Sustainable Building Material Management in Detroit

November 1, 2022

Madison Kraus
Detroit City Council Green Task Force
Chair, Construction and Demolition Subcommittee
Recycling Coordinator

About the Author

Madison Kraus currently works for the City of Detroit Department of Public Works Solid Waste Division as the Recycling Coordinator. In this role she manages the City's residential, commercial, and public space recycling programs. Through this work Madison engages residents, business owners, and community organizations with the goals of ensuring equitable access to recycling opportunities and improving the local circular economy.

Madison is also the Chair of the Detroit City Council's Green Task Force Construction and Demolition Subcommittee. Madison previously worked with the Detroit environmental education non-profit, Green Living Science, as the Director of Community Engagement. She is also an active member of the Michigan Recycling Coalition.

Madison has a Bachelor degree from Lyman Briggs College at Michigan State University, and a Masters of the Environment from University of Colorado Boulder. She is a certified Domicologist and a TRUE Zero Waste Advisor.

Funded by Michigan State University Center for Community and Economic Development

The Center for Community and Economic mission is to advance MSU's land-grant mission by creating, applying, and disseminating valued knowledge through responsive engagement, strategic partnerships, and collaborative learning. They are dedicated to co-creating sustainable prosperity and equitable economies with communities.

Their main pillars include Resiliency Planning, Financial Resiliency, Circular Economies, and 21st Century Communications.

Supported by Green Living Science

Green Living Science (GLS) is an outgrowth of Recycle Here!, Detroit's drop-off recycling center and the city's neighborhood recycling program. GLS was founded in 2007 in response to the Detroit Public Schools Community District's request to bring education about recycling and natural resource conservation to its students. Early programming consisted of assemblies and in-class lessons to teach children about reusing and repurposing materials as well as natural resource conservation.

Over the years, GLS expanded their programming to not only serve schools, but also businesses, and community members. GLS is dedicated to educating Detroiters about the impact waste has on our planet. GLS was incorporated as a 501(c)(3) nonprofit in 2011.

Letter from the Author

The intention of this document is to serve as a resource to various stakeholders including policy makers, City departments, advocacy organizations, and any others as fascinated by this topic as I am.

Detroit has a deeply rooted history of environmental injustice, and it is critical to adopt a justice, equity, diversity, and inclusion lens when analyzing and planning for resource use and disposal. When attempting to understand the lifecycle of the structures in our city we must recognize that Detroit's blighted structures once held loving families or thriving businesses, and there are distinct reasons for the widespread blight that exists today. While this report does not explicitly focus on this history, it is critical to acknowledge prior to delving into details of how we manage the materials that come out of these once cared for structures.

Through this work, I hope to shed light on an **OPPORTUNITY.** I would like to recognize the work that has been done thus far from colleagues across the city, the country, and even the globe. Detroit, we have a chance to do better, to continuously improve. Let us listen, learn, and rise to the challenge.

Contents

Executive Summary....3
Connecting Blight, Demolition, and Waste Production....4
Sustainable Construction and Demolition Material Management....5
Implications and Recommendations....7
Additional Opportunities to Develop the Local C&D Recovery and Reuse Market....9
Glossary....11
Appendix....11

Executive Summary

The City of Detroit is primed to make a transformational impact in the way we manage building materials. The city is already enhancing its recycling systems, undergoing Climate Action Planning, investing in redevelopment and blight removal as well as continually improving its demolition program. Detroit is in a unique position to continue growing and interweaving these systems to become a leader in the field of **resource recovery** and **sustainable building materials management**. The following work reviews existing literature and data related to Detroit's **construction and demolition (C&D) waste** systems and identifies steps that will improve the City's impacts on the environment, the local economy, and the wellbeing of Detroit's communities. This report establishes a foundation for continued research and advocacy regarding demolition and deconstruction occurring in Detroit to inform future research and determine the course of action for the Construction and Demolition Subcommittee of Detroit City Council's Green Task Force (C&D Committee) as political advocates and topical experts.

