority order in waste prevention and management legislation and policy:

- (a) prevention;
- (b) preparing for re-use;
- (c) recycling;
- (d) other recovery, e.g. energy recovery; and
- (e) disposal".

The waste hierarchy looks to set the specific order in which waste management should be conducted. This order is essential for optimizing GHG emission reductions and reducing the consumption of resources altogether. The 2008 directive also explicitly notes amongst these definitions that CDW strictly encompasses "waste generated by construction and demolition activities", is not in any way associated with what is termed "municipal waste" and is not held in compliance with regulations on municipal waste management.

EU Regional Policy

The 2008 Waste Framework Directive presents the first regionally applicable mandate as a percentage minimum requirement for the recovery of CDW. Set at 70% requirement (by weight) by 2020, all member states were thus granted 12 years to implement appropriate policy and incentive schemes to support the industry's circular economy transformation. Member states are also mandated to promote selective demolition practices to facilitate re-use (not just recovery) through establishing sorting systems for wood, and mineral fractions. A list of 15 incentive approaches is provided:

"1. Charges and restrictions for the landfilling and incineration of waste which incentivise waste prevention and recycling, while keeping landfilling the least preferred waste management option".

"2. 'Pay-as-you-throw' schemes that charge waste producers on the basis of the actual amount of waste generated and provide incentives for separation at source of recyclable waste and for reduction of mixed waste".

"3. Fiscal incentives for donation of products, in particular food"

"4. Extended producer responsibility schemes for various types of waste and measures to increase their effectiveness, cost efficiency and governance".

"5. Deposit-refund schemes and other measures to encourage efficient collection of used products and materials".

"6. Sound planning of investments in waste management infrastructure, including through Union funds".

"7. Sustainable public procurement to encourage better waste management and the use of recycled products and materials".

"8. Phasing out of subsidies which are not consistent with the waste hierarchy".

"9. Use of fiscal measures or other means to promote the uptake of products and materials that are prepared for re-use or recycled".

"10. Support to research and innovation in advanced recycling technologies and remanufacturing".

"11. Use of best available techniques for waste treatment".

"12. Economic incentives for regional and local authorities, in particular to promote waste prevention and intensify separate collection schemes, while avoiding support to landfilling and incineration".

"13. Public awareness campaigns, in particular on separate collection, waste prevention and litter reduction, and mainstreaming these issues in education and training".

"14. Systems for coordination, including by digital means, between all competent public authorities involved in waste management".

"15. Promoting continuous dialogue and cooperation between all stakeholders in waste management and encouraging voluntary agreements and company reporting on waste".

The combination of financial, regulation and encouragement program incentives promoted by the EU is a valuable cross-functional approach. It ensures a specific level of progress while also facilitating market forces to develop in support of efficient practices. These incentive options all reflect the 'polluter pays' principle. Denoted as "Extended producer responsibility" (EPR) the EU is entrenching the economic consequences of pollution entirely on the corporation operations which produce it. we can see this approach also taken in the EUs approach to carbon emission management.

"In order to strengthen the re-use and the prevention, recycling and other recovery of waste, Member States may take legislative or non-legislative measures to ensure that any natural or legal person who professionally develops, manufactures, processes, treats, sells or imports products (producer of the product) has extended producer responsibility."

In order to support this EPR, Directive 2008/98/EC also mandates member states to install appropriate infrastructure to support the circularization of the waste management industry for producers through;

- "A clearly defined geographical, product and material coverage without limiting those areas to those where the collection and management of waste are the most profitable"
- "An appropriate availability of waste collection systems within the areas referred to in point (a)"
- "The necessary financial means or financial and organizational means to meet its extended producer responsibility obligations"
- "An adequate self-control mechanism, supported, where relevant, by regular independent audits, to appraise ... financial management ... [and] the quality of data collected and reported"
- "Makes publicly available information about the attainment of the waste management targets"

Article 10 of Directive 2008/98/EC does outline specific conditions in which member states must allow producers to subvert recovery operations. While most of the said conditions are reasonable in nature when referring to situations that degrade environmental integrity at the cost of waste recovery, condition 3(c) has the potential to be severely abused by producers.



