Building Circular Economies in New York City's Industrial Business Zones

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Project Framework

Town+Gown: NYC provides resources for universities and practitioners to support research on infrastructure and the built environment. In order to advance NYC's sustainability and climate goals, Executive Order 23 directs, city construction agencies to reduce their carbon emissions. While the construction sector is a major driver of emissions in NYC, heavy industry remains a vital component of the city's economy. Town+Gown engaged the Wagner team to explore challenges and opportunities associated with creating a circular economy for construction and demolition waste (CDW) sited in the industrial business zones (IBZ). The team identified five IBZs to serve as case studies for this research. The team then conducted site visits, completed analysis of existing conditions, and undertook extensive stakeholder engagement, both through qualitative interviews and a quantitative survey. Based on this research and stakeholder feedback, the team produced a final report highlighting major findings and providing recommendations for strategies to advance circular CDW economies in the IBZs.

Key Findings

The findings of this report are discussed in detail in Section IV. The following items denote key takeaways from research and stakeholder outreach:

1. Decreasing emissions is a legislative priority for the City and State government
2. The extent of CDW recovery is ultimately a question of cost which is driven by end-market uses
3. Workforce development for a circular economy will face obstacles in developing a critical mass both of labor and job opportunities
4. Many heavy industrial activities that are necessary for the operation of New York City can only take place within the IBZs
5. A variety of incentives and mandates are currently in place to encourage industrial uses in the IBZs, but none specifically target CDW recovery
6. Knowledge sharing among and between businesses, economic development organizations, and government agencies is crucial to sustaining a circular economy

Summary Of Recommendations

A multi-pronged strategy of incentives, mandates, practices, and policies will be necessary to ensure a vibrant and self-sustaining circular economy of CDW within New York City's IBZs. Building on models of tax incentives and enforcement mechanisms already in place, the city should **expand capital investment offsets** for facilities that participate in CDW recovery and reuse, and consider offering **additional tax incentives to businesses** that participate as sources and end users of material waste. Additionally, this report recommends the implementation of a **knowledge-sharing and materials marketplace platform** in conjunction with a **materials passport pilot.** Along with stakeholders, the city should also pursue a **zoning text amendment** to safeguard CDW facilities in current M zones. In order to sustain a viable circular economy within the IBZs, the city should encourage, where possible, the **construction of new CDW recovery and reuse facilities.**

I. Introduction

Project Overview

The industrial landscape of New York City has changed dramatically over the city's lifetime, as has the relationship between industrial centers and the neighborhoods that surround them. Faced with the challenge of ensuring the long term health of the city's industrial base while moving toward a green and sustainable economy, New York City's Industrial Business Zones (IBZs) are well situated to provide the base for a new resource economy.

Organization Hierarchy

Town+Gown:NYC is a research body, situated within **NYC Department of Design and Construction.**

This capstone project is sponsored by the **Urban Resource Recovery Working Group (URR WG)** within Town+Gown:NYC. Initially created as the CDW working group, the URR WG has concentrated its efforts on the application of "zero waste" principles to the management of CDW. The group is dedicated to advancing applied research and creating innovative policies that facilitate the closure of construction material loops at a city-wide level.

Under the umbrella of the **Closing Loops City Program Initiative (CLCPI),** the URR WG has devised recommendations for modifying construction policies and practices within city agencies. These changes aim to harness the city's capital program to support a market for the direct re-use of recovered CDW materials from City capital projects. This involves maximizing the use of available materials on city capital projects. Additionally, the initiative seeks to redirect recovered CDW generated on city capital projects away from landfills, channeling it instead to interim processing facilities.

Project Purpose & Need

Since 2017 NYC agencies have increased research collaboration with academic institutions with the goal of advancing CDW recovery. This effort relied on an in-depth examination of existing academic studies, practical challenges, barriers, and suggestions for further research to enhance CDW recycling and reuse practices. Town+Gown: NYC launched several research projects, including a partial comparative life cycle assessment (LCA), that examined environmental impacts of two concrete product systems: one utilizing coarse natural aggregate and the other utilizing coarse recycled aggregate.[1] Over time, Town+Gown: NYC established various working groups, including the Urban Resource Recovery Working Group (URR) and the Closing Loops City Program Initiative (CLCPI). The URR Working Group initially conceived of the CLCPI as a pilot initiative to revise City agency construction practices & policies and to utilize the City's capital program to support private sector efforts to close CDW material loops.[2] The CLCPI also seeks to repurpose certain residuals from the City's wastewater resource recovery facilities (WRRFs) in the manufacturing of new construction materials.

The CLCPI was designed to pursue two primary objectives centeredon actions within the authority of any New York local government.The CLCPI is intended to be adaptable to the unique circumstances and needs of each locality within the city.[3]

1. Enhancing the direct re-use of CLCPI Recoverable Materials generated from public capital projects without interim processing, making them available for use in either public or private construction projects (Direct Re-use); and
2. Deliberately diverting recovered CDW from public capital projects away from landfills to transfer locations for Direct Re-use, either by the local government or private entities, or to interim processing facilities to serve as feedstock for manufacturing new construction materials (Intentional Indirect Re-use).

Although the CLCPI is an initiative led by the city, its construction policies, practices, and tools are also intended to be implemented by private owners. Should private owners choose to adopt any of these policies, practices, or tools, it would significantly amplify the reach and impact of the CLCPI.

State regulatory pathways for local governments initiate with NYS DEC's Part 360 regulations governing beneficial use determination (BUD), along with the procedure for requesting case-specific BUDs in instances where none are currently defined.[4]

The State requires local governments to formulate a Solid Waste Management Plan (SWMP), These State-regulated pathways provide a framework for local governments to identify CDW materials within their capital programs and develop policies and practices for CDW recovery and re-use, thus bolstering the local construction and recycling sectors. The CLCPI, moreover, targets three categories of materials within its Recoverable Materials:[5]

The Direct Re-use category:[6]

- Non-renewable building CDW
- Concrete processed at NYC DOT's crusher generating recycled concrete aggregate (RCA)
- All excavated soils permitted under the BUD regulations
- Nearshore dredged materials
- CDW glass

The Intentional Indirect Re-use category:[7]

- Wood, including wood pallets
- CDW glass
- Concrete and RCA
- Gypsum
- Asphalt
- Grit from DEP's WRRFs
- Other Direct Re-Use materials not directly re-used under the CLCPI

The "Other" category[8] encompasses materials not fitting into the other defined categories but could still be relevant to CLCPI.

Working alongside Town+Gown:NYC, the Capstone team was tasked with supplementing ongoing research efforts by exploring the utilization of local land use and zoning tools. The project aims to leverage these tools to facilitate the transition of businesses within the IBZs towards a Circular CDW Economy.

Goals & Objectives

The NYU Wagner Capstone team explored five IBZs as case studies for circular economies: **North Brooklyn in Brooklyn, Maspeth in Queens, Long Island City in Queens, Port Morris in The Bronx and West Shore in Staten Island.**

- Establish existing conditions of the IBZs and the CDW circular economy within NYC.
- Discover incentives to encourage businesses to participate in a CDW circular economy.
- Leverage the residential communities adjacent to the IBZs to develop a local workforce.

Research Methods & Project Design

Literature Review

The NYU Wagner Capstone team conducted a literature review on construction lifecycles, circular economy, urban resource recovery, land use regulations and policies, and workforce development in NYC to understand the context of planning a circular CDW economy.

Stakeholder Engagement & Outreach

The Capstone team conducted qualitative interviews with over 30 stakeholders to assess the current CDW environment in IBZs, the land use and policy landscape impacting this sector, and experiences and strategies for workforce development. The team engaged with stakeholders from numerous fields, including construction and real estate, environmental consulting, city administration, economic development, workforce development, community organizing, and legal services. A summary of key findings is presented below, organized into four categories: industry landscape in the IBZs, key players in the CDW economy, incentives to encourage investment in CDW recovery, and labor and workforce development.

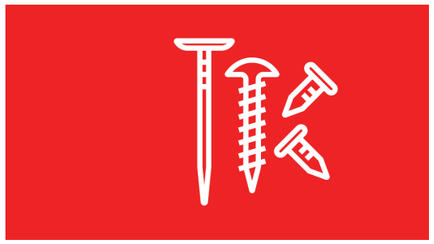
Data & Policy Analysis

The team analyzed existing conditions in NYC's 21 IBZ to choose 5 IBZs as case studies for research findings. The existing conditions examine flood risk, transportation and infrastructure, environmental considerations, and demographics. The team analyzed ongoing initiatives and policies to support a circular CDW economy and conducted a detailed siting analysis in the 5 case studies to support findings and recommendations.

Limitations

Town+Gown:NYC acknowledges that there are limitations in data collection as neither the state nor local governments have accurate data on the amounts of CDW generated from new construction and major renovations of buildings and infrastructure to support policy development. Additionally, outreach efforts with industrial businesses that could participate in a circular CDW economy were limited given the difficulty of contacting and scheduling interviews with the industrial sector.

II. Existing Conditions & Context



In this section, we examine the following key components of the project:

- Industrial Business Zones
- The landscape of construction and demolition waste in NYC
- Existing policies and initiatives relating to resource recovery
- Fact Sheets: Examining 5 IBZs

Introduction to IBZs

Industrial Business Zones (IBZs) are industrial and manufacturing hubs located throughout the outer boroughs of New York City. The zones were designated in 2006, offering manufacturing firms a relocation tax credit of $1,000 for every employee relocated to an IBZ.[9] The IBZs are restricted to manufacturing uses but do not make up the entirety of manufacturing-zoned land in NYC. In 2014, the City Council released the Engines of Opportunity report which examined ways to strengthen the manufacturing sectors of New York City. This document highlighted the importance of industrial jobs which employ over 335,000 New Yorkers and pay on average twice as much as retail and service jobs. These jobs have been a gateway to the middle class for many immigrant families in New York and offer some of the highest paying salaries for positions that do not require a college degree. Engines of Opportunity addressed the challenges facing this industry and highlighted the need for dedicated industrial employment districts, creative economy districts, and real mixed used districts. The IBZs aim to achieve strictly industrial employment districts which allows for the concentration of manufacturing and industrial activity. This encourages new and existing industrial firms to thrive and expand within the districts, which is critical for the functionality of New York City and the health of its overall economy.

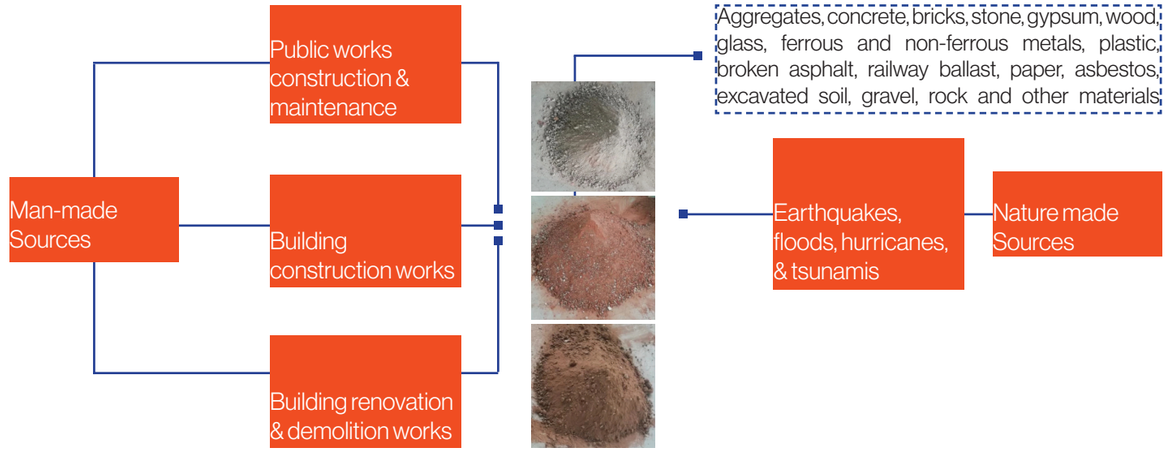
Overview of Construction Demolition Waste (CDW)

In December 2023, the New York State Department of Environmental Conservation (DEC) released a Solid Waste Management Plan for New York State, which enhances initiatives aimed at waste reduction and fostering a shift towards a circular economy. The DEC approximates that at least 80 percent of the materials presently disposed of in landfills or combustion facilities hold economic value, either directly as reusable materials for manufacturing or with beneficial applications, or indirectly by generating employment opportunities in the recycling sector. Furthermore, the report found that in 2018, approximately 42.2 million tons of waste was generated, with the construction industry being a significant contributor to waste production. Waste is currently the fourth-largest contributing sector in NYS when considering GHG emissions, representing 12 percent of annual emissions–a figure only marginally lower than that of the electricity sector.

The Department of Environmental Conservation defines CDW as “all waste and recyclables resulting from construction, remodeling, repair, and demolition of structures, buildings, and roads, including excavated materials used as fill.” CDW is generated by public and private construction projects. Private contractors, transfer stations, and processors manage CDW. This concern is exacerbated by the current state of waste management undergoing transformation across NYC, with disposal facilities reaching capacity, necessitating the export of all non-recyclable waste.

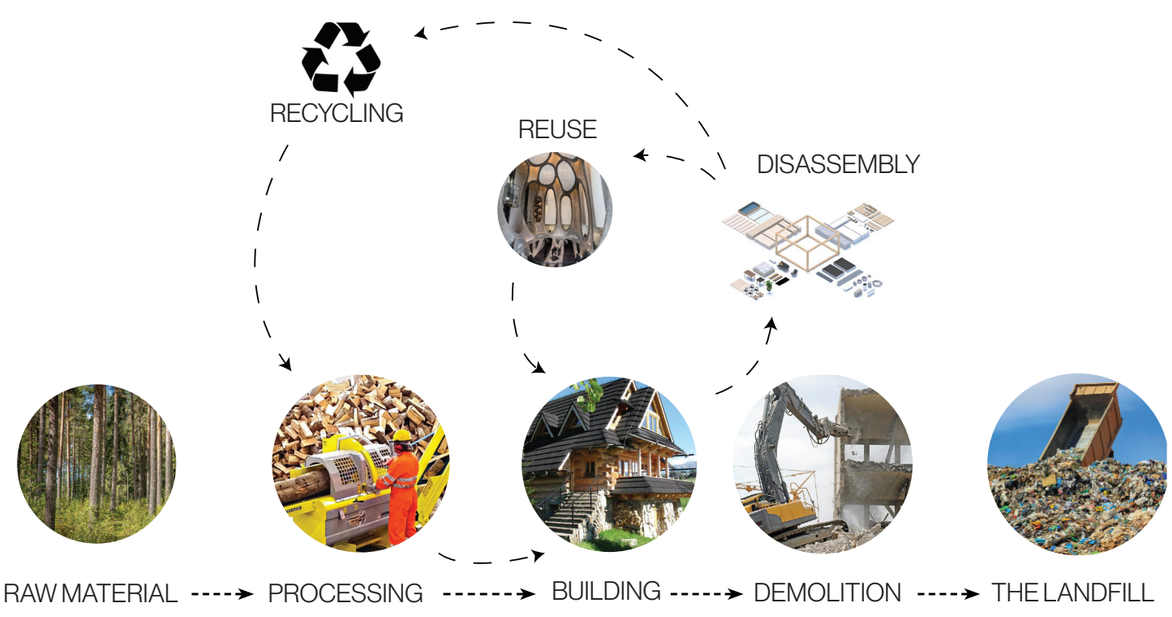
CDW is the largest component of the total waste stream, generated by 46 percent. Furthermore, approximately 18.4 million tons of CDW was generated prior to recycling and beneficial use in 2018.[10] CDW materials include but are not limited to concrete, stone, brick, Gypsum, glass, ferrous and non-ferrous metals, wood, asphalt, plastic, railway ballast, paper asbestos, excavated soil, gravel, rock, and other materials. Hazardous (asbestos, lead paint, and mercury from fluorescent lamps) and liquid wastes have unique regulations that may require special handling and are excluded from CDW for the purposes of this analysis.[11] The DEC estimates that the largest component of CDW is concrete/concrete/asphalt/brick/rock (35%), followed by soil/gravel (27%), wood (15%), metal (6%), roofing (5%), drywall (2%), cardboard (2%), plastic (1%), and other (7%).[12]

CDW is generated across various activities within the construction and demolition sectors, including building construction, road construction, bridge construction, and more. This waste comprises a diverse range of materials and is characterized by its heterogeneous nature, as it may contain any component used in building or infrastructure construction, along with other materials commonly encountered in construction work. Predominantly, CDW consists of inert and non-biodegradable materials such as sand, gravel, concrete, metal, plastic, glass, among others. The schematic representation illustrates the classification of CDW based on its sources of origin.[13] This report primarily focuses on waste originating from man-made sources, particularly construction activities, urban planning initiatives, technological advancements, and similar sources.



Closing the Loop: Circular Economy

The traditional linear economy system, marked by the take-make-use-dispose mentality,[14] must be replaced with an innovative framework that preserves the worth of natural resources within a closed-loop system. In the past, CDW was often deemed without value, unwanted, a loss, or surplus, resulting in reusable materials being discarded into landfills. The sustainability of the linear economy model is proving to be limited as landfills reach capacity and environmental externalities increase. Therefore, embracing the circular economy offers a resilient alternative wherein materials and products are continuously circulated through methods such as maintenance, reuse, refurbishment, remanufacturing, recycling, and composting. Overall, the circular economy eliminates the end-of-life concept, eliminating waste & pollution and perpetuating the circulation of products & materials. [15]

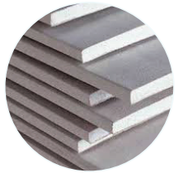


Materials Snapshot

Ceramics are durable materials created by combining raw materials such as clay and minerals at very high temperatures. Ceramics are categorized into traditional and advanced. Traditional ceramics date back to over 24,000 years ago and consist of pottery. Advanced ceramics were discovered in the 20th century and are engineered to have specific properties using synthetic powders such as silicon carbide. Ceramics have potential to be repurposed before contamination. However, there is not as lucrative a market for reuse compared to other CDW materials such as metals.