Connecting Blight, Demolition, and Waste Production

The City of Detroit is taking strides to combat blight through a massive investment in demolition. In 2014, the Detroit Blight Removal Task Force (DBRTF) released a report with the mission to "…address every blighted residential, commercial, and public structure in the entire city as quickly as possible…," [1] and it analyzes the overall costs, methods, and strategies the city might employ to remediate blight in its entirety. The DBRTF Plan provides an in-depth look at the status of blight in the city and identifies recommendations for how to proceed. Many of the task force's recommendations were heeded by the city, such as the creation of a public Demolition Data Dashboard.

Mayor Mike Duggan successfully initiated Detroit's demolition program in 2014 and eventually created the Detroit Demolition Department (DDD) in 2020. The DDD manages the demolition contracts for emergency demolitions and for buildings acquired by Detroit Land Bank Authority which have been slated for demolitions. Over the past eight years, over 20,000 vacant buildings have been demolished, more than 2,000 of which were funded by Proposal N, a $250 million comprehensive plan[2,3]. The program was overhauled recently to require stricter standards for asbestos removal and dust control, and in response the Environmental Protection Agency (EPA) recognized the demolition program "as one of the safest in the country"[4]. The city currently provides monthly reports on its completed demolitions, the total costs of these demolitions, and more figures to improve transparency[5]. However, the DDD does not track the amount of resulting waste or the remaining number of blighted properties.

This widespread blight remediation effort has been profoundly effective and safe; however, there are concerns regarding the quantity of waste these demolitions send to landfill and the impact on the surrounding communities. The demolition of a 1,500 sq ft home produces approximately 116 tons of debris, meaning the demolition program has sent an estimation of over 2 million tons of demolition debris to the landfill since 2014[6].

Wayne County generated

28% of all C&D waste

in Michigan in 2021

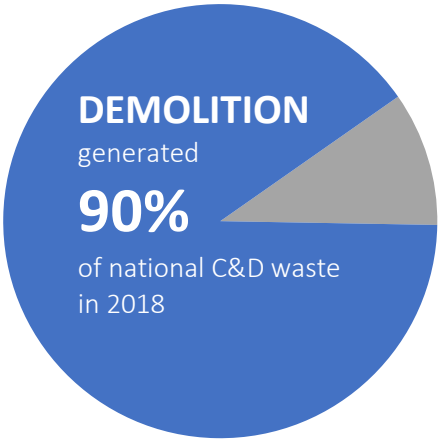
-Michigan Department of Environment, Great Lakes, and Energy
Report of Solid Waste Landfilled in Michigan 2022

---

[1] "Detroit Blight Removal Task Force Plan." *Detroit Blight Removal Task Force*, May 2014.
[2] *City of Detroit Demolition Department.* https://detroitmi.gov/departments/detroit-demolition-department *Accessed March 31 2022.*
[3] "Detroit Demolition Department Data Dashboard." 2021. *ArcGIS Dashboards, Detroit Demolition Department.*
[4] "Protecting Our Neighbors and the Environment." *City of Detroit, Detroit Demolition Department.*
[5] "Detroit Demolition Department Data Dashboard." 2021. *ArcGIS Dashboards, Detroit Demolition Department.*
[6] "Diverting Construction Waste." March 2008. *Buildings.*

Sustainable Construction and Demolition Material Management

Not only do we have limited landfill capacity, but these materials have the potential to be recovered to lengthen their useful lifespan prior to disposal while bringing significant benefits to the community and local economy. It is critical to note here that this section focuses heavily on demolition practices due to the disproportionate amount of waste it creates as compared to construction.



United States Environmenal Protection Agency, Advancing Sustainable Materials Management: 2018 Fact Sheet, 2020.