Article 10 - Recovery

"[Where] separate collection is not technically feasible [member states must allow for deviation from mandated targets] taking into consideration good practices in waste collection".

There is limited clarification on what does and does not constitute "technical feasibility" which therefore leaves substantial room for interoperability

In addition to the mandated requirements for member states Directive 2008/98/EC also establishes a preliminary deadline for the EU to formulate and implement policy revisions specific to CDW. if the necessary data is accumulated to inform said decisions policymakers will look to set re-use and recycling mandates to reinforce the current recovery mandate. These revisions will provide material-specific regulations to ensure the efficiency of resource use. A determination on these revisions will occur by December 2024.

In 2018, Directive 2008/98/EC was amended by Directive (EU) 2018/851. Under these amendments, the majority of renewed content is only relevant to municipal waste management. All previous regulations on CDW remain in place with the continued 70% minimum recovery order, the 'polluter pays' principle and the expected policy revision deadline of December 2024. However, the most relevant revision in this directive regards the setting of increased re-use and recycling of municipal waste over the next 15+ years. Under Directive 2008/98/EC municipal waste reuse and recycling was set to enforce a 50% minimum by weight by 2020. Directive (EU) 2018/851 established a continued progression of recovery actions by mandating a 55% minimum by 2025, a 60% minimum by 2030 and a 65% minimum by 2035. This progressive increase in reuse activity sets a positive precedent for the establishment of a circular economy in the near future.

EU MEMBER STATE ACTIONS

France

As previously noted, the policy function of the EU directives is to define parameters, set mandates and provide a framework for compliance. However, member states are responsible for implementing regulations and establishing infrastructure and monitoring frameworks to facilitate. Here a several examples of how member states have done so.

France has presented one of the most ambitious and robust approaches to circularizing its waste management systems, including that related to CDW. In 2015 the French government passed Law n°2015-992 implementing the Energy Transition for Green Growth Act (LTECV) which mandates targets for regional and local governments to reach the 70% minimum recovery of CDW waste. Under Article 84 it is decreed that local and municipal governments have the discretion to implement inventive systems to promote recovery action beyond the 70% mandate. Additionally, under Article 93 of the LTECV, the framework for setting up a network of specialized collection facilities capable of managing sorted materials is laid out.

As of February 2020, France's Ministry of the Ecological Transition has instituted an Anti-waste law for a circular economy. The purpose of which is to renew a production and consumption framework to support limiting waste and recourse depletion. This regulation formalizes the EPR conceptualized by the EU for the construction industry within France. Additionally, the regulation implements a mandatory waste diagnosis scheme within the industry. This involves submitting a diagnostic report of all expected waste generation sorted between seven waste streams paper, metal, plastic, glass, wood, mineral fraction and plaster), before construction and demolition operations begin. This report requires approval from the Scientific and Technical Building Center (a branch of the Ministry of the Ecological Transition). Such approvals are made in collaboration with construction contracting authorities which also stipulate post-deconstruction reporting of actual waste accrual.

The Netherlands

In the Netherlands, since 2001 the recycling rate for CDW was varied between 95- 100% to the landfill ban instituted in 1997. While this in and of itself greatly supports the circularizing of the economy, the reuse of materials is primarily utilized in road construction and foundation building for other road and building construction. This means little recycling is funneling specific materials into reuse as their former function (i.e. concrete into concrete or glass into glass). A 2015 governmental report estimates that only 3-4% of construction material for building originates from recycled waste products. The government's justification for settling in this practice is due existing hi rate of recycling however it recognized that in order to stabilize the circularity of its economy pursuing incentives for function-specific reuse is necessary.