By some estimates, Concrete makes up to 85% of construction and demolition waste streams. Concrete can be reused in the form of aggregate as fill or as road sub-base. Recycled concrete aggregate (RCA) can also be fed back into production streams for new concrete. Although concrete manufactured through this method can not be used for habitable construction, it can serve a variety of uses including walkways, soil stabilization, and landscaping. At the most basic level, crushed concrete and other fine particulate by-products from CDW recycling processes can be used as alternate daily cover (ADC) for landfills.

Pozzolan, derived from glass recycling, transforms into a cementitious material when finely ground and combined with particular chemicals and water. This results in a safer, more sustainable, and high-performance substance that effectively reduces CO2 emissions in concrete.Pozzolan is a by-product of glass recycling, which, when finely ground and mixed with specific chemicals and water, becomes cementitious. It produces a safer, sustainable, and higher-performing material that reduces CO2 emissions in concrete.



The properties of gypsum can pose challenges to effective recovery but also offers opportunities. Gypsum sourced from building demolitions is likely to be contaminated by water damage, fasteners, wall covering, insulation, or other chemicals. It is therefore an intensive process to recycle this material into a useable product. However, excess gypsum generated from new construction can be reused or recycled into new product relatively easily. This "clean waste" makes up the majority of all gypsum waste. As landfilled gypsum releases harmful sulfide and methane gasses, diverting gypsum from waste streams reduces greenhouse gas emissions and reduces the demand for the mining of its component materials.

Metals are typically categorized by whether they are ferrous or non-ferrous, meaning whether or not they contain iron. While the price for metals is impacted by commodity markets, metals tend to be consistently valuable and, therefore, to command a robust end market.

If large pieces of wood, such as pallets, remain intact during waste hauling, they can be repurposed. Various local wood salvaging companies like M. Fine Lumber in Brooklyn, NY, Sawkill Lumber Co. in the Bronx, Build It Green in Queens, and Big Wood in Upstate NY facilitate this process. Guidelines from DSNY, DCAS, and SCA emphasize the importance of sorting and stacking wood pieces based on size, type, and length. Additionally, they advocate for separating lumber, engineered wood products, panel projects, and treated wood materials.

Existing Initiatives, Policies, and Regulations

The Beneficial Use Determination (BUD) is a part of New York State's Solid Waste Management program that involves utilizing certain waste materials as by-products to replace raw materials or commercial products. These materials are frequently sourced from the industrial waste stream, although approval has been granted for various types of solid waste, including C&D debris, organic waste, and biosolids. Beneficial use is not always synonymous with recycling, but it stands as a preferable option to waste disposal or combustion.[24]

The program's structure consists of two types: predetermined beneficial uses and case-specific beneficial uses. Predetermined beneficial uses, outlined in Subdivision 6 NYCRR Section 360 12(c), allow materials that would otherwise be considered solid waste to be reused.[25] Predetermined beneficial uses are established by regulation, typically requiring no further authorization or reporting from DEC. In contrast, case-specific beneficial uses are not explicitly outlined in regulations. Involved parties must petition for a case-specific BUD. Case-specific determinations are issued for a maximum term of five years and necessitate annual reporting of the quantity of material beneficially used, analytical data (if applicable), and any other information required by DEC.[26] From 2010 to 2022, CDW has been granted approximately 33 case-specific BUDs by EDC.[27]

The **Recycling Certification Institute (RCI)** provides third-party verification of reported CDW recycling rates. RCI uses the National Standard CORR Protocol developed by the Construction & Demolition Recycling Association to confirm that CDW recyclers are meeting minimum standard rates across various material streams. Participation in third party certification is not yet an industry-standard practice, and only three facilities in New York state have been confirmed to report "accurate, transparent, and reliable recovery, use, and recycling rates" by the RCI.[28] Of these facilities, only one is located within New York City.

City of Yes is a zoning regulation overhaul put forward by Mayor Eric Adams's administration. It most notably impacts this project by creating new manufacturing district options and allowing industrial businesses to occupy commercially zoned areas. CDW facilities, however, can be noisy and noxious. The loosening of the industrial business siting regulations are likely incompatible with a CDW facility. Our project, furthermore, seeks to leverage the IBZs which are not impacted by City of Yes.

New York City Council No 1012-2023 Legislation (2023) sets out to address similar goals to those articulated in the 2005 Bloomberg administration whitepaper.[16] The bill tasks the New York Department of City Planning (DCP), the New York City Department of Small Business Services (SBS), and the New York City Economic Development Corporation (EDC) with creating an "industrial development action plan" and updating it every five years. The action plan would:

- Include a summary of existing City policies targeting the industrial sector;
- Provide an overview of trends in the sector's performance as well as relevant land use and economic data;
- Outline strategies for ongoing support and growth;
- Develop implementation guidelines for land use regulation, capital investment, and workforce development for priority industrial sectors.[17]

This legislation is consistent with the finding from our preliminary stakeholder interviews that industrial sector challenges outlined by the Bloomberg administration remain pressing issues today as industrial businesses struggle both in large cities and in the country as a whole.[18]

Executive Order No. 23 (2022) denotes an effort by the Mayor's Office to reduce greenhouse gas emissions resulting from City agency construction projects. [19]The order engages DDC, DSNY,[20] the Department of Citywide Administrative Services, the Department of Environmental Protections (DEP), the Department of Transportation, and the Department of Parks and Recreation, asking them to "make their best efforts" to utilize low-carbon concrete. The order requires that these agencies publish Environmental Product Declarations, reports documenting the life cycle of each product used. The declarations demonstrate that these agencies have ample material ripe for reuse. The agencies were also required to submit individual or joint action plans to the Mayor's Office specifying how they would reduce emissions from capital projects. At present the agencies listed in the executive order opted for individual joint action plans. Given the extent of the material suitable for reuse, agencies would be well served in working together to increase diversion rates.[21]

In addition to the State DEC's 360 Regulations there is further legislation that regulates private carters. **31 DSNY 16 RCNY §1-10** designates CDW as recyclable with the exception of plaster, shingles, drywall, and glass, and further stipulates that construction and demolition debris must be separated from other solid waste for collection.[22]

In response to the threat of Climate Change shaping our interactions with the planet, NYC has released a **Roadmap to 80 x 50,** aiming to reduce greenhouse gas (GHG) emissions by a minimum of 80 percent by 2050. The Roadmap envisions that by 2050, NYC will have already met its 2030 Zero Waste goals, eliminating the landfilling of waste from residential buildings, commercial establishments, and industrial and institutional operations. The City anticipates that minimizing waste generation and encouraging the reuse or recycling of products will become convenient for New Yorkers. The comprehensive plan includes the collection of recyclables and organic materials, such as food scraps and yard waste, coupled with the expansion of energy and material recovery from waste, fostering economic activity and promoting the development of a citywide circular economy. The implementation of smart collection routes, cleaner vehicles, and innovative technologies is expected to contribute to the reduction of emissions from the transportation and processing of waste.

A collaborative effort between architects and circular economy advocates has recently introduced the **Zero Waste Design Guidelines,**[23] with a special focus on CDW associated with buildings rather than horizontal infrastructure. As described in the report, Zero Waste Design Guidelines "aim to serve as both inspiration and resource to help designers, operators and planners collaborate on modifying existing buildings and designing new ones that dramatically reduce our waste and work toward circular material flows." Implementing design strategies to enhance the City's existing material flow system not only enhances sidewalks and buildings but also mitigates the environmental and human impacts of the current system within the city and beyond.

The Zero Waste International Alliance (ZWIA) defines Zero Waste "as a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use."

The Zero Waste Design Guidelines focus on highlighting broader strategies, such as "maximizing asset utilization through programming." This involves the creation of flexible spaces where uses can evolve over the extended lifespan of a built object. This strategy can complement the approach of "designing for deconstruction at the end of life of a building component." Additionally, it advocates for the adoption of existing and emerging design and construction technologies, including designing for off-site construction, proven to reduce waste by minimizing errors and rework. The use of building information modeling (BIM) or other three-dimensional modeling is also recommended, enabling virtual coordination and effectively minimizing errors during on-site construction. Overall, the Guidelines emphasize the importance of "writ[ing] specifications to require a construction waste management plan that covers on-site storage and logistics and sets diversion goals." Furthermore, NYC's Zero Waste plan is to eventually eliminate the use of landfills. By employing a multifaceted approach encompassing waste reduction, reuse, and recycling initiatives, alongside wastewater treatment facilities equipped with anaerobic digestion technology that converts food scraps into energy, the city endeavors to achieve a 90% reduction in landfill waste, ultimately phasing out landfills entirely.

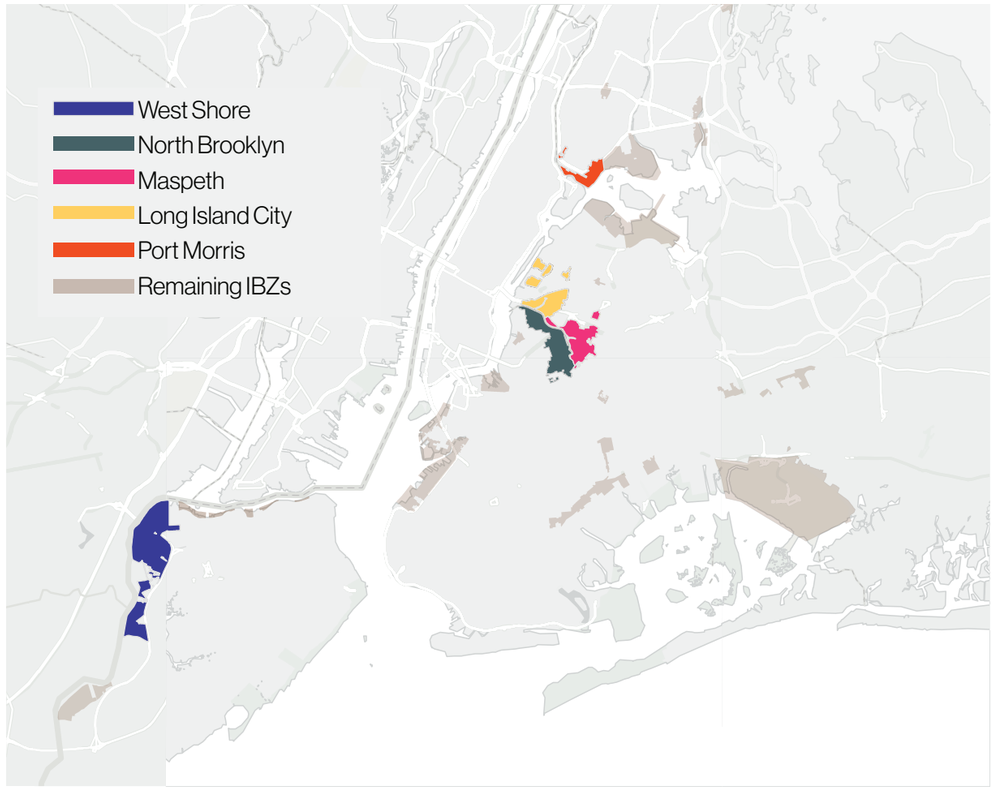
Various New York City agencies have developed **Waste Management Plans (WMP)** and are implementing strategies to promote resource recovery. In addition to the DDC, the DOT, DEP, DSNY, DCAS, and Parks have implemented WMPs requiring certain thresholds of CDW recycling for the city projects that these agencies oversee. The Port Authority of New York and New Jersey (PANYNJ) also adheres to high standards of recovery and reuse for concrete, asphalt, soil, and steel, targeting 90% diversion from landfill for these materials.

In March 2024, NYC EDC published **Clean and Circular: Design & Construction Guidelines.** [29]This document establishes circularity guidelines for teams working onEDC managed projects for certain city agencies. The guidelines provide strategies to ensure teams' compliance with these guidelines, and requires reporting on the implementation of circularity measures throughout a project's life cycle. The guidelines lay out strategies for resource recovery at every stage of the build process, from planning and design, through construction and renovation, and ultimately to decommissioning and deconstruction. The guidelines are centered on the three primary goals of diverting CDW from landfills, reusing concrete and soil generated by construction and demolition projects, and encouraging the use of low-carbon building materials. EDC set ambitious goals for resource recovery, and will require that 75 percent of CDW be reused or recycled in new construction as well as during deconstruction, renovation or major rehabilitation projects. EDC also targets 95 percent recovery or reuse of concrete and soil from construction and deconstruction. The guidelines promote the use of alternative construction materials such as mass timber.

Five IBZs in Focus

This project contemplates the use of the IBZs for siting interim processing facilities to increase CDW recovery. We considered zoning, land use, and access to transportation to select the 5 IBZs best suited for these facilities:

- North Brooklyn in Brooklyn,
- Maspeth in Queens,
- Long Island City in Queens,
- Port Morris in The Bronx and
- West Shore in Staten Island.[30]



Zoning: All land within the IBZs is zoned for manufacturing. Zoning designations within the IBZs range from light manufacturing (M1-1) to heavy manufacturing (M3-2).

Land Use: Manufacturing zoning has facilitated industrial and manufacturing land uses across the five IBZs. Commercial and office buildings are also found across the five IBZs and are most prominent in the Long Island City IBZ and North Brooklyn IBZ. Parking facilities, public facilities and institutions, and transportation and utility buildings exist in all five of the IBZs. One outlier is the West Shore IBZ where nearly half of the land in the IBZ is vacant (underwater). There are limited nonconforming residential uses in the IBZs.

Transportation: The five IBZs are well served by expansive transportation networks. Each IBZ has multiple truck routes which allow goods to move easily via road delivery vehicles. The Brooklyn IBZ, Maspeth IBZ and Long Island City IBZ are adjacent to the Long Island Expressway and Brooklyn Queens Expressway allowing for quick access to major highways. Similarly, the Port Morris IBZ sits next to the Major Deegan Expressway and Bruckner Expressway while the Staten Island Expressway cuts through the West Shore IBZ. The West Shore IBZ is also home to shipping container terminals. Each IBZ has extensive public transportation networks. Subway lines are accessible to all five IBZs excluding the West Shore IBZ while bus lines are present in all of them.

III. Circular Economy Precedents

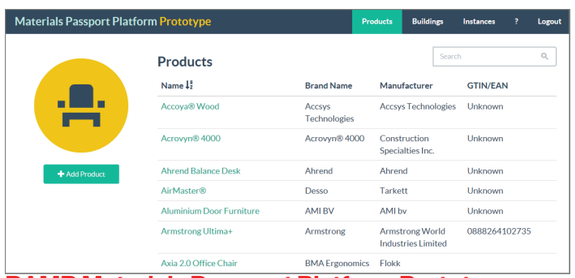
This section describes existing programs to facilitate resource recovery in the United States and internationally, including material passport platforms and municipal mandates for CDW recycling.

Material Marketplaces

The CLCPI recommended the implementation of a virtual real-time CDW matching digital platform. The initiative emphasized the importance of real-time data in ensuring timely movement of materials between sources and end users of CDW. The City's DonateNYC exchange platform is an existing materials exchange platform that generators of CDW elements and potential users of CDW elements can use consistent with BUD regulations. With greater awareness of DonateNYC among the built environment practitioners, such as contractors, designers and manufacturers, the platform could expand on its own through expanded use.

The United States Business Council for Sustainable Development (US BCSD) connects more than 2,200 businesses and organizations through its Materials Marketplace, primarily in the Midwest and in Canada. Manufacturers and recyclers can use the platform to supply new feedstock or offload difficult waste types. According to US BCSD estimates, the materials marketplace had diverted 5,300 tons from landfills by 2020.[31] While this initiative continues to grow, it is one of the few programs of its kind in the United States.

While not widespread in the US, a robust framework for material tracking and exchange exists in the European Union. Funded by the European Commission's Horizon 2020 program, the Circular Construction in Regenerative Cities (CIRCuIT) report[32] emphasized the importance of digital tools and real-time data in the success of circular economies. The European Circular Economy Stakeholder Platform currently hosts nearly 200 non-profits, user networks, and platforms for materials exchange. These networks include both public and private stakeholders, and are based both in individual countries and across multiple nations within the EU. The dozens of exchange platforms within the EU encompass a wide variety of materials, including CDW.



BAMB Materials Passport Platform Prototype

Materials Passports

Materials passports provide data on the various materials that make up buildings, allowing these resources to be cataloged, tracked, and more easily recovered at the end of a building's life. The European Union (EU) published the 2015 EU Action Plan for the Circular Economy,[33] intended to encourage sustainable development and resource recovery and reuse at scale. The Action Plan laid out a framework for circularity beginning with production and encompassing waste management and secondary materials markets. To date, a variety of material passport platforms have been implemented in many countries of the European Union.[34]

In 2020, the EU published the results of the Buildings as Material Banks Project (BAMP),[35] which advocated for the coupling of materials passports with reversible design, and developed a methodology for assessing the resource productivity of new and existing buildings.

Material passport platforms have not been adopted in the United States at any significant scale. However, New York City's density of building stock, high rate of construction, and comprehensive existing data infrastructure make it a likely candidate to pilot such a program.

Recovery + Reuse Mandates in the United States

Boulder, CO: The city's Energy Conservation Code mandates the reuse and recycling of waste as part of a sustainable deconstruction initiative. The ordinance requires that 75 percent of demolition and deconstruction materials be diverted from the landfill.[36]

Austin, TX: A Construction and Demolition Recycling Ordinance requires contractors to reuse or recycle 50 percent of CDW. This regulation applies to all commercial and multifamily demolition projects, and to all construction permits over 5000 square feet.[37]

Portland, OR: Buildings built before 1916 or those designated as a historic resource are required to be deconstructed rather than demolished. Additionally, all CDW generated within the city must be transported to a material recovery facility.[38]

IV. Findings

This section summarizes major findings derived from literature review, stakeholder outreach, and policy and data analysis. Findings have been organized into four categories encompassing:

- An overview of CDW processing practices
- Identified stakeholders in any potential circular economy,
- Incentives and mandates relating to industrial and CDW-generating businesses, and
- Workforce development opportunities and challenges within the sector.