Deconstruction provides an alternative to demolition in which a building or its elements are disassembled to salvage, preserve, reuse, or recycle the materials. Detroit is presented with an opportunity to harness the significant benefits of deconstruction in its efforts to manage vacant and blighted structures and the materials that come along with it. Deconstruction has repeatedly demonstrated positive impacts on public health, the environment, and the local economy.

In 2013, a Partial Deconstruction Pilot project was implemented by various nonprofit and for-profit organizations exemplifying that deconstruction is a viable alternative to demolition for blighted homes[7]. This deconstruction effort concluded with numerous benefits which includes the creation of 100 jobs and produced revenue from the sale of salvaged material[7]above. It was reported that each deconstruction diverted an average of 90 percent of building materials, with an equivalence of 1,260 MMBTUs of embodied fossil fuel energy[7, 8]. To put it into context, a single MMBTU is 1,000,000 BTUs and a single BTU is equal to the equivalent of 1055 joules. When all 1,260 MMBTUs are converted into joules, that equals around 1.3 quadrillion joules or 1.3 terajoules. One terajoule can power about 35 households for one year. The EPA WARM model estimates that the entire pilot equals a reduction of 147,420 lbs of CO_2[7]. This pilot is not the only example of success in sustainable building materials management.

Recommendation #2: DDD Transition From Demolition Contracts Towards Deconstruction Contracts

At this time, the DDD has begun exploring alternatives to demolition by awarding an unpaid contract that allows the salvage of non-structural materials from a relatively small list of these homes. This form of contract, while a step in the right direction, significantly limits the amount of value or resources that can be salvaged from blighted homes, as a majority of the material that is valuable in these homes is the structural timber. The DDD should continue to expand this programming to incorporate deconstruction practices.

Detroit is ripe with businesses moving into the sustainable building industry. This is apparent in businesses such as Huntington Place and Bedrock vying for LEED certification[9,10]. Additionally, there is a diverse group of businesses certified as "Bee Green Businesses" by Green Living Science, a Detroit-based nonprofit which provides waste reduction education and consulting services. Other businesses such as Reclaim

[7] *Partial Deconstruction.* https://www.deconstructionproject.com/
[8] Frazier, Kysha, and Tammy Coxen. Sept. 2012 "Creating Triple Bottom Line Impact*" Detroit GreenWorks Solutions*
[9] "Bedrock says clean energy initiative to supply 15% of its power in 2023." April 2021. *The Detroit News.*
[10] "TCF Center Becomes the Largest LEED Certified Building in Michigan." October 2019. *Huntington Place.*

Detroit, Architectural Salvage Warehouse Detroit (ASWD), End Grain Woodworking Co., and Eco-Environmental Solutions specialize in deconstruction, salvage, reclaim, or resale[11,12,13,14]. It is evident that Detroit is slowly trending towards C&D material recovery and reuse but still has a long way to go to integrate these practices on a broad scale as many other cities have.

Across the nation, cities have enacted deconstruction policies and programs for a variety of reasons. Through conversations with Portland's Construction Waste Specialist, Shawn Wood, and San Antonio's Deconstruction and Circular Economy Program Manager, Stephanie Phillips, it was clear that these cities do not struggle with blight remediation as their main motivation for deconstruction. Rather, their housing stock consists of livable structures and their desired outcomes were primarily to divert waste from landfills and reduce the harmful environmental impacts of demolition. However, similar to Detroit, many cities like Pittsburgh and Baltimore struggle with blight and abandonment and have taken to executing sustainable materials management programs and policies[15,16].

For example, the City of Baltimore incorporated deconstruction contracts into their blight removal process, according to the 2019 Baltimore Sustainability Plan[17]. In 2018, the City was also able to salvage 1.2 million bricks and over 425,000 feet of lumber for resale[15]. Over the course of eight years, one highly awarded deconstruction enterprise was able to deconstruct over 600 blighted properties in Baltimore, creating six to eight jobs for every site, with up to a 90 percent diversion rate[18].