The practical management of CDW waste in the city of Amsterdam is conducted in collaboration with the city government. Construction organizations (either small-scale individual projects or industry businesses) require a contract with the City of Amsterdam to correctly dispose of CDW in collection facilities. Operation done NOT in contract with the City will incur a fee by weight at the waste collection sites. This fee is variable and dependent on the operating waste collection enterprise operating at the collection point.

Germany

Germany, similarly, to the Netherlands initiated its management strategy for constriction and demolition waste recycling as early as 1996. A voluntary commitment was made by Germany's construction industry to half the quantity (by weight) of recyclable CDW by 2005. This target was achieved and as it stands today, approximately 87% of excavation waste is recycled and 70% of all other CDW is recycled. These results were yielded out of a voluntary industry commitment in an effort to establish more environmentally sustainable practices. This achievement is a clear reflection of the industry culture in Germany and should serve as a moral example of how industries should prioritize the sustainability of their conduct.

OTHER EUROPEAN COUNTRIES

The United Kingdom

The United Kingdom is also making progress in the circular economy transition. In 2021 the Parliament passed the Environment Act which granted authority to national agencies to set CDW recycling and reuse mandates as they see fit. While this Act does not strictly enforce a national target for CDW waste reuse, regulations by national departments and local governments are expected to come into place within the following 2-5 years.

The City of London has been escalating its CDW management strategies since 2014 when the London Authority passed Policy 5.16 mandating the reuse and recycling of 95% of all CDW by 2020. This policy was then accompanied by Policy 5.18 which also states the requirement for all on-site sorting where practicable and the use of water and rail transport over vehicular transport wherever possible to further reduce GHG emission production. With landfill fee rates standing at around £96.70 as of 2021 and set to increase to £103.70 by 2024 it pays for the construction industry to incur re-use and recycling costs to a) avoid the fee and b) accrue profits from re-sales.

Norway

Norway began the development of their CDW recycling strategy over 20 years ago. In 2001 the Federation of Norwegian Construction Industries launched its first 'national action plan'. Since then three renewed versions of the action plan have been adopted and the recycling rate of CDW has changed from 80% being diverted to landfill in 2001, to over 80% being recycled by 2018. This large transformation has developed a robust and efficient infrastructure system for Norway's CDW management. There are various regulations on the operation of construction and demolition sites. For instance, pre-approved plans for CDW management are mandatory which should indicate all areas where waste has been a) avoided, b) recovered and c) recycled. Regulations also require a minimum of 60% of CDW to be sorted on-site with additional mixed waste encouraged. While the existing regulation strategy has a lower minimum thresh hold than the EU it has yielded promising results. That being said, there are currently limited plans to escalate requirements. In a 2018 report by the Nordic Council of Ministers several recommendations are made to further the re- use agenda including the expansions of requirements in the pre-approval work plan; increasing the minimum recycling rate, and requiring stricter documentation of material origins to increase the use of recycled products.

CHALLENGES TO Implementation

Deconstruction requires a strong commitment from entities across several sectors and industries. This can include representatives from various government departments or agencies, interest groups, reuse and recycling outlets or markets, developers, contractors, or property owners. There is a wide range of stakeholders, and it is often a challenge to find ways to engage these different parties. Even with the growing number of stakeholders who are assisting the acceleration of the circular economy, some systemic barriers make expansion challenging for all stakeholders involved. This section highlights some of the common barriers that establishing a circular economy can have, and where some challenges can also be identified. Due to the nature of how the United States and Europe operate, not all the challenges and barriers are as taxing to overcome. Depending on the organizational structure of organizations and government administrations across the country, some communities may not face all of these barriers; understanding what can impede the pace of applying the mechanisms for a circular economy can offer discussion for areas of improvement.