Industry Landscape

Establishing a circular CDW economy necessitates the creation of a consistent supply of recovered CDW resources and a steady demand for them in both direct reuse and indirect manufacturing of new construction materials.

1. Enabling private firms, developers, and community organizations to invest and participate in the CDW economy is key to leveraging BUDs and moving towards CDW into a hyperlocal CDW economy.
2. The development of a diverse array of interim processing facilities is needed to address gaps in supply and demand.
3. Developing interim processing facilities must take into account, community needs, and existing infrastructure and transportation facilities.

Current land use policy in the IBZ is focused on limiting self storage and hotels while encouraging the development of distribution centers. In many cases, developers would prefer to develop lighter uses in heavy manufacturing districts because it is more profitable.[39] The City of Yes Rezoning seeks to ease regulation in commercial zones to encourage mixed commercial and light manufacturing uses. In this context, CDW interim processing facilities, including sorting and urban mining facilities have the potential to develop and close the loop in local material supply within heavy manufacturing districts in the IBZs. Currently, Interim processing facilities are limited in NYC due to limited availability of space[40] as interim processing facilities require at least 1.5 acres of land to operate. Additionally, these facilities must be sited away from residential areas and close enough to the city and the highway. As such, the development of interim processing facilities in the IBZ is challenged given the high cost of renting large plots of land and difficulty competing with other uses.[41] CDW waste is regulated by the NYS EDC within the BUD framework. Practitioners, developers, and owners have environmental regulation codes. However, these codes are unenforceable causing gaps in tracking the flow of CDW materials.[42] On the other hand, public agencies including DSNY, DCAS, and PANYNJ have high divergence rates[43] and waste management practices that sort materials on site to avoid contamination and generate sufficient mass of CDW to be processed locally.[44] However, there is little information and data about where CDW are being sorted, processed, and recycled.

CDW materials constitute a diverse array of materials, each with unique contamination risk if not refined and processed properly on site. This in turns influences materials market demands and their potential for circularity and their Greenhouse Gas emissions over their lifecycle. Among these materials, Recycled Concrete Aggregate (RCA) stands out with a better hyperlocal market in New York City, primarily due to its ability to travel short distances efficiently. While aggregates, metal, wood, and plastic are deemed the most cost-efficient to recycle, it's essential to note that advancements in metal and concrete manufacturing would yield more significant emission reductions compared to recycling these materials.[45] Gypsum drywall, if uncontaminated, holds high value in the recycling market. However, contamination is a common issue, which can compromise other materials if the drywall crumbles, necessitating intervention. Gypsum, typically sourced through mining or synthetic production from coal, faces challenges due to the declining coal economy, resulting in reduced availability of synthetic gypsum. However, the construction market in NYC has large suppliers of gypsum in Pennsylvania and Spain. This external supply diminishes the local demand for gypsum, thus impacting the dynamics of gypsum recovery and its market viability within the city.

Property owners, developers, municipalities, and other stakeholders can participate in cleaning up contaminated sites in the IBZ to put underutilized properties back into productive use. E-Designation is a restrictive declaration of toxic sites in which property owners are required to have a remedial action plan to clean a site before they can obtain a building permit and a certificate of occupancy by the New York City Department of Buildings (DOB). This process does not directly address hazardous waste as property owners have shown a tendency to defer to their contractors when handling hazardous waste, although lending institutions exert some regulatory influence. The establishment of the Office of Environmental Remediation (OER) aimed to address concerns over the lack of oversight in voluntary cleanups, particularly for Brownfield sites. OER has facilitated approximately 800 cleanups, with 50 being voluntary. OER often serves as an intermediary between developers and city and state cleanup requirements. Developers may opt for OER's services driven by lenders or environmental attorneys. OER's leverage in soil management is evident, with the ability to confer liability releases from both city and state governments upon proper cleanup. A BUD by OER, specifically for soil management, ensures proper handling during transfer and disposal. Retroactive cleanup efforts face stringent criteria. Inefficiencies in soil and asphalt management exist, with DOT managing RCA and asphalt millings primarily for street use. Efforts to streamline these processes include the Clean Soil Bank and locating facilities in IBZs. Environmental evaluations focus on hazardous materials, particularly above-ground concerns like asbestos and lead paint. Materials such as concrete, steel, and asphalt undergo processing for reuse, with contamination determining disposal destinations. The Environmental Protection Agency (EPA) Superfund program refers to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The act aims to address toxic dumping, hazardous substance releases, particularly those posing risks to human health and the environment. Under the EPA Superfund program, EPA is responsible for identifying and cleaning up contaminated sites. These sites could be abandoned or uncontrolled hazardous waste sites, or sites where there is potential for hazardous substance releases. The Superfund program also holds responsible parties financially accountable for cleanup costs.[46]

Under the Kosciuszko Bridge Park

NORTH BROOKLYN PARKS ALLIANCE

enter The Arm at Van Dam St, Meeker Ave, 11222, United States of America

Under the Kosciuszko Bridge Park, is a unique example of a remediated site within the North Brooklyn IBZ. The park was funded in part by Greenpoint Community Environmental Fund (GCEFF)[47] to offer public and open spaces to the community. The North Brooklyn Park Alliance (NBPA) manages and maintains the park and uses upcycled and repurposed materials.[48] Given that the park is not owned by the NYC Parks Department, it is operated by the State Department of Transportation, providing opportunities to experiment with various materials. OER offers three options for materials: Fill, Top Soil, and Reuse. Approximately 25-30 percent of the materials used in the park are recycled, with these materials sourced from various sources including construction and excavation sites, Inwood marble, Manhattan Schist from OER, coffee bags from local roasters, and sawdust from Tri-lox, a member of the Forest for All Coalition supporting tree cycle sustainability. Concrete, while commonly used, presents challenges for horticultural purposes due to its pH levels. Despite these challenges, the process of transforming Brownfield and Superfund sites into parks is feasible with political will and adequate funding.

Stakeholders

Key Findings

1. Decreasing emissions is a legislative priority for the City and State government
2. The private sector shapes the CDW industry as the City's reach extends as far as its own projects
3. The extent of CDW recovery is ultimately a question of cost which is driven by end-market uses

There are a variety of stakeholders who shape the CDW economy at different junctures. These stakeholders include government officials who set policy concerning construction, emissions standards, land use, and zoning practices as well as private sector officials who carry out this policy and develop their own industry practices. For a complete list of interviewees see Appendix 1.

Government officials: Increasing recovery and reuse is top of mind for government officials, as evidenced by Executive Order 23 and the EDC Guidelines.[49] Thus far, policies have only extended as far as government sponsored projects.[50] There are a limited number of incentive programs that the government employs to encourage manufacturing the IBZs but the incentives for CDW recovery are limited.[51] We will cover existing incentives in the next section and the potential to expand incentives in the recommendations section.

Developers, Contractors, Design Services: The CDW industry is largely driven by the private sector.[52] Public and private owners work with the construction industry on construction and waste management. Real estate developers, with the aid of architects and engineers, envision a project.[53] They then issue a bid for contractors who compete on cost and quality, unless the construction contract has a waste management spec, in which case the contractor will hire waste management plan specialists. Carters, the contractors who handle CDW disposal, are incentivized to dispose of CDW as cheaply as possible. Carters can opt to dispose of CDW in a landfill or to bring it to a waste transfer station, a facility that sorts through the CDW.[5455] They will do the latter so long as it remains cheaper.[56] After sorting through the CDW, the waste transfer station will decide to sell materials to end markets, recycle materials, or to send materials to a landfill.[57] Selling the materials to an end user is the most desirable option but it is only feasible for materials that have a profitable reuse. The choice to recycle materials or send them to a landfill is driven by the bottom line. If it is cheaper to recycle the materials the waste transfer station will opt to do so but this requires a sufficient volume of the material. The waste transfer station is unlikely to recycle less than a dumpster of material as the transportation costs do not justify it and the facilities are limited by spatial constraints. These facilities operate 24/7. Construction, moreover, is seasonal. Waste transfer stations need to move materials quickly to accommodate the volume of CDW coming in. They cannot afford, for example, to let a half full dumpster of ceiling tiles sit on their lot in the hopes that additional materials will trickle in. End markets and space are the critical drivers of CDW recovery.

Incentives and Mandates

The capstone team researched ways to encourage stakeholders to participate in a circular CDW economy. We discovered an array of existing government incentives and mandates that are associated with our goal of encouraging organizations to take part in a circular CDW economy within the IBZs. These existing incentives and mandates include:

Existing Incentives and Mandates	Administering Government Agencies
Build NYC	NYC EDC
New York City Industrial Development Agency (NYCIDA) Incentives	NYC Department of Finance
Relocation and Employment Assistance Program (REAP)	NYC Small Business Services: careers, businesses, neighborhoods
IBZ Relocation Credit	NYC Mayor's Office of Climate and Sustainability
LEED Rating Level Requirement	NYC DDC Department of Design and Construction
Internal Agency Practices	

Build NYC: This initiative offers tax exempt and taxable bond financing for 501(c)(3) organizations and companies developing tax exempt facilities. Companies can apply to BuildNYC to help finance real estate and operations costs. This bond financing can also be applied towards specific infrastructure projects deemed as exempt facilities. Eligible tax exempt facilities are listed in the Internal Revenue Code which includes types of industrial and manufacturing facilities.[58] Benefits of this program can include lower interest rates, no mortgage recording tax, ability to refinance existing debt and longer repayment terms.

New York City Industrial Development Agency (NYCIDA) Incentives: There are three incentives administered by the NYCIDA to support business growth across the five boroughs. These incentives include property tax reduction for up to 25 years, reductions on the mortgage recording tax, and/or a waiver on sales taxes for certain materials. Eligible businesses for this incentive include businesses constructing or renovating commercial office spaces in well served transit areas, property owners renting space to fashion manufacturers in the Garment District as well as businesses constructing or expanding industrial facilities.[59]

Relocation and Employment Assistance Program (REAP): This program provides income tax credits for businesses that were previously located in Manhattan below 96th Street to locations above 96th Street in Manhattan or the four outer boroughs. The relocation areas must be classified as revitalization areas which are lots zoned for C4, C5, C6, M1, M2, or M3 above 96th Street.[60] The annual credit totals $3,000 per eligible employee for a duration of 12 years for businesses that have relocated to a revitalization designated area. An annual credit of $1,000 per share is applicable for businesses relocating to non revitalization designated areas above 96th Street and the outer boroughs. This credit may be taken against the NYC General Corporation Tax (GCT), Banking Corporation Tax (BCT), Business, Corporation Tax, Unincorporated Business Tax (UBT), and/or the Utility Tax. Requirements include that businesses must prove residency under 96th street for more than 24 months before relocation and eligible premises must be non residential.

IBZ Relocation Credit: This credit is applicable for manufacturing and industrial businesses relocating to an IBZ. This is a one time tax credit of $1000 per relocated employee. The incentive is applied against the business' City tax liability capped at $100,000 for individual business. Therefore no credit will be applied after the 100th employee.[61] Businesses that REAP benefits are not eligible for the IBZ Relocation Credit.

LEED Rating Level Requirement: Low energy intensity building designations are required for projects involving the construction of a new building, an addition to an existing building, or the substantial reconstruction of an existing building with estimated construction costs of more than $2,000,000.[62] Low energy intensity buildings are defined by the Leed Gold certification rating system creating cost-saving green buildings which provide environmental and social benefits.

Internal Agency Practices: NYC agencies have been studying construction demolition waste and ways to locally circulate these materials for decades. In 2003, the DDC released the Construction and Demolition Waste Manuel which identifies strategies to expand CDW recovery through the practices of reducing, repurposing and recycling.[63] This manual established the framework for increasing local circular CDW economy processes for DDC operations as well as the precedent for future studies. Other agencies such as DOT and DEP have conducted research on ways to repurpose CDW materials in their Sustainable Streets[64] and NYC Green Infrastructure Plan Reports.[65] These internal agency CDW management practices could be expanded to other city and state organizations.

Workforce

Key Findings

1. Industries associated with CDW do not generally require high labor volumes.
2. There are many entry points into the material waste stream and therefore a variety of potential job profiles involved in circular economies.
3. A critical mass of specialized workers is needed among local workforces.Knowledge sharing among and between businesses, economic development organizations, and city agencies is crucial.

Supporting local workforce development near the IBZs is a feature of Town+Gown's CLCPI . Perspectives from the construction industry emphasized the number of parties involved in the demolition and construction cycle. Prior to full demolition, environmental demolition crews are engaged to remove toxic substances from sites, salvage easily recycled materials such as steel, and excavate and test soil. During demolition and later construction, carting companies periodically haul away waste materials. Finally, materials are processed at transfer or recycling facilities and are sent to landfills or reused. A circular economy would provide opportunities for new jobs at each stage of this process.

Across stakeholder interviews, respondents highlighted the need to achieve a critical mass of workers with skill sets relevant to the CDW processing industry. While much of the process of sorting and storing material is land-intensive, the number of positions required in this sector is relatively small. However, increasing on-site sorting and creating spaces for the manufacturing of products using CDW materials would expand demand for labor. Stakeholders supporting workforce development in the industrial sector described opportunities for both short- and long-term workers, and a mix of highly skilled and entry-level positions.

Examining the urban mining and recycling industries, the team heard that relatively high-skilled labor is required but that there has historically been tension between job creation and increasing automation, especially in the recycling process. Stakeholders noted that downstream sectors in material reuse and manufacturing could benefit from closer proximity to resource streams and material stockpiles. In several interviews, respondents suggested that light manufacturing facilities adjacent to recycling centers could serve as markets for diverted materials, creating another job market within the larger IBZ ecosystem.

Ongoing coordination with employers is needed to ensure that training curriculums remain relevant to company's needs. Forging and maintaining relationships between local companies, workforce development agencies, and industrial development organizations is key to maintaining a robust job market in this sector.

Paper Mills | Pratt Industries

4435 Victory Blvd, Staten Island, NY 10314, United States of America

V. Recommendations & Implementation Strategies

This section provides recommendations and implementation strategies to develop and maintain a circular economy of CDW in the IBZs based on the findings of this report. Each recommendation corresponds to one or more strategies outlined in the Circular Economy Toolkit.

Recommendations

Based on the above findings, the following recommendations have been developed:

1. Construct new CDW recovery and reuse facilities within the IBZs
2. Expand and further develop existing mandates and incentives for CDW recovery
3. Launch a knowledge sharing network and materials marketplace for IBZ industries
4. Pilot a materials passport program in the IBZs
5. Pursue a zoning text amendment to protect CDW recovery and reuse activities in industrial zones
6. Strengthen third-party oversight of CDW recycling reporting
7. Develop a framework for measuring outcomes

Develop a menu of resource recovery facilities to meet the needs of each IBZ and their surrounding communities

In order to meet the goal of a circular economy based within New York City IBZs, this report recommends that New York City facilitate the siting of two tiers of CDW processing and storage facilities

- Full scale CDW recycling facilities on the scale of Cooper Transfer Station. Appropriate sites for these facilities would include properties at least 1.5 acres in area and near or adjacent to trucking, barge or rail transport.
- Small-scale material hubs that can act as short-term depots serving local businesses and other end users of recovered materials.

Expand and further develop existing mandates and incentives

- An array of existing mandates and incentives have the potential to be amended or expanded to promote the participation of private industries in a circular CDW economy The New York City Industrial Development Agency (NYCIDA) program targets a variety of industries including firms constructing or expanding industrial industries. This program could be expanded to include direct incentives for private firms investing in the development of new CDW processing facilities or construction companies that are actively partaking in CDW recovery.
- Build NYC offers tax exempt bond financing for registered 501(c)(3) applicants and developers constructing tax exempt facilities. Companies that are developing facilities participating in a local circular CDW economy could be included in the list of tax exempt uses. This would be a federal mandate requiring modifications to the Internal Revenue Code which directs the list of tax exempt facilities qualifying for the Build NYC program.
- IBZ Relocation Credit and Relocation Employment Assistance Program (REAP): These programs target industries attempting to relocate to industrial areas. Expansion of these programs could include increased financial benefits for firms that are participating in CDW recovery.

Knowledge sharing network and material marketplace

Based on the identified need for a critical mass both of CDW materials and end users, this report recommends the creation of a materials marketplace centered on the IBZs that will facilitate the exchange of CDW between businesses that create this material and businesses that can use CDW as an input In conjunction the the DonateNYC Exchange this materials marketplace would:

- Reduce storage times of materials and allow for less acreage devoted to storage
- Encourage synergy between heavy industry and recycled manufacturing, and
- Divert materials from landfill to productive alternative uses

Materials Passport Pilot

Grounded in the concept of urban mining, materials passports catalog the components embodied in a given building. In-depth records of the materials and components of a building allow for higher percentages of resource recapture at the end of a building's life cycle. Data is stored in digital records, and can be recorded during construction and accessed at the time of deconstruction or demolition. Material passports platforms are well-established in the European Union, and have been piloted in the United States. While a city-wide platform is not a feasible short term goal, the IBZs provide an excellent environment to pilot materials tracking on a smaller scale. Such a pilot would leverage networks established through a real-time materials exchange.

Zoning text amendment to facilitate CDW facilities in M zones

Heavy industrial uses will remain a vital component of New York City's economy. However, many of the manufacturing and waste processing facilities present in the IBZs can only feasibly operate within these areas, and encroachment in M2 and M3 zones by non-industrial uses can hinder the necessary functioning of these industries.