Across other rust belt cities in the United States, similar policies are common. In 2021, the Mayor of Pittsburgh issued an executive order creating a city-led deconstruction effort and establishing a set of principles to guide their blight removal initiatives. An ordinance in Chicago, IL mandates contractors to track C&D debris generation and achieve a 50 percent diversion rate[19]. Madison, WI currently mandates that construction and roofing projects recycle C&D materials19[19]. As such, there are a variety of approaches worthwhile to consider in Detroit since our city has made a historic commitment to blight remediation and produces a large amount of C&D waste.

Recommendation #3:
Explore a Local Ordinance to Increase C&D Material Diversion

Cities, both similar and dissimilar to Detroit, utilize similar facts and data to justify their investments in deconstruction and sustainable C&D material management. In 2014, the DBRTF recommended deconstructing approximately 7,000 residential structures, based on the end markets for materials at the time. However, now, markets for reclaimed materials are rising[1,20]. Sustainable building materials management practices have been proven and are supported by encouraging statistics and benefits. Therefore, the City of Detroit is in an opportune position to reap the benefits of deconstruction.

---

[11] ASW Detroit, https://aswdetroit.org/. *Accessed 27 Apr 2022.*
[12] *Reclaim Detroit*. https://reclaim-detroit.myshopify.com/ *Accessed 27 Apr 2022.*
[13] End Grain Woodworking Co. https://www.endgraindetroit.com/ *Accessed 27 Apr 2022.*
[14] Detroit Innovation. https://detroitinnovation.org/fellow/gary-ringer/ *Accessed 27 Apr 2022.*
[15] "Baltimore City Deconstruction Project Named National Award-Winning Program in Mutual of America's 2018 Community Partnership Award Competition." PR Newswire, Nov 2018
[16] "Deconstruction in Pittsburgh." *The City of Pittsburgh.*
[17] "The 2019 Baltimore Sustainability Plan." 2019. *Baltimore Office of Sustainability.*
[18] "Humanism Announces Closure of Details Deconstruction: an Innovative Social Enterprise" 2020. *Humanim.*
[19] "Muskegon, Michigan Deconstruction Economic Cluster Feasibility Study." 2017. *Michigan State Center for Community and Economic Development.*
[20] "St. Louis Deconstruction Market Assessment" April 2019, *Delta Institute.*

Adopting deconstruction, in addition to demolition, creates more well-paying job opportunities for Detroit businesses. The DBRTF determined that deconstruction of only 10 percent (approximately 7,232 buildings) of the total amount of blighted structures in the city would create over 30 new jobs[1]. In addition, the recycling potential of these materials would add 120 new jobs with the creation of two C&D recycling centers[1].

Recommendation #5: Invest in a C&D Recovery Yard and Reuse Facility

Investing in this industry would boost the local circular economy, keeping natural resources in circulation as well as local spending on the salvaging, refurbishing, recycling, and resale of building materials. These materials provide affordable repair opportunities to residents, and this process supports local businesses and nonprofits handling salvaged materials.

Recommendation #6: Improve Community Resources

It has been demonstrated repeatedly across the United States that C&D material recovery creates many benefits. It is also critical to point out that this would assist the City in achieving the goal as set in the Sustainability Action Agenda, Goal 7: reduce waste sent to landfill to 30% by 2029.

Implications and Recommendations

This analysis aims to analyze data and opportunities for Detroit to improve their building materials management practices to incorporate a circular economy approach. There are several recommendations and data gaps to acknowledge throughout this research, indicating a need for further exploration.

Recommendation #1: Obtain Baseline Data

Detroit does not currently have any public data indicating the quantity of C&D waste going to landfill, or the potential for recovery, and there is currently no method for analyzing that information. Moving forward, **a baseline must be established to set goals and track future diversion of C&D material**. Online tools can be used for this, such as Green Halo Systems.

Utilize the Detroit Demolition Department's data dashboard to obtain:
1) A baseline value of the yearly quantity of waste produced from demolitions, and
2) An updated number of blighted structures in the City.