Infrastructure

Many existing buildings in the U.S. lack modular components and mechanical joinery that can be easily taken apart and sorted for potential reuse and reconstruction. There is also the concern for building materials that contain toxic substances or are required to follow specific waste management practices that eliminate any reuse or recycling potential because of their hazardous nature. Salvaging is also hindered greatly by infrastructure challenges due to the lack of building documentation. Accuracy and transparency of a building's component documentation can be extremely varied across the country, and even more by individual local governments and zoning authorities.

Material Integrity

Ensuring material integrity is another crucial aspect of establishing a circular economy, however, there are several challenges associated with the integrity of the materials that can hinder the adoption of these practices. Contamination and mixed materials often can be challenging in deconstruction practices, since many building materials, such as plastics, composites, or treated wood can be difficult to

recycle or reuse due to contamination and federal and state standards for reprocessing. Contaminants such as chemicals, certain paints, or adhesives can also render materials unsuitable for reuse and recycling. There is also a strong lack of standardization across the U.S., with large absences of standardized material specifications, labelling, and identification systems either not being available at all, or different about different municipalities and state governments. While some regions in the U.S. do a better job requiring and following industry or EPA guidelines, there isn't a legal requirement or strong enforcement practice to make sure all the information on construction materials is standardized across the country; this creates a significant challenge to incentivizing deconstruction practices, as limited popularity and awareness of the specifications for reusing and recycling CDW materials make it a time-consuming process for governments and developers.

Workforce Development

As more areas are adopting deconstruction practices, there is becoming a stronger need for skilled labor that is trained in deconstruction demolition. Deconstruction demolition requires specific processes and knowledgeable authorities who can navigate the requirements for reusing, recycling, and salvaging materials in each step of the demolition. Often many of the city and county ordinances in the U.S. require certified deconstruction demolition contractors, limiting the pool of applicants and qualified workers who can legally complete the project. While some areas offer training and education, there is limited evidence of funding or accessibility for workers to find or be encouraged to complete this critical training.

Burdens and Underdeveloped Markets

It is often a struggle for many communities to establish a circular economy, largely because of the permitting and regulatory environment that discourages deconstruction. Schedule constraints, extensive permitting fees, lack of tax incentives, administrative burdens, and lack of coordination between legal authorities and private entities create more obstacles than opportunities.

There is also the overall struggle to bolster the reuse market, which requires extensive time, money, and space to relocate salvaged items. Along with storage requirements for salvaged items, there are complexities to managing the supply and demand for these materials since it's costly to transport many of these items due to their size or they require more time to deconstruct and become acceptable for reuse according to local/state/federal requirements. This can be a cost-intensive process and an administrative setback for companies or agencies that aren't able to spend the time, money, or personnel to follow the detailed requirements for these materials.

Political Environment

The establishment of a circular economy and support for the infrastructure needed is heavily influenced by the political environment it exists. Political will and support are crucial for enabling an environment that encourages and incentivizes deconstruction and the regular practice of circular economy mechanisms. Policy regulations, lobbying, interagency coordination, and public perception are among the largest barriers to deconstruction standards and incentives to be successful. The development and implementation of supportive infrastructure and policy is an essential component of a successful deconstruction incentive and program. However, the political process of formulating and enacting such policies can be burdensome. Different stakeholders may have divergent interests and perspectives, leading to delays in policy adoption. Political considerations such as perceived economic impacts, conflicts with existing construction or waste management industries, and lack of political support contribute to this challenge for incentives to be considered.

This alludes to the influence of interest groups, which can include industry associations and advocacy organizations (for the support or either implementing or blocking the adoption of deconstruction incentives). The conflicting views of interested stakeholders create an unusual power dynamic, particularly if an interest group has more resources and data to support their lobbying efforts against applying these incentives. This can affect how the information supporting incentives is accepted among decision-makers, ultimately creating a barrier to expansion and knowledge of CDW deconstruction.