Incentive zoning is a tool that provides bonuses to developers (e.g, floor area or height increases) in exchange for the provision of public amenities or benefits. Town & Gown along with stakeholders across the IBZs should collaborate with the NYC Department of City Planning on outlining incentive zoning regulations aimed at promoting the objectives of local circular CDW economies. A zoning map or text amendment for zoning districts within the IBZs would establish specific regulations governing the exchange of circular CDW economy metrics in exchange for bonuses.

Pursuant to the New York City Charter § 197-c (3) zoning map amendments are subject to the New York City Uniform Land Use Review Procedure (UULRP). While zoning text amendments are not subject to ULURP, both zoning map and text amendments are subject to a City Environmental Quality Review (CEQR), pursuant to Mayoral Executive Order No. 91 of 1977, CEQR Rules of Procedure of 1991, and the regulations of Article 8 of the State Environmental Conservation Law, State Environmental Quality Review Act (SEQRA) [6 NYCRR Part 617].

The Privately Owned Public Spaces (POPS) Model

POPS are owned and maintained by private property owners but are dedicated to public use. The program allows for the creation of these spaces through the exchange of FAR bonuses or waivers between private owners and the city. This program is an example of the use of zoning incentives to promote the utilization of property that is beneficial for the collective. Using the POPS Program model, Town & Gown should explore strategies to incentivize private industries' participation in a local circular CDW economy. The key will be to identify the needs of the private operators and the public, and then determine a balanced exchange of concessions and provisions. Zoning is one tool - perhaps the most powerful one - for establishing and implementing such a program. However, other mechanisms, such as financial incentives, should be explored.

Strengthen third-party oversight off CDW recycling

While the RCI provides a framework for third-party oversight of CDW recycling, a more robust standard for recycling rate reporting is needed to ensure that regulatory thresholds for CDW are met. Accurate and transparent certification of end uses is necessary both for the functioning of a circular CDW economy, and to verify that standards for sustainable construction such as LEED are truly being met. New York City should therefore require that all recycling rates for CDW be substantiated by independent third-party evaluators.

Develop a framework for tracking outcomes

Concurrent with the implementation of the above recommendations, Town+Gown should develop a framework to gauge the success of the various recommendations included in this report.

Circular Economy Toolkit

The following toolkit has been developed to provide a variety of strategies to advance a circular CDW economy within NYC IBZs. These are envisioned as complementary approaches, and can be employed singularly or comprehensively.

Circular Economy Toolkit		
Facilities	Tool 1	Small-scale material storage depots
	Tool 2	Full-scale CDW recycling centers
Policies	Tool 3	New tax incentive programs for participants in circular economy
	Tool 4	Expand exisitng CDW recyling mandates
	Tool 5	Zoning text amendment protecting circular economy in M3 zones
Practices	Tool 6	Deconstruction and pre-demolition salvage audits
	Tool 7	Materials passport pilot
	Tool 8	Knowledge network and materials marketplace

VI. Opportunities in the Five IBZs

Site Discovery Process: In line with our findings, theteam developed a strategy to identify potential sites for CDW interim processing facilities within the 5 IBZ case studies. The goal of this process was to discover government owned or vacant land that could be optimal locations for the desired facilities in relation to other environmental conditions. Ideal sites would preferably include:

- Government owned or tax exempt land
- Vacant land
- Over 2 acres of land
- Well served by transportation options including freight connections either by water, rail or truck routes and public transit access for workers
- Easy land to redevelop such as parking lots, warehouses or fields
- Contaminated land

The first step of the process was finding the relationship between government facilities, 193 identified CDW participating private industries and non CDW involved industrial uses in order to locate optimal sites for a potential CDW repurposing facility.

There are nine categories included in this criteria:

Category	Type	Description	Examples
Government	Fully tax exempt	Land that may be owned by the government or private institution.	National Grid
Government	City ownership	Land directly owned and controlled by a city agency.	DSNY
Government	Owned by either a Public Authority or State or Federal government	Land directly owned and controlled by a Federal, State or Public Authority organization.	MTA Rail Yards
Private CDW Related Facility	Concrete and cement	Privately owned land participating in the production, transportation, or removal of concrete and cement materials.	SRM Concrete
Private CDW Related Facility	Fabricators and scrap metal	Privately owned land participating in the production, transportation, or removal of metal materials.	Metal Dimensions
Private CDW Related Facility	Recyling and garbage	Privately owned facilities directly participating in the collection, disposal, or repurposing of waste materials.	Cooper Recycling
Private CDW Related Facility	Miscellaneous	Privately owned land participating in miscellaneous activities that involve construction and demolition waste.	Kings Building Material
Private Industrial Facility	Non CDW Related Industrial Facility	Privately owned land that is classified for industrial and manufacturing uses by the government but are not related to CDW industries.	U-Pack
Private Vacant Land	Non CDW Related Vacant Land	Privately owned land that has been classified as vacant usually due to reasons that prevent residential development such as contamination or flooding.	980 BLC Owner LLC

*Site mapping formula is described in the methodology section below.

After gathering this information, the team created extensive maps to visually identify the geographical relationships between CDW related industries and government facilities. We cross referenced this research with other environmental conditions such as demographics, transportation access and flood zones.

Siting Analysis

Siting Classification		
Public *(All Public Facilites)*	Fully Tax-Exempt Land	nationalgrid, conEdison
	City Owned Land	NYC Department of Sanitation, NYPD, NYC DOT
	Public Authority, State or Federal Government Owned Land	MTA, Port Authority NY NJ
Private *(Only CDW Related Facilities)*	Concrete and Cement	26 (13%)
	Fabricators and Scrap Metal	82 (42%)
	Recycling and garbage	52 (27%)
	Miscellaneous	33 (17%)
Total Privateily Owned CDW Related Facilities		**193 (100%)**

Ideal Site

First Priority

- Vacant Land
- Tax Exempt Land
- Government Land

Second Priority

- Easy land to redevelop such as parking lots, warehouses or fields
- Truck route access

Third Priority

- Public Transit
- Freight line access
- Water access
- 2+ acres of land

Potential Site Locations

After careful review, theteam identified four optimal sites for a CDW interim processing facility. These locations include:

Vacant Site between Port Morris and Hunts Point | Bronx (Borough 2) | Block 2599 | Lot 175: To the east of Bruckner Boulevard near E 142nd Street sits vacant land extending under the Bruckner Expressway towards Rose Feiss Boulevard. The site is over 1 acre wide and sits under government owned freight tracks and truck routes. The location is surrounded by privately owned parking lots and less than 50 meters away is the construction of the Bronx Logistics Center, a 14.2 acres and $500 million warehouse. This site has the potential to receive an FAR height bonus and be built so that the third floor is on the same level as the freight tracks.

Undeveloped land next to DSNY in West Shore | Staten Island (Borough 5) | Block 2705 | Lot 300: Next to the DSNY facility at 450 Wild Avenue sits close to 82 acres of unutilized land. The land is tax-exempt property controlled by Con Edison. This site has great transit access with a freight line cutting through the lot and easy access to the West Shore Expressway. The location would be in a recycling and garbage 'hub' with Pratt Industries, a paper redeveloping company, located adjacent to the north and DSNY adjacent to the east. The site is also on the shoreline with potential for port accessibility but as a result is severely in the flood zone.

Underutilized MTA property in Long Island City | Queens (Borough 4) | Block 68 | Lot 150: At the end of 53rd Avenue on the shoreline of Newtown Creek sits 1.3 acres of unused land. This property is currently controlled by the MTA and is adjacent to a freight rail line. This site could also be accessed by Newtown Creek but would be prone to flooding.

Cooper Fields | Brooklyn (Borough 3) | Block 2837 | Lot 1: This land is located at Maspeth Avenue and Vandervoort Avenue in North Brooklyn and is owned by National Grid. The underutilized land is classified as tax exempt and is over 14.3 acres large. The baseball fields to the north have a history of contamination and was a victim of one of the largest oil spills in US History. The fields have not been used for recreational purposes since 2010 and sits vacant.

Government Facilities
- City Ownership
- Fully Taxed-Exempt
- Other*

Private CDW Related Facilities
- Concrete and Cement
- Fabricators and Scrap Metal
- Miscellaneous
- Recyling and Garbage
- Private Ownership
- Non CDW Related Industrial + Manufacturing Facilities
- Parking Lot
- Vacant Land
- Park Properties

*Owned by either a public authority or the state or federal government

Environmental Considerations

- 2020s 100-Year Floodplain
- 2050s 100-Year Floodplain
- Park
- Designated BOA Sites
- E-designations
- OER Clean-up Sites

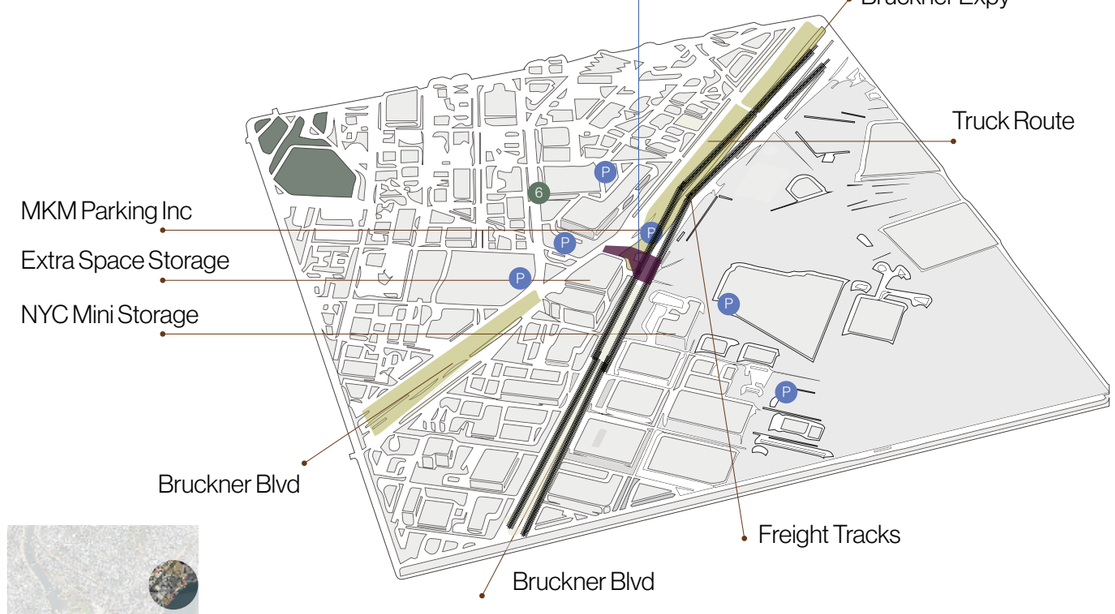
Transportation

149th St Grand Concourse
Prospect Av
3 Av 149th St
Jackson Av
138th St Grand Concourse
E 149th St
138th St
E 149rd St - St. Mary's
Brook Av
Bruckner Expwy
Major Deegan Expwy
Cypress Av

- Truck Routes
- Bus Lanes
- Railroad
- Bike Lanes
- Park Properties
- Water

Potential Port Morris Facilitiy
Vacant Site between Port Morris and Hunts Point
Bronx (Borough 2) | Block 2599 | Lot 175

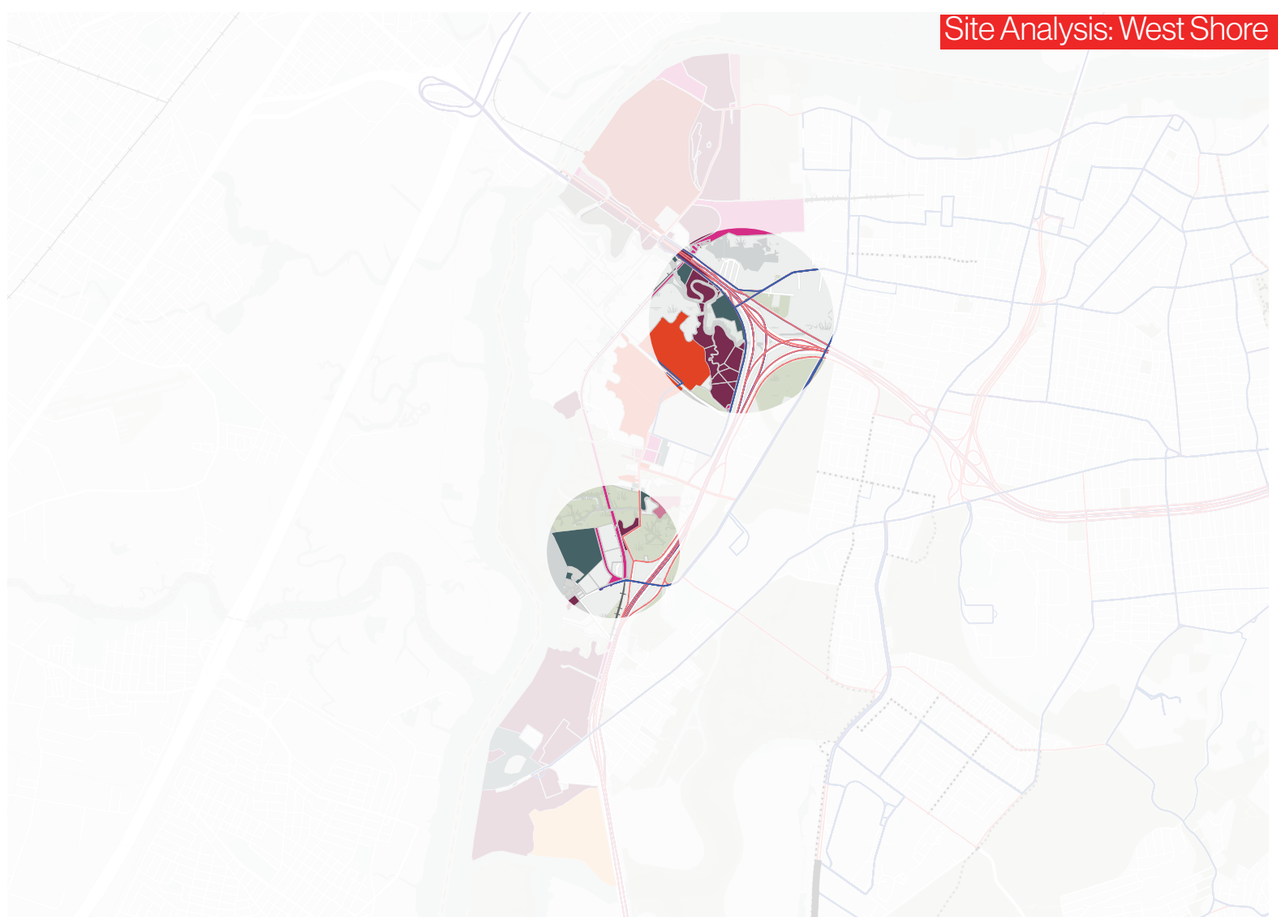
Owner: 980 BLC Owner LLC
Land Use: Vacant Land
Lot Area: 35,800 sq ft

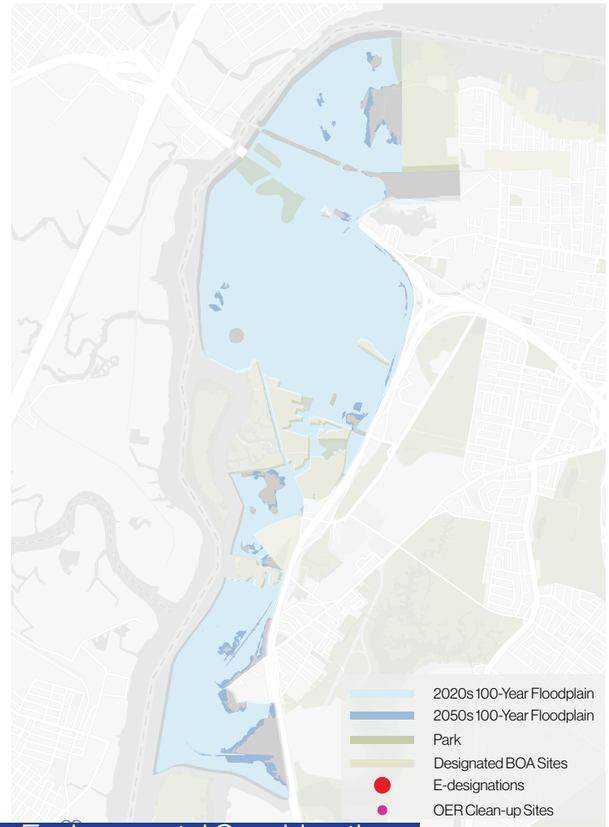


Government Facilities
- City Ownership
- Fully Taxed-Exempt
- Other*

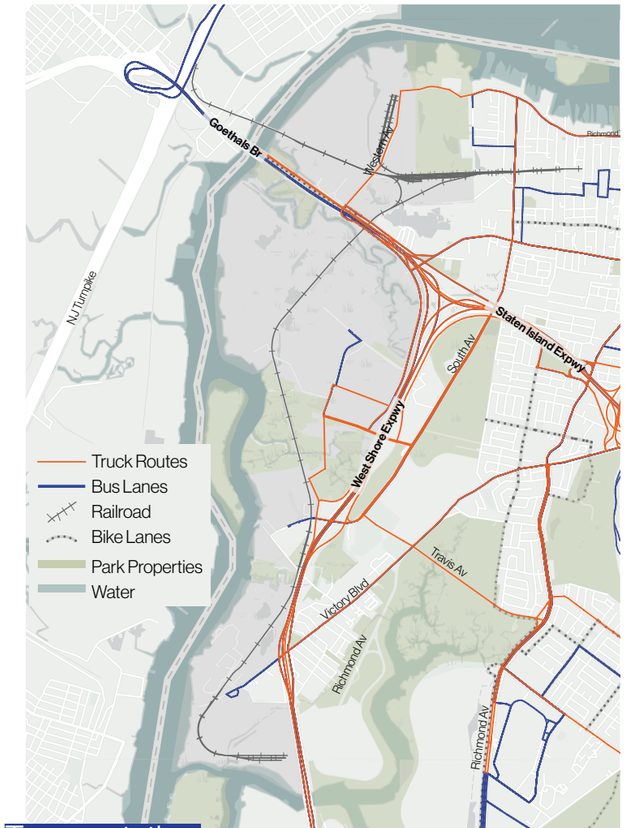
Private CDW Related Facilities
- Concrete and Cement
- Fabricators and Scrap Metal
- Miscellaneous
- Recyling and Garbage
- Private Ownership
- Non CDW Related Industrial + Manufacturing Facilities
- Parking Lot
- Vacant Land
- Park Properties