*See Figure 1 in Appendix for estimation of the volume of major C&D material types per average Michigan Structure.

Recommendation #2: The Detroit Demolition Department Transition Away From Demolition Contracts Towards Deconstruction Contracts

At this time, the DDD contracts out the demolitions of DLBA owned properties. The DDD has awarded an unpaid contract to ASWD to salvage non-structural materials from a relatively small list of these homes. The DDD should continue to expand this programming to further incorporate deconstruction practices.

Recommendation #3: Explore Local Ordinance to Increase C&D Material Diversion

Detroit City Council should explore **enacting an ordinance** which would enhance the supply, distribution, and demand of C&D materials. Various avenues include:

1. Requiring a percent diversion by weight or volume for new constructions.
2. Requiring all construction and demolition projects to complete a Sustainable Materials Management Plan to identify diversion opportunities.
3. Requiring deconstruction of structures built prior to 1929, or another year as specified in the ordinance.
4. Requiring new constructions to incorporate a certain percent of used, salvaged, or recycled materials, or requiring LEED certification.
5. Requiring new constructions to create an End-of-Life Waste Diversion Plan.

These avenues should be built out in phases to allow time for the market to adjust and practitioners to adapt. Requirements through the ordinance may also differ to accommodate for property types (single family residential, multifamily residential, commercial, etc.), type of activities happening on site (renovation, roofing, new construction, demolition, etc.), or building size. The city should also consider targeting specific markets that could be considered "low hanging fruit," such as roofing materials. In order to address issues of transparency, contractors may be required to pay a deposit when they submit a Sustainable Materials Management Plan and are refunded after providing proof of diversion.

Throughout this process, the city should engage with Detroiters to ensure their needs are being considered and met. Community engagement is a must if change is meant to be long-term. There needs to be an active strive towards building new relationships with intended beneficiaries and community organizations in order to form a strong network for C&D material diversion. This includes involvement, education, facilitation, opportunities, and especially the empowerment of the people of Detroit. Local ordinances should primarily be in the benefit of the people rather than for the benefit of the network. Putting the needs of the people should go first and foremost when enacting positive change for the community.

Recommendation #5: Invest in a C&D Recovery Yard and Reuse Facility

To capture and process building materials from construction, deconstruction, demolition, and renovation, a **C&D recovery yard should be built within city limits**. This will reduce the need to source-separate materials, bolster the local economy, and significantly improve our supply chain. The DBRTF initially recommended the construction of two C&D recycling facilities, one on the East side and one on the West side. One study reported the investment in C&D recycling infrastructure at $63.33 per ton of material processing capacity, and this investment is critical to reinforce a local circular supply chain of C&D materials[19].

Recommendation #6: Improve Community Resources

Investment in a C&D recovery yard would provide the chance for haulers and residents to divert some of this material from the landfill. Best practices, resources, and drop-off recycling facilities accepting these materials should be shared publicly to ensure opportunities for diversion are provided on all scales from home renovations to large developments.

Additional Opportunities to Improve Local C&D Recovery and Reuse

Creating Solutions for Source Separation

Source separation of C&D materials on a job site requires a significant amount of space but yields the best outcomes for waste diversion. This barrier is not easily overcome in populated neighborhoods, where blight remediation is taking place, or in dense areas, such as downtown Detroit. **Best practices for source separation should be determined and shared** with stakeholders when they interact with the city for permitting processes.

Incorporating Deconstruction Feasibility into Existing Site Analysis Processes

Prior to demolition, buildings are evaluated to determine if they should be stabilized for renovation or demolished. This process should incorporate a widespread practice – **completing a Deconstruction Feasibility Assessment**. These assessments come in many forms, and the EPA has various tools to refer to including a Deconstruction Rapid Assessment Tool, and a Building Material Reuse and Recycling Estimating Tool[21].