Interagency coordination is another area in the political arena that can create barriers to adopting the various deconstruction incentives. Adoption of any type of incentive at any level requires collaboration and coordination among multiple government departments and agencies, as well as private entities that governmental organizations contract with for the deconstruction process. With limited policy examples on a larger administrative scale and governmental operation practices varying on each level, even within a state and its city governments, there is great difficulty establishing an incentive long term. Often there is ambiguity between agencies or departments regarding the roles, responsibilities, and funding allocation on how these initiatives will be managed.

The political difficulties explained here also contribute to the challenges around garnering public support and awareness of supporting the adoption of regular deconstruction usage. Public opinion plays a crucial role in shaping the political priorities of not only creating the space for these incentives but how likely they can become integrated with regular construction practices. Some of this challenge is addressed by non-profits, private companies, and some governmental organizations developing research and empirical evidence explaining the circular economy and its various benefits. Educational access and public knowledge of the unique processes involved in deconstruction and the concepts within the circular economy are limited, and generally not as accessible outside of industry professionals who deal with these operations on a regular basis.

The limited public awareness and understanding of deconstruction incentives and the overall reuse economy pose a huge barrier to gaining more support across the country. Public engagement is a critical support for communities to expand their knowledge of these practices, but it can be challenging to address all the barriers to knowledge and understanding of these concepts and practices.

RECOMENDATIONS

This report has offered insight into the opportunities available to encourage the development of the circular economy for deconstruction and reuse practices. Understanding of the current state of incentives available and supporting information provided in this report, this section aims to provide recommendations for the transition to a circular economy infrastructure for NYC. There are several guides publicly available that can be applied to NYC's specific constraints, and below we have identified the following recommendations to assist in supporting the goals set out by the CLCPI.

Supporting Regulation for the Development of the Circular Economy:

New York has already taken steps through other initiatives and programs to encourage closing the CDW material loops, and ultimately stimulate circular activities in different sectors. Our research from this report indicates that for many of these initiatives to be successfully implemented, there needs to be supportive legislation and regulatory policy to promote circular practices. Cities like San Antonio, Seattle, Milwaukee, and other counties and municipalities in the U.S. have instituted ordinances, bylaws, and code language that installs requirements for construction projects to incorporate deconstruction as part of the overall process.

Various cities have taken different approaches to how they've built their regulatory policies, with some being more lenient and only requiring attempts at deconstruction, such as mandating waste management plans before any deconstruction can begin or specifying an amount of the CDW materials that must be reused and recycled for any given project. NYC currently does not have any legislation that is directly related to CDW material reduction. Making use of this type of legislation and regulation can be a way for NYC to make progress on closing the material loops, looking to other U.S. and European examples to guide on how to lay the groundwork based on NYC's financial and personnel capacity, as well as how to address any political barriers establishing this enforcement mechanism.

Capacity Building for Deconstruction

Among the various tools to build support for training and support for deconstruction, city governments have a unique ability to provide stakeholders with access to practical training and business capacity building to mainstream deconstruction

incentives and knowledge. Each sector, whether private or public, has so many resources and support to tackle the challenges associated with closing the material loop. NYC has global recognition and the ability to encourage capacity building through convening with stakeholders and raising awareness of the opportunities that exist for building a reuse economy for deconstruction. The analysis indicates that for the successful implementation of incentives, there is a need for developing resource networks and making information, training opportunities, and other program support more accessible to build participation.

For example, in London, the Circular London program works to bring a wide range of stakeholders together for collaborative workshops, helping to build partnerships and reinforce circular economy practices. Often cities will contract or collaborate with private stakeholders to address gaps in service delivery, and knowledge, or improve access to resources. There are also many collaborative forums and other large nonprofits, such as Build Reuse which is a premier organization working to empower communities to turn CDW materials into local resources; Build Reuse is an example of collaborative opportunities, as the organization provides opportunities for members and interested stakeholders to convene and share information and practices supporting CDW reuse and recycling, as well as guides and resource to how other municipalities have approached building the capacity for it. Prioritizing the connection with supporting organizations, other municipalities, and resource networks for technical assistance and training is key to the longevity of these deconstruction practices. Engagement with deconstruction incentives is only strengthened when there is the capacity to support ongoing education and awareness of practices. Examples of how this can be achieved include awareness campaigns by public entities, creating forums or networking events for industry professionals to have access to new deconstruction opportunities, as well as public participation programs like crowdsourcing, leveraging public engagement to encourage innovative ideas for circular economic practices long term.