*Owned by either a public authority or the state or federal government





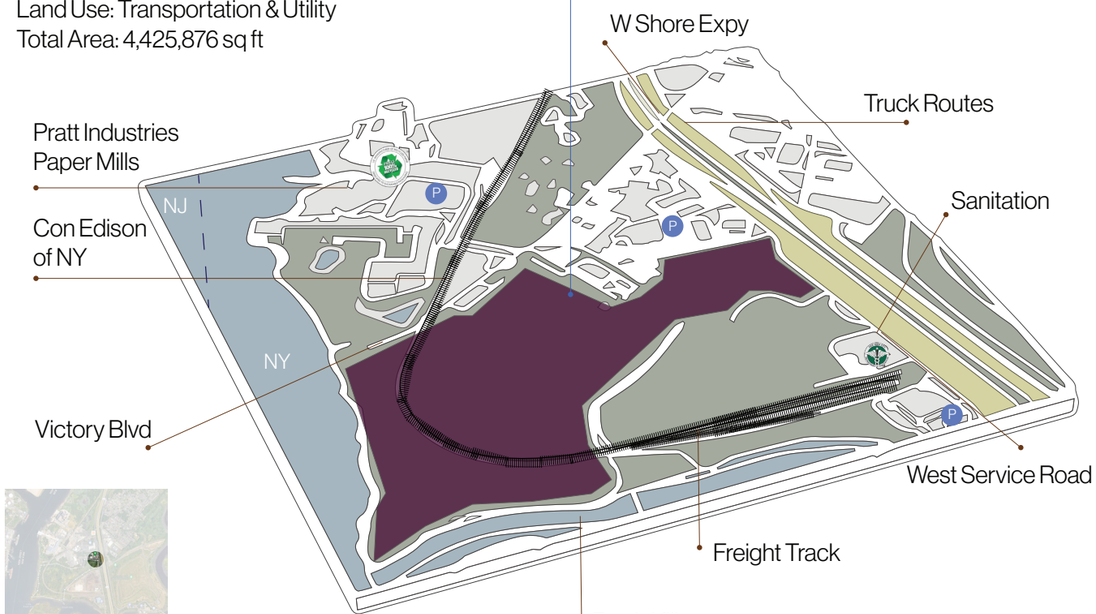
Environmental Considerations



Transportation

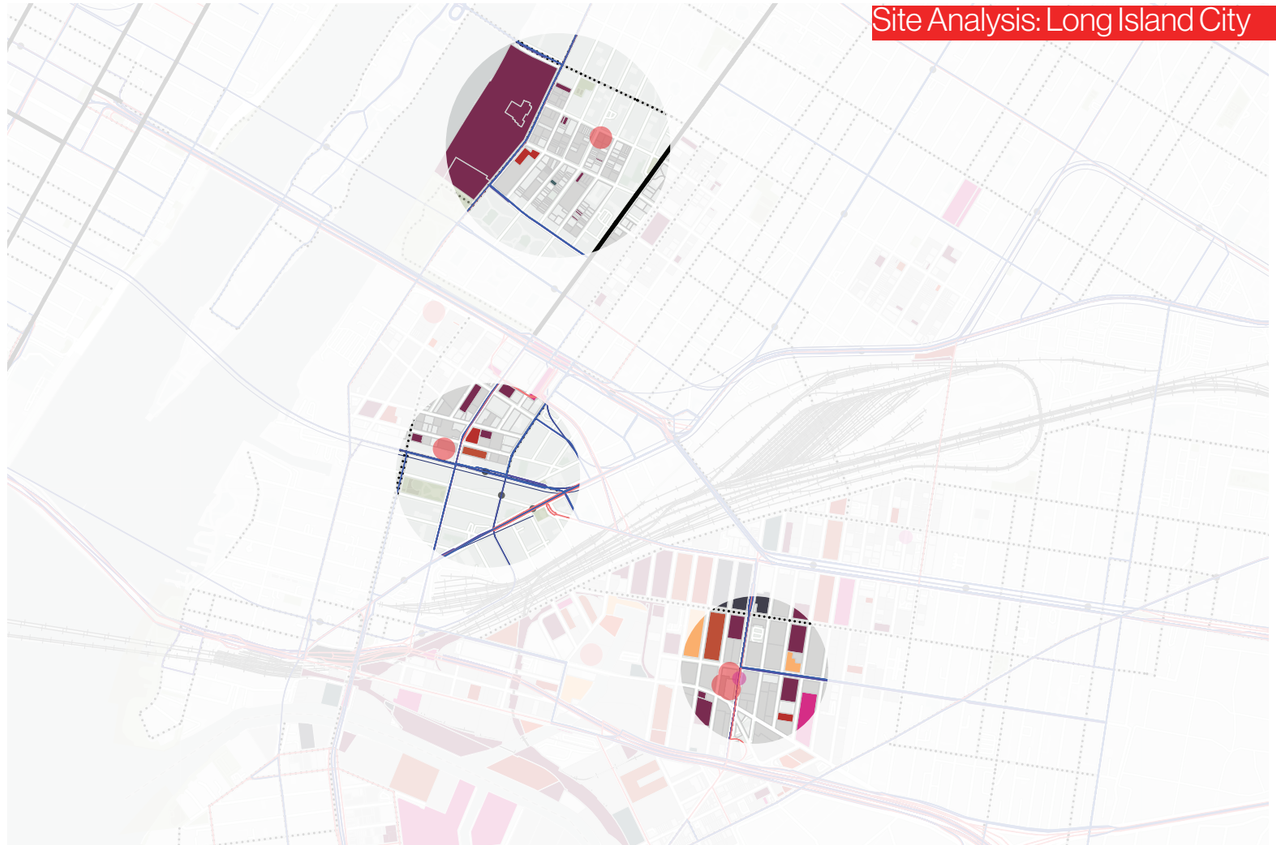
Potential West Shore Facilitiy
Undeveloped land next to DSNY in West Shore
Staten Island (Borough 5) | Block 2705 | Lot 300

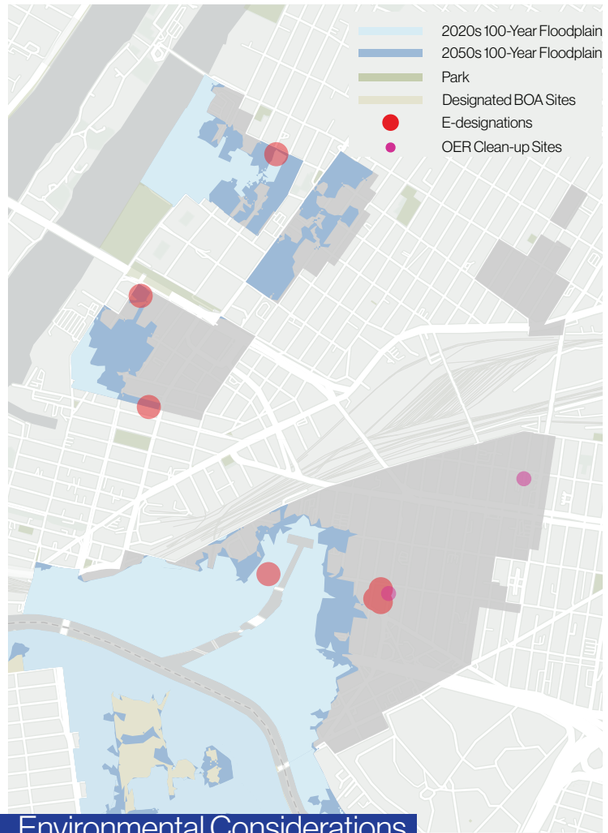
Owner Type: Mixed
Owner: Consolidated Edison CO.OF N.Y.,INC.
Land Use: Transportation & Utility
Total Area: 4,425,876 sq ft



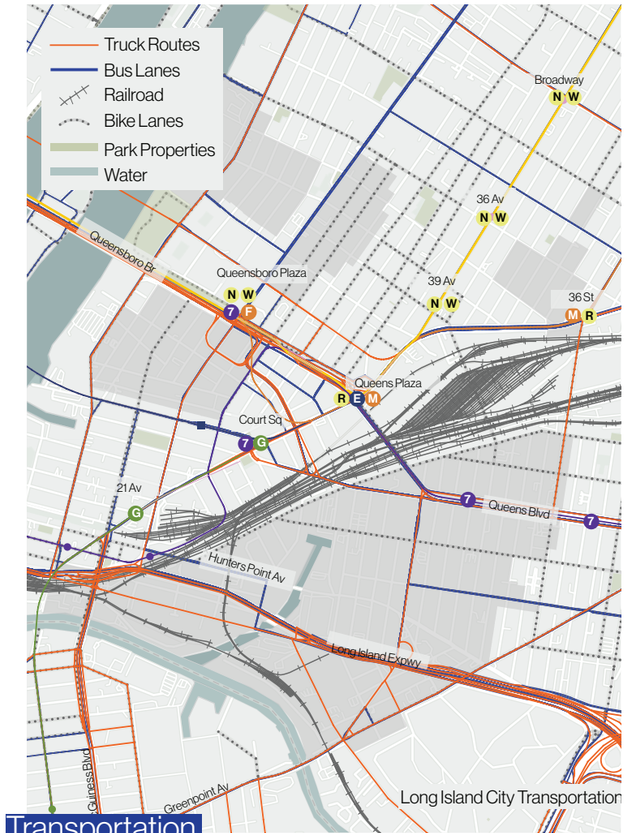
Site Analysis: Long Island City

*Owned by either a public authority or the state or federal government





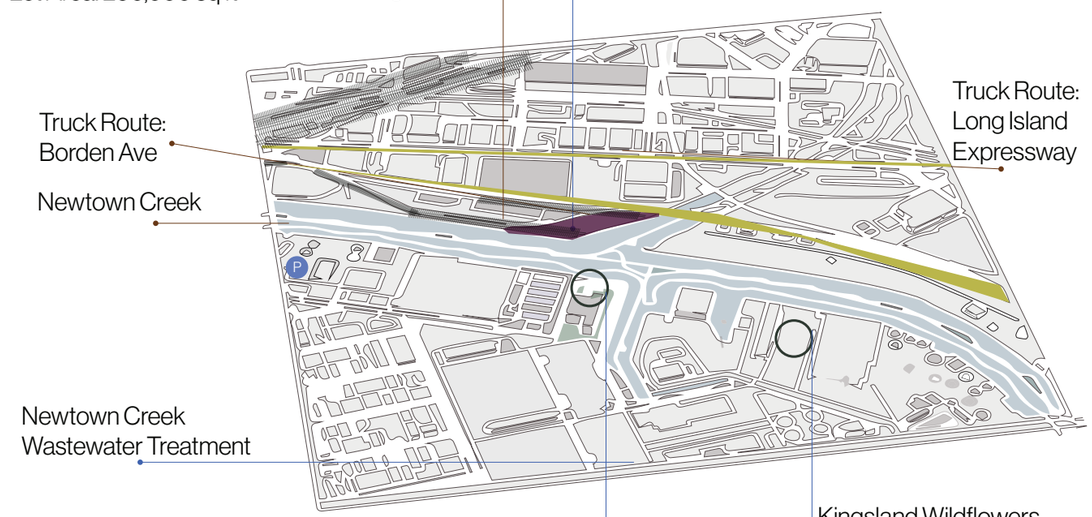
Environmental Considerations



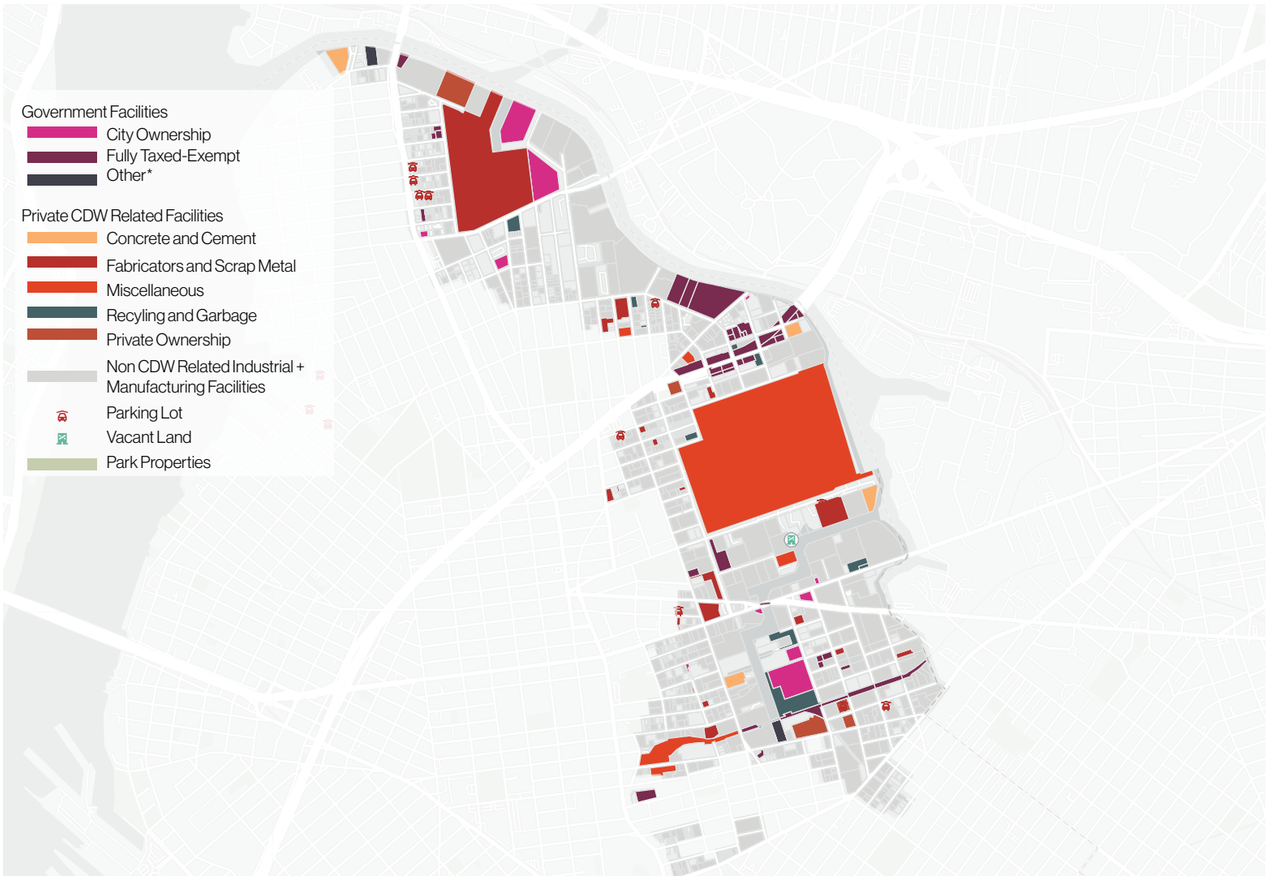
Transportation

Potential Long Island City Facility
Underutilized MTA property in Long Island City
Queens (Borough 4) | Block 68 | Lot 150

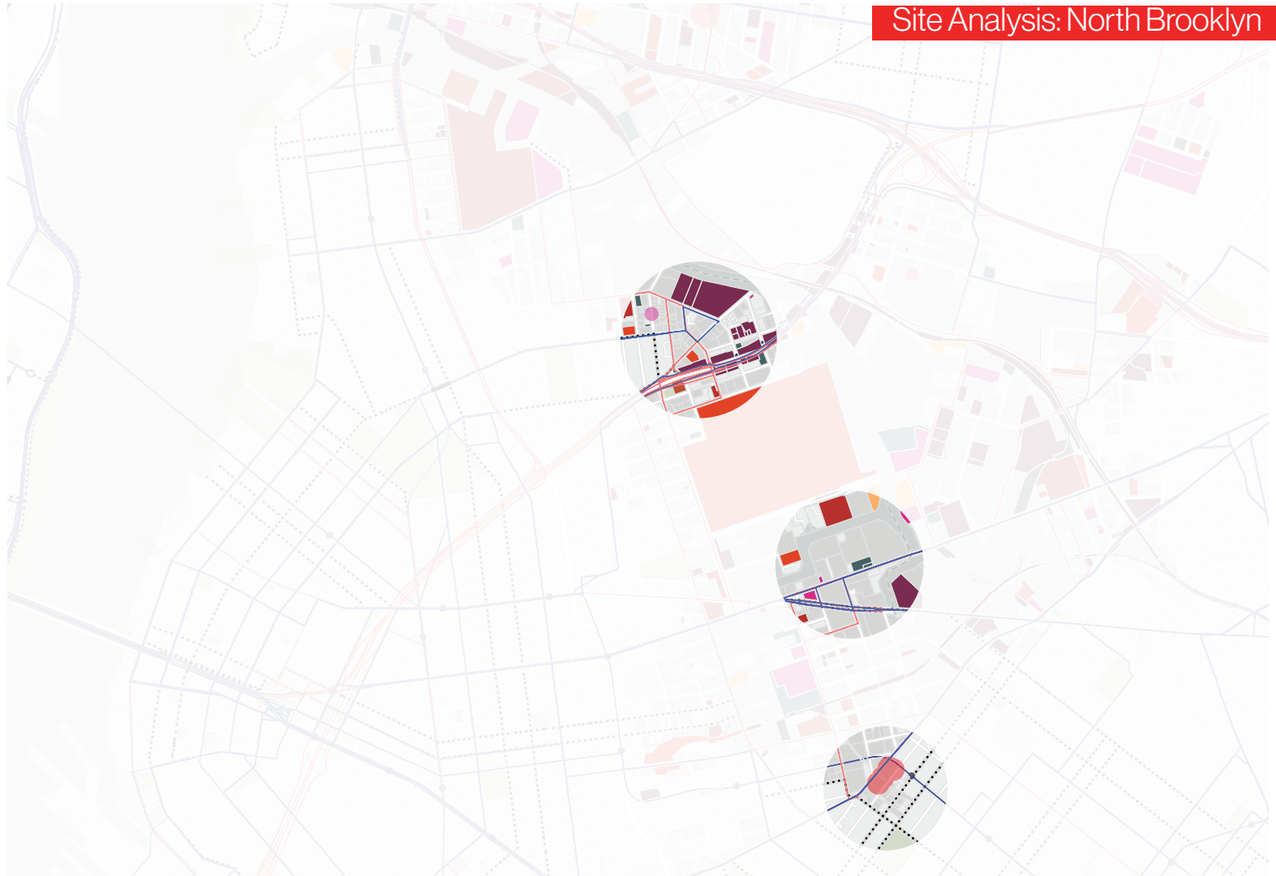
Owner Type: Mixed
Owner: MTA - LIRR
Lot Area: 290,000 sq ft