Sharing, Encouraging, and/or Requiring Best Practices

Best practices in construction and demolition waste reduction should be provided to all contractors prior to the project planning stage. Contract language may require adherence to best practices.

Opportunity Sharing for End-Market Development

There are various opportunities at the State level, such as NextCycle Michigan, to contribute to the **development of end-markets for C&D materials in the region**. The funding and business development opportunities have the potential to significantly bolster end markets for C&D materials in the region. Other considerations for potential end market development could be incentivizing or requiring via local ordinance the use of salvaged content in new development of a certain caliber.

In addition, there is not a significant amount of local data regarding the quantity of material and potential end markets. Further research on the local economy for salvaged materials should be considered. Similar research was done within a 150-mile radius of Muskegon; the methods could be replicated near Detroit to determine end market opportunities.

Local System Mapping

To fully address the local building materials supply chain, a **regional systems map** should be produced to better understand the levers and potential interventions in the system which would increase our C&D waste diversion rates.

[21] "Large-Scale Residential Demolition." November 2021. *United States Environmental Protection Agency*.

Address Structural Inequities that Cause Blight

Throughout this work, the city should engage with Detroiters to ensure that their voices are heard and incorporated into any actions moving forward. There should be an emphasis on community engagement where the focus is on the long-term sustainability of C&D diversion and where work is done collaboratively to address issues that affect the well-being of the people of Detroit, especially those whose voices have been historically unheard like people of color.

"At the heart of all blight removal efforts in Detroit is city officials' chronic abdication of responsibility for and unwillingness to address the structural inequalities that create blight in the first place. This does not mean that blight removal is unnecessary or that demolition, deconstruction, and reclamation practices are inherently wrong because they reflect, contribute to, and do not ''fix'' Detroit's legacy of disinvestment; simply changing these practices will not automatically ''fix'' the way people perceive and engage with the concept of urban blight and the necessity of its removal…If expanded and prioritized, the deconstruction and reclamation process could serve as a way to engage with and work through the trauma and unresolved grief associated with Detroit's postindustrial decline and the enduring legacies of racism that created and shaped the landscape we see today."

– Kaeleigh Herstad
Reclaiming' Detroit: Demolition and Deconstruction in the Motor City, 2017

Glossary

C&D waste: C&D materials often contain bulky, heavy materials such as: Concrete, Wood (from buildings), Asphalt (from roads and roofing shingles), Gypsum (the main component of drywall), Metals, Bricks, Glass, Plastics, Salvaged building components (doors, windows, and plumbing fixtures), Trees, stumps, earth, and rock from clearing sites.[22]

Deconstruction: A method of taking down or dismantling a structure in a way to preserve its components for further use in its life cycle.

Domicology: The study of the economic, social, and environmental characteristics relating to the life cycle of the built environment.

Source *Separation:* A waste management process which involves the separation of waste into different elements, typically for reuse.

Sustainable Building Materials Management: A systemic approach to using and reusing building materials more productively over their entire life cycles.

Resource Recovery: The diversion of waste from landfill or incineration through recycling, repair, reuse, or composting.

Appendix

City of Detroit Sustainability Action Agenda

https://detroitmi.gov/departments/general-services-department/office-sustainability/sustainability-action-agenda

Figure 1: Estimated Material Quantities from a 1,500 to 2,000 ft^2 Residential Structure	
Material Name	**Estimated Quantity**
Framing Lumber	4,000 board feet (BF) (BF=12" x 12" x 1")
Standard Brick	5,000 bricks
Asphalt Shingles	650 square feet (ft^2)
Flooring	1,125 square feet (ft^2)
Concrete	37 cubic yards (yd^3)
Drywall	1,445 ft^2
Siding	1,620 ft^2

Note: To estimate potential material salvage via deconstruction, multiply material category quantity (M) by the # of structures deconstructed (N) and the estimated material recovery rate (R). Material Quantity = M * N * R

[22] "Sustainable Management of Construction and Demolition Materials." United States Environmental Protection Agency.