Standardization of Practice and Resources:

The lack of clear and broadly applicable definitions of industry practice and parameters is a significant barrier to the stimulation of circular economy practices in the construction and demolition waste industry. Without clarity on what constitutes actions such as 'recycling' and 'reuse' or even CDW itself, participation and encouragement will be inconsistent, making incentives less likely to be adopted or poorly implemented. Along with gaps in industry-standard definitions and policy, there are variations of industry supports that establish deconstruction as a regular part of the construction process. It is recommended that NYC engage in developing a public material exchange platform and create a guide for deconstruction best practices.

Cities in the U.S. and in Europe are part of the drivers for establishing industry standards for deconstruction, and there are many examples of municipalities and larger regions creating administrative guidelines that are accepted and developed in coordination with industry professionals. Currently, the most recent guide for CDW materials is from May 2003. Best practices and management for CDW have changed in the past 20 years, and there are now more examples and resources available. An updated guide manual, with the inclusion of a public material exchange platform, is key to supporting incentives for deconstruction. Having access to resources like these, and updating with powerful mechanisms like public material exchange platforms, which allow developers, contractors, and governments to share available materials for reuse and recycling, bridging the gap for finding viable materials for CDW reuse for projects.

Appendix 1: References

All For Reuse (2023). 'Ecosystem Map'. Available at: Https://Www.Allforreuse.Org/Ecosystem-map

Build Reuse Association. (2023). 'Guidebook For Municipalities To Create & Implement Deconstruction & Building Material Reuse (BMR) Infrastructure. Build Reuse'. Available at: Https://Www.Buildreuse.Org/Communityhighlights/Guidebook

Center For EcoTechnology. (2019). 'City Governments And Their Role In Enabling A Circular Economy Transition'. Available at: Https://Emf.Thirdlight.Com/File/24/Nh4l9fbnpydk9pnhojkna16hvb/Circular%20e conomy%20in%20cities%20-%20policy%20levers%20-%20mar%2019.Pdf

Delta Institute. (2018) 'Deconstruction Go Guide. Delta Institute'. Available at: Https://Delta-institute.Org/Publication/Deconstruction-go-guide/

Ellen Macarthur Foundation. (2022). 'Promoting The Practice Of Deconstruction A Resource For Developing And Implementing A Municipal Deconstruction Policy Or Initiative Center For Ecotechnology'. Available at: Https://Www.Centerforecotechnology.Org/Wpcontent/Uploads/2022/05/Promoting-the-practice-of-deconstruction-1.Pdf

European Commission (2000) 'Commission Decision: 2000/532/EC', Available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32000D0532

European Parliament and the Council (2008) 'Directive 2008/98/EC'. Available at:

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0098

European Parliament and the Council (2018) 'Directive (EU) 2018/851'. Available at:

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018L0851

Federal Ministry for the Environment Nature Conservation and Nuclear Safety (2023) 'Construction Waste'. Available at: https://www.bmuv.de/en/topics/water-resources-waste/circular-

Appendix 1: References

Greater London Authority (2023). 'Policy 5.16 Waste net self-sufficiency' Available at:https://www.london.gov.uk/programmes-strategies/planning/london-plan/past-versions-and-alterations-london-plan/london-plan-2016/london-plan-chapter-five-londons-response/pol-17

Greater London Authority (2023). 'Policy 5.18 Waste net self-sufficiency' Available at: https://www.london.gov.uk/programmes-strategies/planning/londonplan/past-versions-and-alterations-london-plan/london-plan-2016/london-planchapter-five-londons-response/pol-15