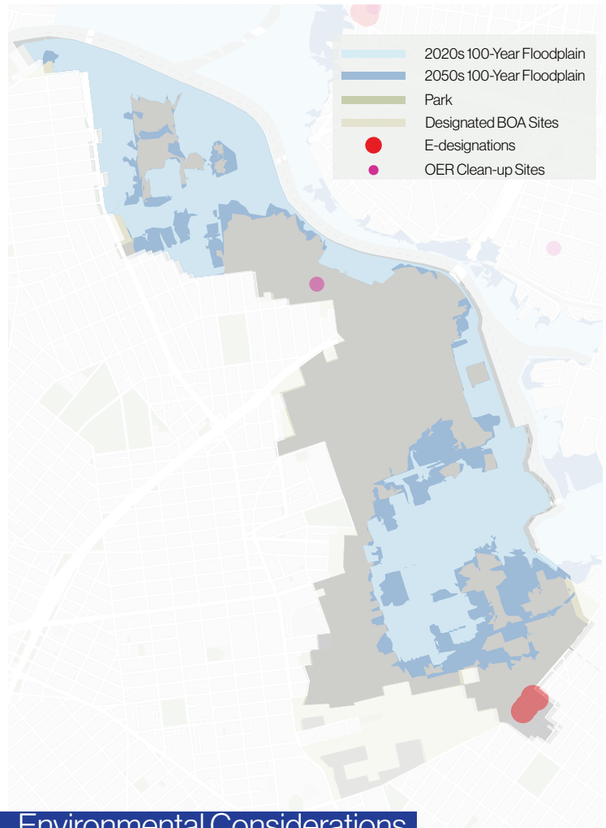


P Parking Space



*Owned by either a public authority or the state or federal government





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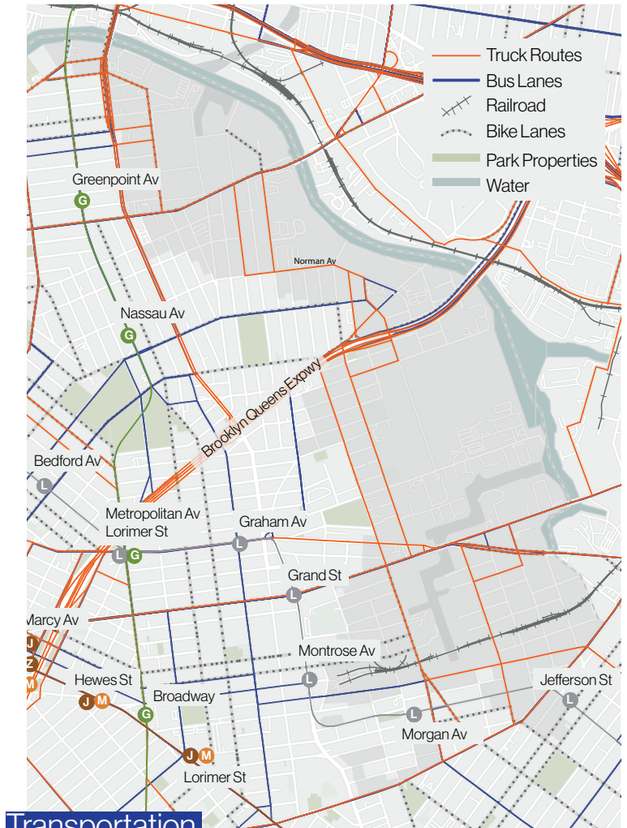
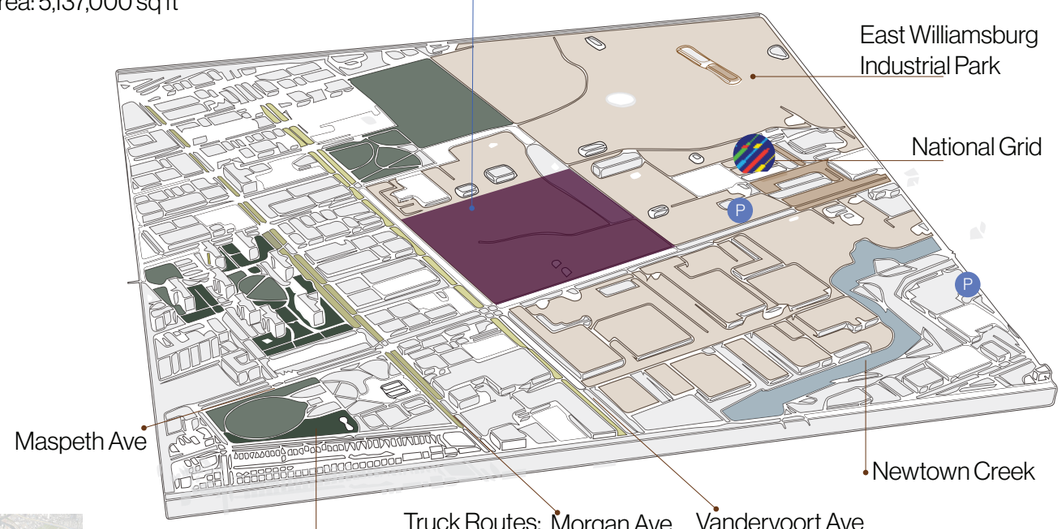
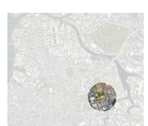


Transportation

Potential North Brooklyn Facilitiy
Cooper Fields
Brooklyn (Borough 3) | Block 2837 | Lot 1

Owner Type: Mixed
Owner: Brooklyn Union Gas Company
Land Use: Transportation & Utility
Lot Area: 5,137,000 sq ft

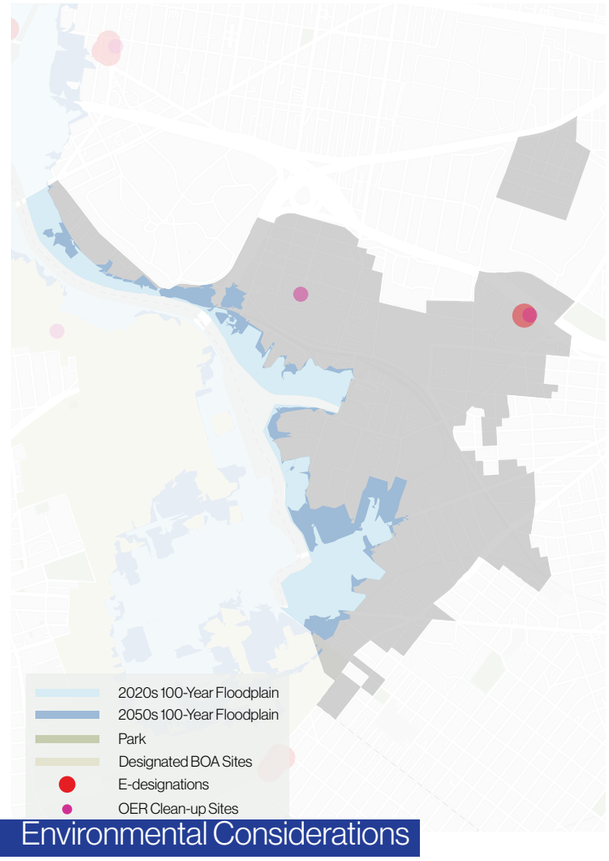




Government Facilities
- City Ownership
- Fully Taxed-Exempt
- Other*

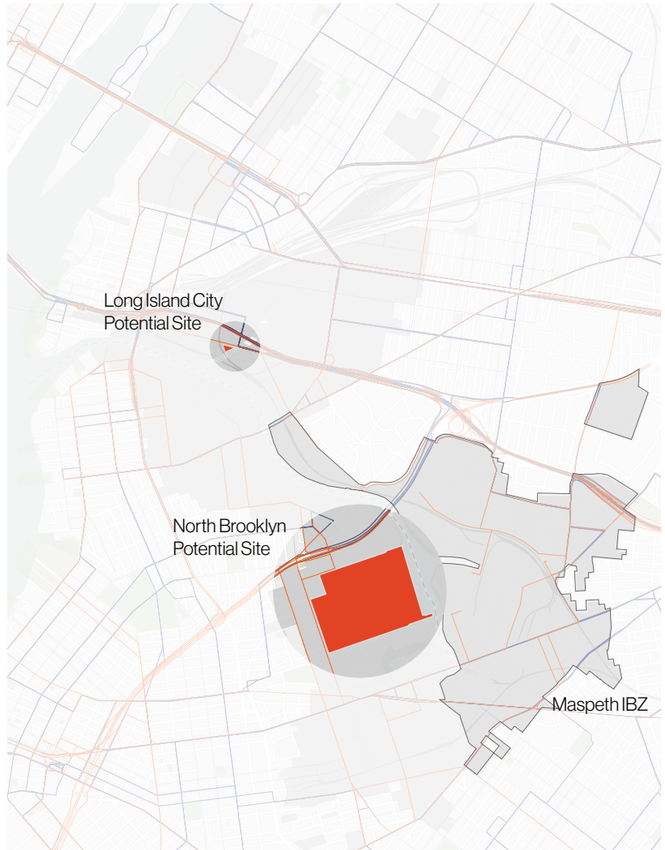
Private CDW Related Facilities
- Concrete and Cement
- Fabricators and Scrap Metal
- Miscellaneous
- Recyling and Garbage
- Private Ownership
- Non CDW Related Industrial + Manufacturing Facilities
- Parking Lot
- Vacant Land
- Park Properties

*Owned by either a public authority or the state or federal government



Environmental Considerations

Transportation



The Capstone Team selected a site in every IBZ except Maspeth owing to its proximity to Cooper Transfer Station in North Brooklyn and the other potential sites in North Brooklyn and Long Island City.

VII. Next Steps and Opportunities for Further Analysis

Areas for Further Research

FAR Analysis: As part of further research to identify optimal locations for CDW processing facilities, and find areas of possible incentive for local businesses a complete analysis of FAR could be completed in the IBZs. This would involve identifying areas where FAR is less than the maximum allowed by current zoning and cross referencing these properties against their proximity to trucking and other transportation routes.

Greater classification of CDW related facilities: The team created a methodology that classified land in Industrial Business Zones into eight categories in order to determine affiliation with a potential local CDW circular economy. Three of these categories are related to the government, four to privately owned CDW related facilities, and two for privately owned non related CDW facilities. A potential next step for further analysis is creating a more indepth classification for determining this relationship. This could be completed by expanding the categories for government owned property and privately owned CDW related facilities. Examples of this would be greater classification of City Government owned land into the unique departments that control them or a greater categorization of metals and fabricators industries into the specific types of metals such as steel.

Additional IBZ Case Studies: This project studied only five of the twenty one Industrial Business Zones in New York City. There are sixteen other IBZs that could play an important part in understanding this study and providing participation in a local circular CDW economy. A prime example of an IBZ that should be considered for next steps is Hunts Point. This IBZ is adjacent to our case study of Port Morris and would greatly benefit from a potential CDW processing facility in the area.

Incorporation of Construction Sites Data: CDW from construction locations was not incorporated into the siting analysis. This data is difficult to acquire as there is limited monitoring of where CDW is transported to from development sites across the city. Further analysis on the amounts of CDW that is generated from construction sites could be an opportunity for further research in this field.

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IX. 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 multidisciplinary 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.

Construction & Demolition Waste (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. The Department of Design & Construction defines CDW as "that part of the solid waste stream that results from land clearing and excavation, and the construction, demolition, remodeling and repair of structures, roads and utilities." This type of waste is usually divided into two main legal categories: clean fill and another category for all other debris. C&D materials include but are not limited to concrete, stone, brick, Gypsum, glass, ferrous and non-ferrous metals, wood, asphalt, plastic, railway ballast, paper asbestos, excavated soil, gravel, rock, and other materials.

Circular Economy
A circular economy aims to prolong the circulation of materials and products by minimizing material use, redesigning them to be more resource-efficient, and transforming "waste" into a resource for producing new materials and products. Rooted in three key principles, it strives to eradicate waste and pollution, promote the circulation of products and materials, and regenerate nature. This model advocates for maximizing the reuse and recovery of materials, offering a framework to enhance deconstruction practices and close loops in construction and demolition waste materials.

Closing Loops City Program Initiative (CLCPI)
The 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.

Department of Sanitation (DSNY)
A New York City agency dedicated to keeping New York City clean, safe, and healthy by collecting, recycling, and disposing of waste, cleaning streets, attacking the scourge of illegal dumping, and clearing snow and ice

Industrial Business Zones (IBZs)
Industrial Business Zones 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

Interim Processing Facility
An interim processing facility denotes either
(1) An initial CDW separation facility (see e.g. Cooper Transfer Station)
(2) A refined sorting facility that recovers CDW elements suitable for manufacturing of products.

Mayor's Office of Environmental Remediation (OER) E designations
An E-designation is a zoning restriction imposed on a piece of property that requires the owner to satisfy environmental requirements relating to air, noise, or hazardous materials as a condition to obtaining permits to redevelop the property.

Net zero strategies promote the consumption of only as much energy or water as produced. The aim is to create a sustainable balance between resource availability and demand, and eliminate waste to landfill.

New York City Department of City Planning (DCP)
Oversees land use application processes and maintains the Zoning Resolution text and maps.

New York City Department of Design and Construction (DDC)
Oversees New York City capital construction projects including libraries, courts, and precincts as well as vital infrastructure projects such as roadway, sewer, and water main construction projects.

New York City Department of Environmental Protection (DEP)
Responsible for supplying potable water, treating wastewater, and reducing noise, air, and hazardous materials pollution.

New York City Department of Small Business Services (SBS)
Helps unlock economic potential and create economic security for all New Yorkers by connecting New Yorkers to good jobs, creating stronger businesses, and building thriving neighborhoods across the five boroughs.

New York City Department of Transportation (DOT)
A New York City Agency dedicated to providing for the safe, efficient, and environmentally responsible movement of people and goods in the City of New York and to maintain and enhance the transportation infrastructure crucial to the economic vitality and quality of life of our primary customers, City residents.

New York City Economic Development Corporation (NYCEDC)
Uses City resources to support businesses that strengthen New York City's economy and advance community interests.

Recycled Concrete Aggregate (RCA)

Resilience is the capacity of individuals and systems to withstand and adapt to occasional shocks
such as flooding, terrorist attacks or ongoing stresses including increasing energy demand and lack of affordable housing.

The New York City Industrial Development Agency (NYCIDA)
facilitates business growth, relocation, and expansion throughout the five boroughs by reducing the cost of capital investment. NYCIDA's tax incentive initiatives contribute to the local economy, generate employment opportunities for residents of New York, and reinforce the city's status as a prominent global business center.

Privately Owned Public Spaces Program (POPs)
Privately owned public spaces, also known by the acronym POPS, are spaces dedicated to public use and enjoyment and which are owned and maintained by private property owners, in exchange for bonus floor area or waivers. New York City was the first to use the system, after the promulgation of the 1961 Zoning Resolution.

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.

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

Waterfront Access Plan (WAP)
A waterfront access plan (WAP) is a specific plan, set forth in the Zoning Resolution that tailors waterfront bulk regulations and public access requirements to the specific conditions of a particular waterfront area.

Zoning Resolution Section 62-811 provides that no excavation or building permit shall be issued for any development on a waterfront block, or any other block included within a Waterfront Access Plan, until the Chairperson of the City Planning Commission certifies to the Department of Buildings or Department of Business Services that, either there is no waterfront public access area or visual corridor requirement, or, in the alternative, that the waterfront public access area and/or visual corridor requirements have been satisfied in accordance with the requirements of ZR § 62-50.

Pursuant to ZR § 62-51, visual corridors shall be provided for zoning lots developed within waterfront blocks in accordance with the provisions of this Section. The methodology for providing and requiring visual corridors through a zoning lot are set forth in ZR § 62-511. Pursuant to ZR § 62-52, waterfront public access shall be provided on waterfront zoning lots with a lot area of at least 10,000 square feet and a shoreline of at least 100 feet that are developed, and for all developments on floating structures, unless certain exemptions apply.

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.

X. Appendices

Appendix 1: Data Methodology

Existing Conditions

To understand the challenges and opportunities in our five case studies IBZ, the team analyzed land use data and land use by land area using MapPLUTO. The team calculated percent of lot area by land use using RStudio to group by "landUse " and sum the total of "LotArea". Environmental conditions analyzed existing Designated Brownfield Opportunity Areas, E-designated sites, and OER Clean Up sites using Environmental Remediation dataset fromNYS Open Data as well as flood zones from Federal Emergency Management Agency (FEMA). Additionally, the team analyzed the demographics of the neighborhoods of each IBZ using Neighborhood Tabular Area and Census and American Community Survey (2021). Industrial workforce within each IBZ was defined as utilities, construction, manufacturing, wholesale trade, and transportation and warehousing and were obtained from the Longitudinal Employer-Household Dynamics Census (2021). The team used ArcGIS to join the workforce data to New York City Census Blocks and clip the data by the IBZ shapefile. Using RStudio, the team aggregated industrial workforce data in each IBZ to calculate the percentage of each industrial sector. Transportation infrastructure was analyzed using the New York City Truck Routes shapefile from NYC Open Data. Streets were classified into through truck routes, local truck routes. Bus routes were created using MTA bus route shapefiles from New York State Data. Subway stations, railroad, and bike routes, and shipping terminals were also obtained from NYC Open Data.

Siting Maps

To arrive at the ideal site for the development of interim processing facilities, the team constructed a methodology that aligns with the ideal site criteria and used ArcGIS to find the ideal site in each IBZ. To view the complete analysis, visit the *Circular Economies Data GitHub.*

- Download NYC City Owned and Leased Properties (COLP), Facilities Database, and MapPLUTO into ArcGiS and clip these layers to their respective IBZ using the IBZ shapefile.
  - *City Owned and Leased Property (COLP) Database*
  - *Facilities Database*
  - *MapPLUTO*
  - *IBZs Shapefile*
- Using the MapPLUTO layer that is clipped to their respective IBZ Shapefiles, Government-Owned Facilities were classified into the three categories, fully tax exempt land, owned by the city and owned by either a Public Authority or State or Federal government, under the 'Ownertype' column. Using symbology features, identify each respective category using a different color.
- Identify Vacant land by selecting land use: 11 in the MapPLUTO layer. This type of land has been labeled vacant by the government usually due to reasons that prevent development such as contamination.
- Identify Non CDW Related Industrial Facilities provided by MAPPLUTO under the section 'land use.' Industrial Facilities are Land Use: 6.
- Using a combination of google maps and Simply Analytics Database, the team identified privately owned CDW Related Facilities, grouping them into 4 categories of Concrete and cement, Fabricators and metal scrap, Recycling and garbage, and Miscellaneous.

Appendix 2: Outreach Methods & Results

As a component of stakeholder outreach, a survey was developed to collect the experiences and opinions of local businesses with regard to CDW. Copies of this survey were provided by Town+Gown as well as several stakeholders. Response rates to the survey were low, but the questions have been included as an example for future information-gathering efforts.

Construction and Demolition Waste and Your Business

On behalf of Town+Gown:NYC, our team is soliciting feedback from businesses within five IBZs about their experience with construction and demolition waste (CDW) processing and workforce development. Your responses to this survey will help inform recommendations for the development of IBZ policy in general and with respect to transformation of IBZ businesses to create a local circular CDW economy. Thank you for your participation. This survey will take about five minutes to complete.

1. Which of the following best describes you?

- ◯ A business that create CDW as a result of their operations
- ◯ A business that receives and transfers CDW
- ◯ A business that uses CDW as an input

2. In which IBZ are you located?

- ◯ Long Island City
- ◯ Maspeth
- ◯ North Brooklyn
- ◯ Port Morris
- ◯ West Shore

3. Which of the following best describes your business?

- ◯ Waste Management
- ◯ Manufacturing
- ◯ Transportation & warehousing
- ◯ Utilities
- ◯ Construction
- ◯ Wholesale Trade

Other (please specify)

4. Please list the city agencies with whom you regularly interact with, and specify which one(s) you most frequently interact with

5. What volume of construction and demolition waste [CDW] does your company process produce each month?

- ◯ Less than 1 ton
- ◯ Between 1 and 9.99 tons
- ◯ Between 10 and 24.99 tons
- ◯ More than 25 tons
- ◯ None/not applicable
- ◯ Don't know

6. Does that amount of CDW vary throughout the year?

- ◯ Most during winter
- ◯ Most during summer
- ◯ Consistent throughout year
- ◯ Occasionally
- ◯ Don't know/Not applicable

7. Do you currently separate CDW for resource recovery on site?

- ◯ Yes
- ◯ No
- ◯ Don't Know

8. On a scale from 1 to 5, with 1 being the easiest and 5 being the hardest, which materials are most financially and/or logistically difficult for your facility to dispose of?

	Easiest				Hardest
Concrete	◯	◯	◯	◯	◯
Metals	◯	◯	◯	◯	◯
Masonry	◯	◯	◯	◯	◯
Gypsum	◯	◯	◯	◯	◯
Untreated wood	◯	◯	◯	◯	◯
Treated wood	◯	◯	◯	◯	◯
Plastics	◯	◯	◯	◯	◯
Other	◯	◯	◯	◯	◯

Other (please specify)

9. What organizations handle your CDW disposal? **Note: This information is confidential and will only be used to help us understand the process and flow of CDW materials.**

10. Where do you typically send the CDW materials you recover/recycle?

11. What are the largest challenges to resource recovery at your facility? (Check all that apply)

- ☐ Costs
- ☐ Space constraints
- ☐ Time constraints
- ☐ Local transportation for workers
- ☐ Local transportation/transportation routes for transporting materials into facility and out of facility
- ☐ Unclear rules
- ☐ Too many or redundant regulations
- ☐ Insufficient labor
- ☐ Other (please specify)

12. Please identify any inefficiencies you have observed in the CDW disposal process

13. What changes would you recommend to the CDW disposal system?

14. How do you recruit your workforce?

15. What educational requirements are necessary for your workers?

16. What percentage of your workforce do you estimate lives:

- ◯ Within Less than 1 mile of the facility
- ◯ Within 1-3 miles of the facility
- ◯ Within Greater than 3-10 miles but less than 10 miles of the facility
- ◯ Outside NYC

17. Do you do on-the-job training? If so what kinds?

18. What if any workforce development would you like to see in the IBZ that would benefit your business?

List of Interviewees

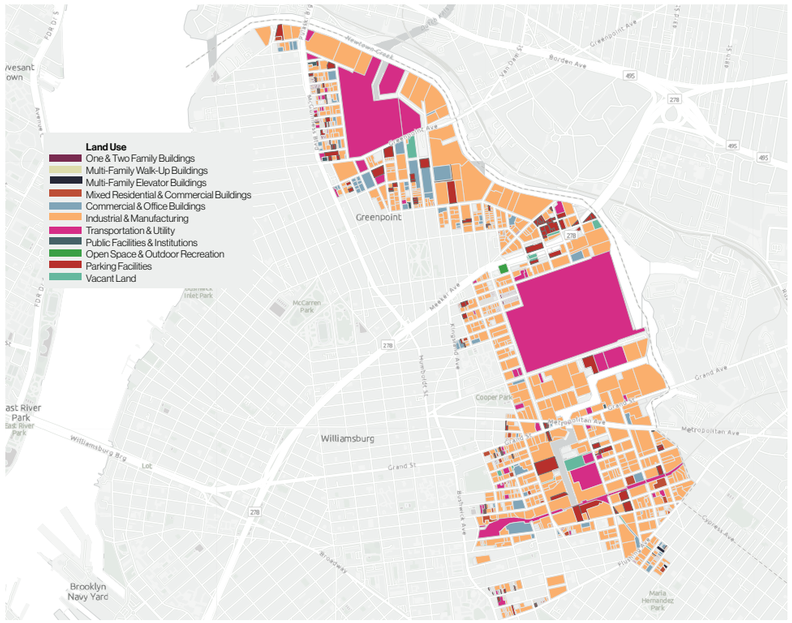
Interviewee	Title	Organization	Industry
Jerry Salama	Affordable housing developer	Janus Property	Real Estate
Bryan Murty	Senior Technical Director	AKRF	Environmental Consulting
Zachariah Schreiber	Director	OER	Environmental /Government Administration
Michelle Sarro	Assistant General Counsel		
Kendall Christiansen	Principal	Gaia Strategies	CDW Recycling
Marinna Koval	Director, Invest NYC SDG	NYU Stern Center for Sustainable Business	CDW Recycling
Patrick Sullivan	Special Counsel	Kramer Levin	Legal Services
Ankita Nalavade	Project Director, Capital Division	NYCEDC	Economic Development/ Government Administration
David Green	Principal	ARUP	Design Services/ Consulting
Ryan Cagle	Director of Strategy and Operations	NYC Manufacturing and Industrial Innovation Council (MaiiC)/ MIBA	Workforce Development
Zair Cheema	Clinical Assistant Professor and Program Coordinator, MS Construction Management program	NYU Schack Institute of Real Estate	Construction/ Real Estate
Amanda Kaminsky	Director, Sustainable Construction - Americas	Lendlease	Construction/ Real Estate
Carl Hum	Senior Vice President and General Counsel	RBNY	Real Estate
Morgan Cassidy	Sustainability Analyst, LEED Green Associate	Cooper Recycling	CDW Recycling
Joe Hogan	Vice President Building Services	AGC NY	Construction
Miriam Voss	Senior Sustainable Design Specialist	PANYNJ	Infrastructure & Transportation/ Semi-Government Administration
Amy Cole	Senior engineer, construction		
Leah Archibald	Executive Director	Evergreen	Workforce & Economic Development
Hannah Wilson	Consultant Adaptation and Resilience	ARUP	Design Services/ Consulting
Lisa Bloodgood	Director of Horticulture and Stewardship	North Brooklyn Park Alliance	Nonprofit
Cindy Isidoro	Industrial Business Program Assistant	BOC Network	Workforce & Economic Development
Quincy Ely-Cat	Manager of Industrial Business Services	MIBA	Workforce & Economic Development
Carolyn Grossman Meagher	Director of Economic Development and Regional Planning	DCP	Land use and Zoning / Government Administration
John O'Neill	Senior Planning Specialist		
Jennifer Gravel	Director of Housing and Economic Development		

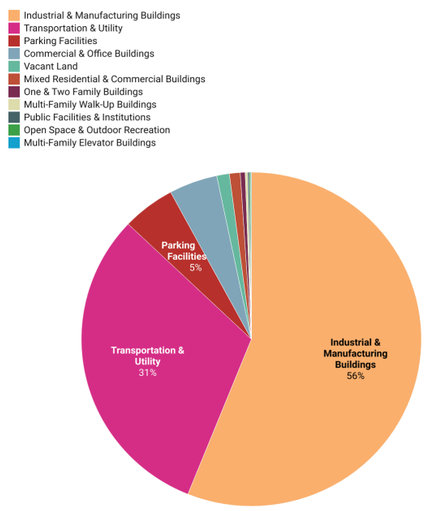
David Meade	Executive Director	Building Skills NY	Workforce Development/ Real Estate
Mike Altobelli	Vice President NorthEast Region	Pratt Industries Recycling Division	Workforce and Economic Development
Eli Khazzam	Vice President of economic development	Staten Island Economic Development Corporation (SIEDC)	Workforce and Economic Development
Noah Schumer	Assistant Vice President, Strategic Investments Group	NYCIDA	Economic Development/ Government Administration

Appendix 3: Recommendation Checklist

Implementation Timeline		
Short term	**Tax Incentive Programs**	To create an incentive program based off of the IBZ Relocation Credit, REAP and NYCIDA initiatives encouraging manufacturing and industrial businesses to reconstruct and repurpose their organizations to better participate in a local CDW economy.
	Bond Financing	Based on the Build NYC initiative; to provide bond financing encouraging organizations within the IBZs to reconstruct and repurpose to engage more efficiently in a local CDW economy.
	Incorporating CDW Recovery into Existing Mandates	Require developers to participate in circular economy initiatives for future developments through amendments of E-Designation and LEED mandates.
Medium term	**Pre-demolition salvage audits**	Expand existing programs to encourage material salvage prior to full demolition or deconstruction of buildings to remove materials from waste streams and streamline sorting of CDW.
	Materials marketplace	Develop platforms through which businesses and government agencies can buy and sell surplus material resulting from construction, renovation and demolition projects.
	Materials Passport pilot	Based on systems used in the European Union, design and implement a materials passport pilot, in which building materials are mapped and tracked to facilitate the development of material markets.
Long term	**New interim processing facilities**	Evaluate sites for their efficacy as material transfer stations and depots and ultimately construct new facilities.
	Zoning text amendment to facilitate CDW facilities in M zones	Through advocacy and ultimately legislation, eliminate as-of-right developments within heavy industry M3 zones that conflict with the effective operation of manufacturing and waste processing facilities. These may include self storage units and event venues.

North Brooklyn





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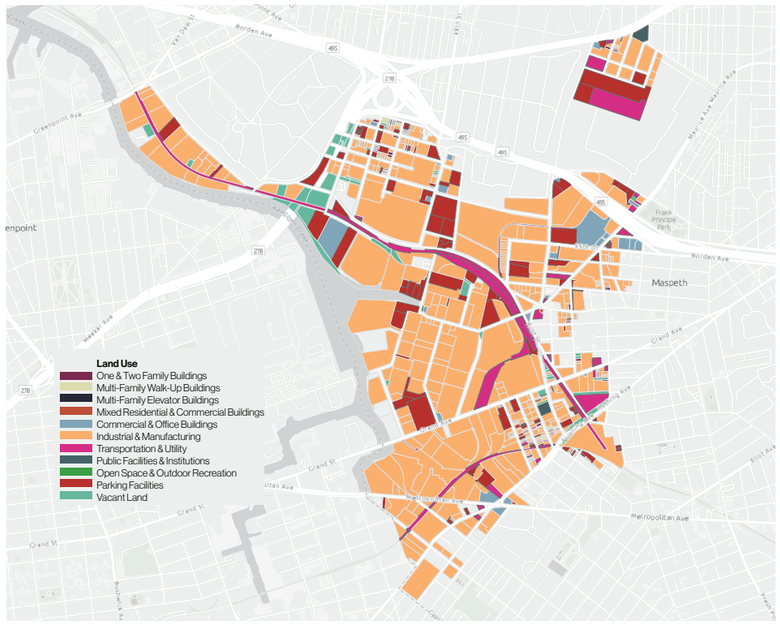
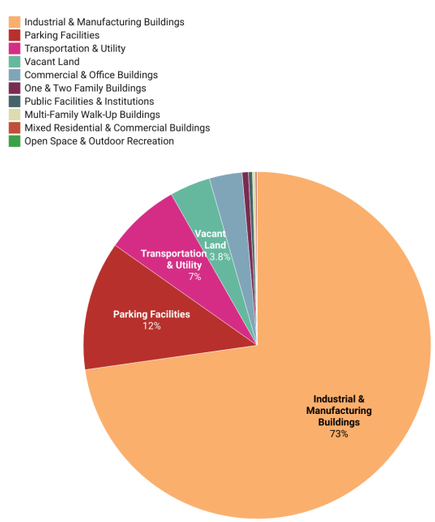
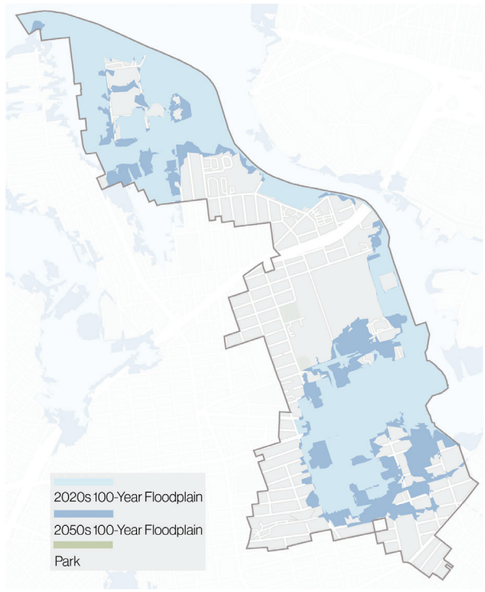
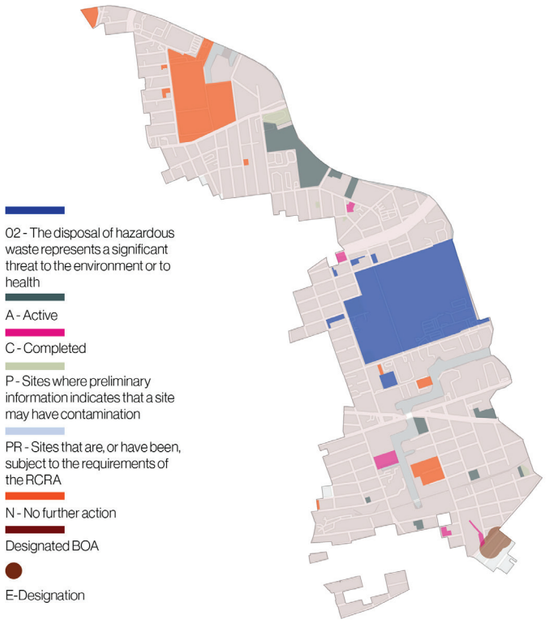
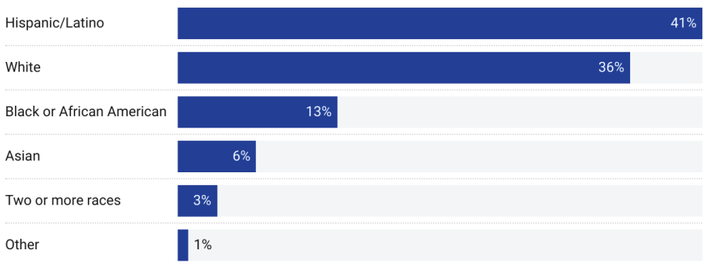