International Development Norway (2019) 'Circular Economy in the Construction Sector – the Norwegian case'. Available at: https://id-norway.com/circular-economy-in-the-construction-sector-the-norwegian-case/

Ministry of Infrastructure and the Environment (2015). 'Circular economy in the Dutch construction sector: A perspective for the market and government'. Available at: https://www.rivm.nl/bibliotheek/rapporten/2016-0024.pdf

Ministry of the Ecological Transition (2021). 'La Loi Anti-gaspillage Dans Le Quotidien Des Français : Concretement Ça Donne Quoi?' Available at: https://www.ecologie.gouv.fr/sites/default/files/Document_LoiAntiGaspillage%2 0_2020.pdf

Ministry of the Ecological Transition (2023). 'Building Framework' Available at: https://optigede.ademe.fr/outils-multi-acteurs/batiments-et-travauxpublics/dechets-du-batiment/cadre-reglementaire

New York City Department of Sanitation (2019) 'Commercial Waste Zones'. Available at: https://www.nyc.gov/assets/dsny/site/resources/reports/ commercial-waste-zones-plan

New York City Economic Development Corporation (2023) 'Industrial and Manufacturing'. Available at: https://edc.nyc/industry/industrial-and-manufacturing

New York State Department of Environmental Conservation (2023) 'Adoption of Final Rule: 6 NYCRR Parts 360-366 and 369, Solid Waste Management'. Available at: https://www.dec.ny.gov/regulations/118777.html

Appendix 1: References

New York State Department of Environmental Conservation (2023) 'Beneficial Use Determinations (BUDs)'. Available at: https://www.dec.ny.gov/chemical/8821.html

New York State Department of Environmental Conservation (2023) 'Draft New York State Solid Waste Management Plan: Building the Circular Economy Through Sustainable Materials Management (2023 - 2032)'. Available at: https://www.dec.ny.gov/chemical/47861.html

NYSERDA (2019). 'Climate Leadership and Community Protection Act (CLCPA)'. Available at: https://climate.ny.gov/

Nordic Council of Ministers (2018) 'Circular Economy In The Nordic Construction Sector'. Available at: https://www.divaportal.org/smash/get/diva2:1188884/FULLTEXT01.pdf

Parliament of the United Kingdom (2021). 'Environment Act 2021'. Available at: https://www.legislation.gov.uk/ukpga/2021/30/section/51/enacted

U.S. Green Building Council (2023). 'LEED rating system'. Available at: https://www.usgbc.org/leed

APPENDIX

Appendix 2:

Commission Decision 2000/532/EC

CONSTRUCTION AND DEMOLITION WASTES (INCLUDING ROAD CONSTRUCTION)

1701 - Concrete, bricks, tiles, ceramics, and gypsum-based materials
170101 - Concrete
170102 - Bricks
170103 - Tiles and ceramics
170104 - Gypsum-based construction materials
170105 - Asbestos-based construction materials

1702 - Wood, glass and plastic 170201 - Wood 170202 - Glass 170203 - Plastic

1703 - Asphalt, tar and tarred products 170301 - Asphalt containing tar 170302 - Asphalt not containing tar 170303 - Tar and tar products

1704 - Metals (including their alloys) 170401 - Copper, bronze, brass 170402 - Aluminum 170403 - Lead 170404 - Zinc 170405 - Iron and steel 170406 - Tin 170407 - Mixed metals 170408 - Cables

1705 - Soil and dredging spoil
170503 - Soil and stones containing dangerous substances
170504 - Soil and stones other than those mentioned in 170503
170505 -Dredging spoil containing dangerous substances
170506 - Dredging spoil other than those mentioned in 170505

1706 - Insulation materials

170601 - Insulation materials containing asbestos 170602 - Other insulation materials

1707 - Mixed construction and demolition waste

170702 - Mixed construction and demolition waste or separated fractions containing dangerous substances

170703 - Mixed construction and demolition waste other than those mentioned in 170702