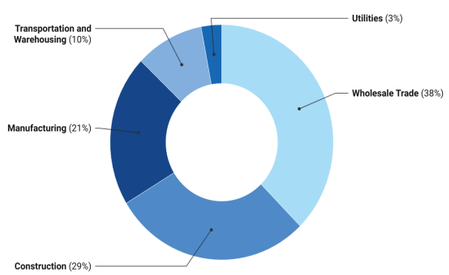


North Brooklyn Environmental Conditions

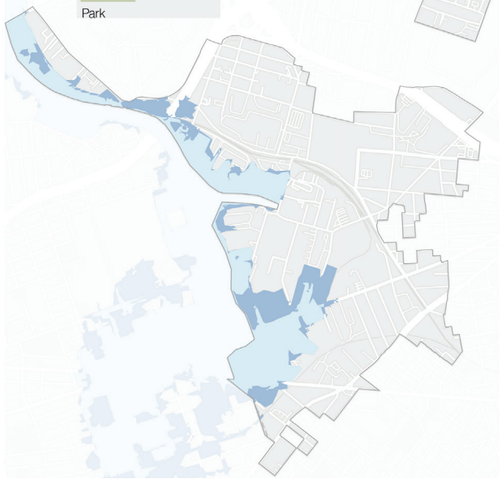


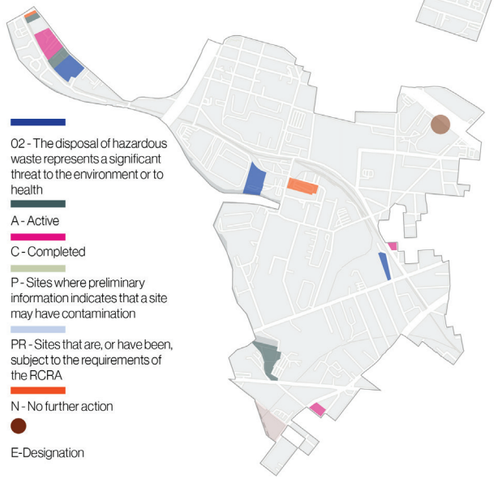


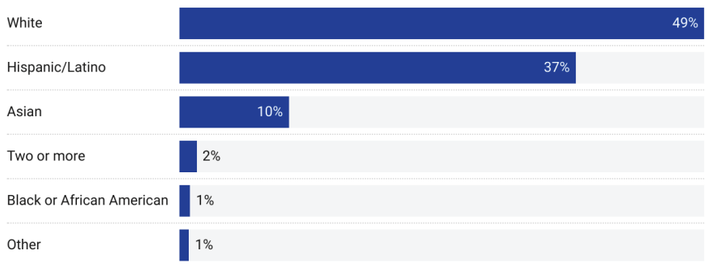


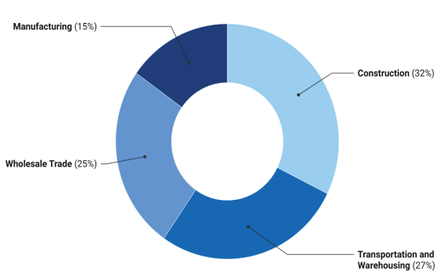


Maspeth Environmental Conditions



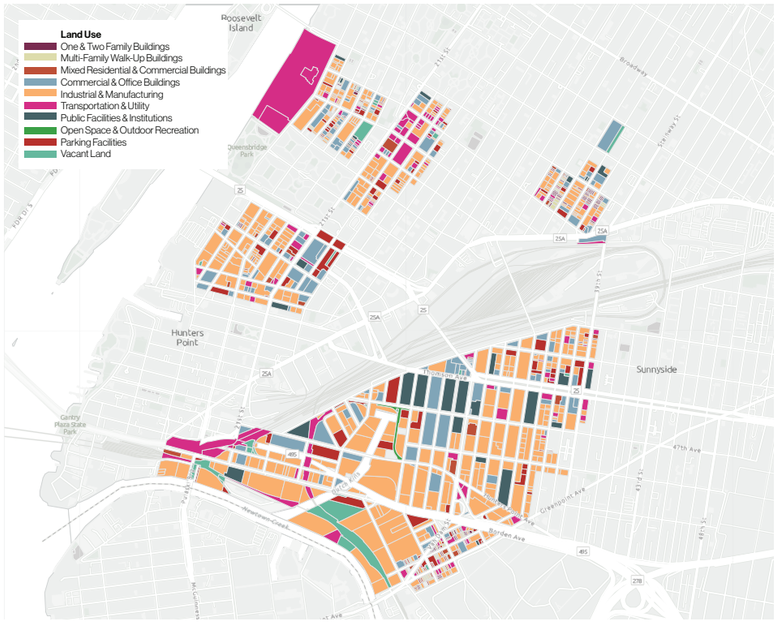


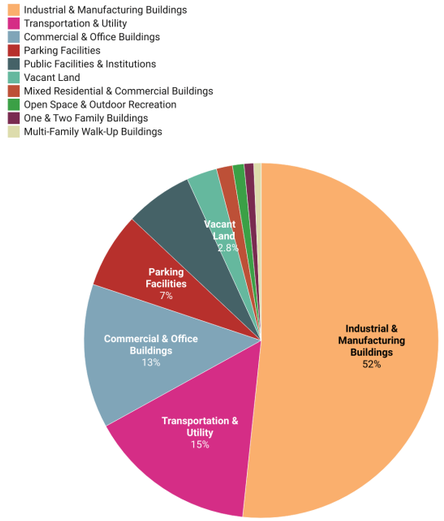




Appendix 4: IBZ Fact Sheets

Long Island City





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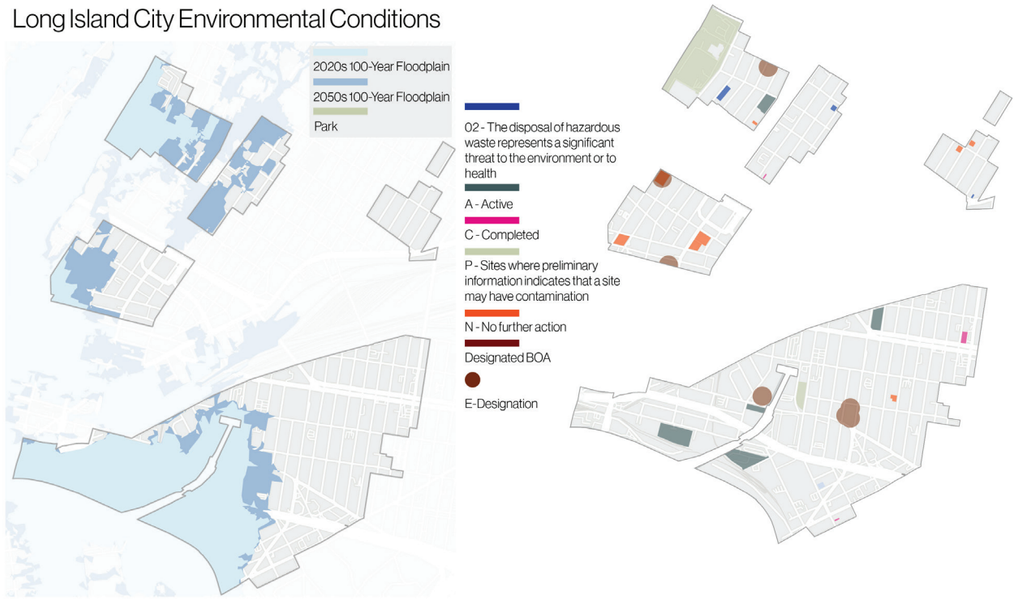

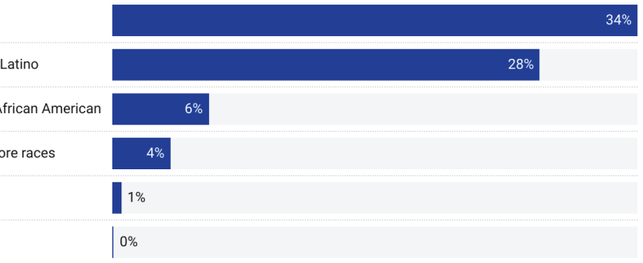

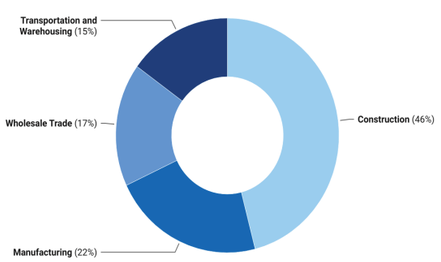

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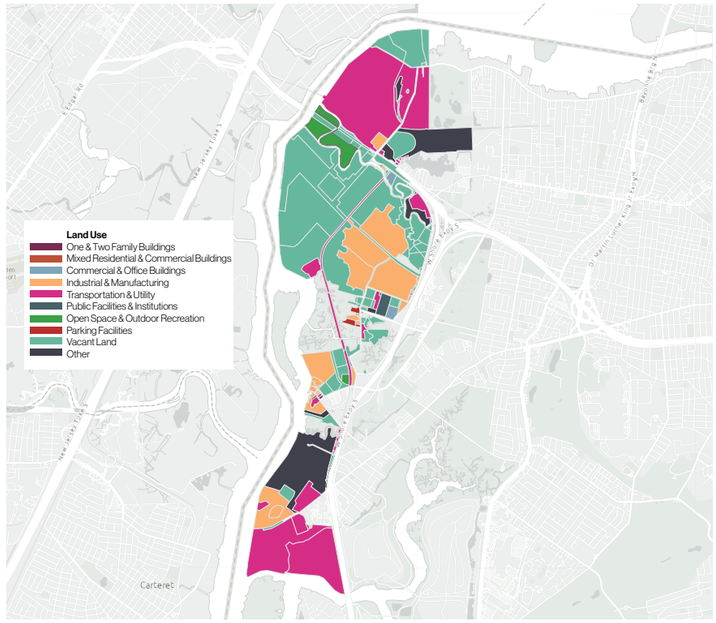

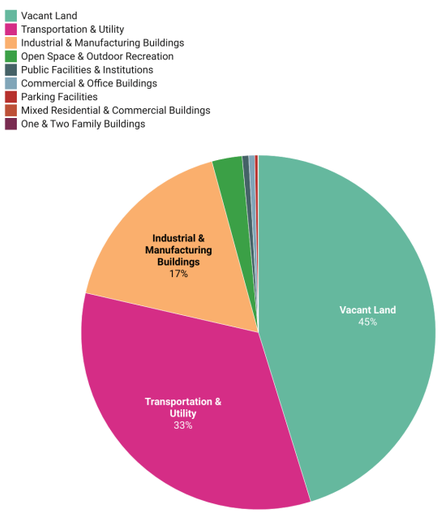

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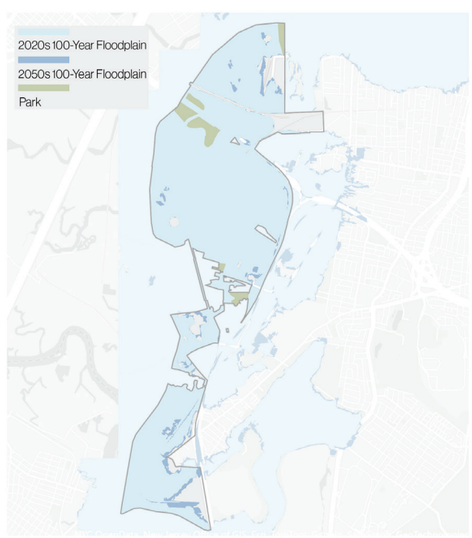
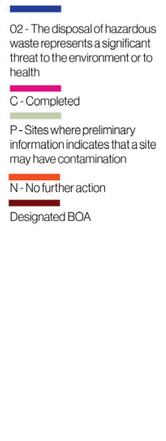
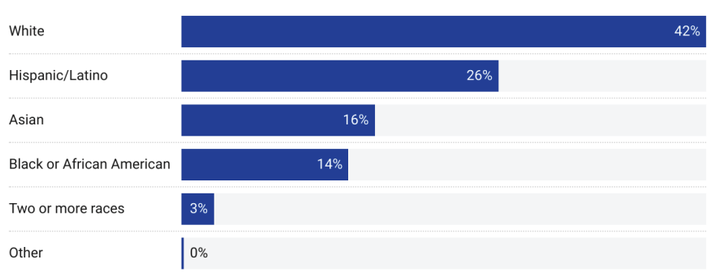
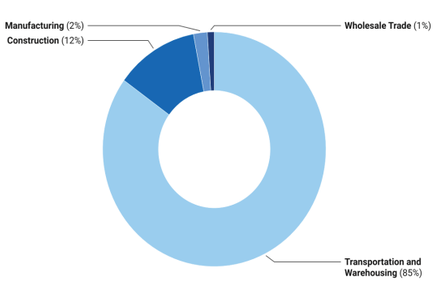
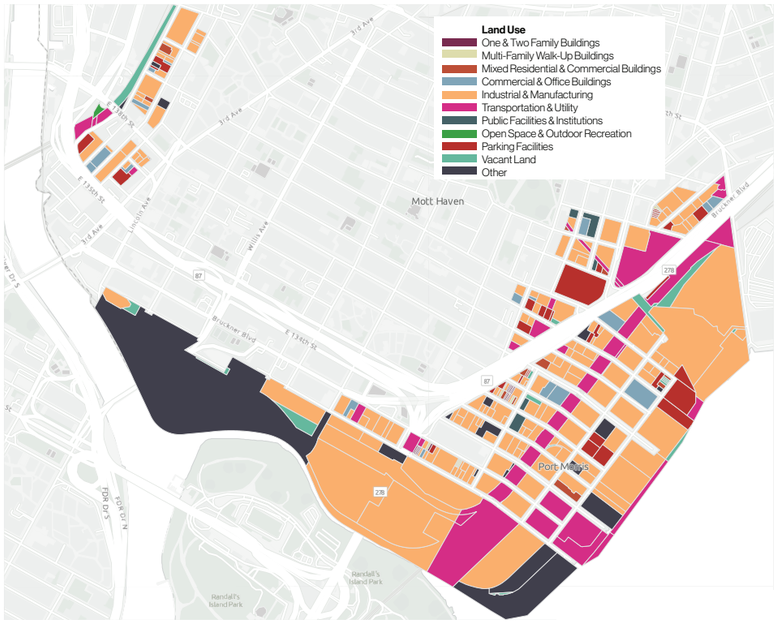


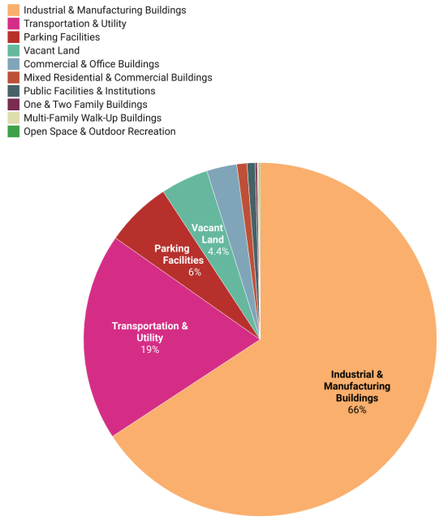




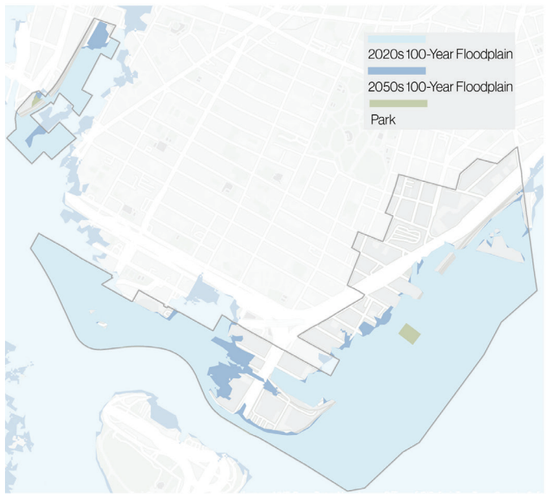


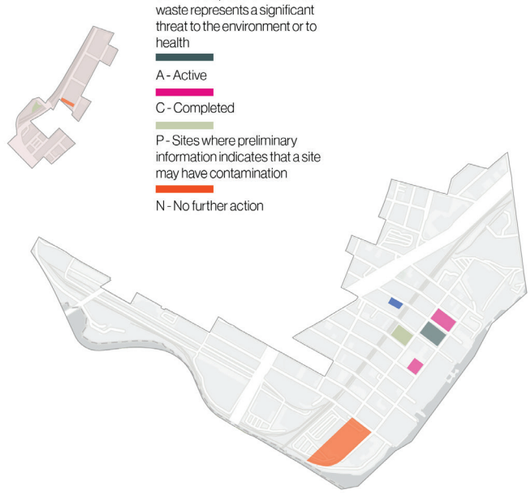
Port Morris

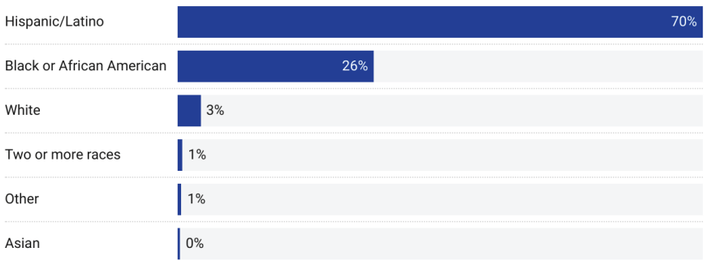


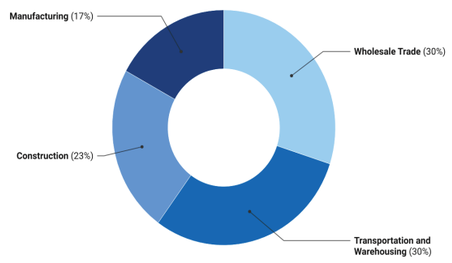


Port Morris Environmental Conditions









Building Circular Economies in New York City's Industrial Business Zones

NYU WAGNER