

Demolition Waste Recycling Opportunities

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Session Overview of Domicology

- Domicology: A comprehensive approach to structural abandonment
- In this session we will:
 - Discuss causes of structural abandonment
 - Examine the social, economic and environmental consequences associated with abandonment
 - Propose a new built environment paradigm to reduce the negative effects of blight and end future abandonment
 - Explore methods of financing blight removal that reduces the burden on vulnerable people and places.
 - Identify next steps in pursuing a more environmentally sustainable, economically feasible and socially just built environment paradigm.

What are some of the Causes of blight and Abandonment

- Contributing factors:
 - Transformation of the economy
 - Loss of jobs through competition, automation, etc.
 - Loss of jobs through loss of non-renewable resource (mining town)
 - Racial Segregation
 - Decline in population
 - Small box government/inflexible municipal boundaries
 - Declining public revenues
 - Decline in the quality of public services
 - Changes in housing preferences
 - Changes in Commercial preferences (shopping malls to Amazon)
 - Natural Disasters
 - Man-made disasters (Chernobyl/War)
 - Poor schools
 - Crime and perceived safety
 - Others?

Blight Is....

- A public nuisance
- An attractive nuisance
- A fire hazardous or otherwise dangerous
- Has had the utilities, plumbing, heating or sewerage disconnected, destroyed, removed or rendered ineffective
- A tax-reverted property
- Owned or is under the control of a land bank
- Has been vacant for five consecutive years and not maintained to code
- Has code violations posing a severe or immediate health or safety threat

Structural Abandonment in the United States

- 7.4 million homes that are currently vacant and not being marketed for sale or rent in 2012 (The Joint Center for Housing Studies of Harvard University).
- nearly 40 percent of the nation's vacant homes are located in just 10 percent of all census tracts

(Duke 2012).

- More than two dozen malls have shut down in the last four years and another 60 malls are on the brink of death (New York Times Report)
- It is estimated in Detroit, Michigan that 36% of commercial properties are vacant (Detroit Works Project 2012)
- 78,506 total structures needing intervention in Motor City
- Motor City Mapping categories
- 72,328 Single Family Residential Structures
- 707 Multi-family Residential Structures
- 3,904 Neighborhood Commercial Structures with lot size < 25,000 sq. ft.
- 220 Large-Scale Commercial Structures with lot size > 25,000 sq. ft
- Industrial Structures with lot size > 25,000 sq. ft
- Additional Research Required:
 - Institutions like churches, school government offices, etc.
 - Unknown buildings with no identifying characteristics

Vacant Properties: The True Cost to Communities

- A study in Austin, Texas found that “blocks with unsecured [vacant] buildings had 3.2 times as many drug calls to police, 1.8 times as many theft calls, and twice the number of violent calls” as blocks without vacant buildings.
- More than 12,000 fires break out in vacant structures each year in the US, resulting in \$73M in property damage annually. Most are the result of arson.
- Over the past five years, St. Louis has spent \$15.5M, or \$100 per household, to demolish vacant buildings. Detroit spends \$800k per year, and Philadelphia spends \$1,846,745 per year cleaning vacant lots.
- A 2001 study in Philadelphia found that houses within 150 feet of a vacant or abandoned property experienced a net loss of \$7,627 in value.

Costs to Homeowners

- Higher Insurance Premiums
 - Proximity to vacant/abandoned properties makes obtaining homeowner’s insurance, mortgages, and loans for home improvement more difficult
 - Insurance companies pay attention to neighborhood dynamics
- Poorer Quality of Life
 - Abandoned buildings = social fragmentation
 - Feelings of isolation weaken the community
- Large numbers of vacant buildings symbolize that no one cares
 - Increases likelihood that property values will continue to decline, resulting in further abandonment
- Aesthetic impact of abandoned properties
 - Not easily quantified in dollars

Health Impacts

- Lead and asbestos are highly dangerous health and safety hazards and found in many older structures.
- Lead can cause lifelong learning and behavioral problems in children if they are exposed at a young age. Asbestos is a carcinogen.
- Demolition can produce large amounts of ambient lead and asbestos dust.
- Pre-removal of asbestos by certified workers is often required (increases cost of demolition and deconstruction)
- Demolition done using a “wetting” process can reduce these hazards, but does not eliminate lead dust completely

- Industrial and commercial sites may contain other contaminants.
 - There are approximately 450,000 sites considered brownfields in the U.S.

Economic Impacts

- The removal of all the currently estimated abandoned residential properties (7.4 million) could cost over \$88 billion dollars (not including brownfield remediation costs)
 - The full cost of demolishing an average residential property is around \$12,619 (City of Detroit-Blight Taskforce 2016)
- Abandoned properties inherently decrease the tax revenues available to public entities to support public safety, debt retirement, public works maintenance and other critical social needs.
 - Local Government Financial Stress due to loss revenues

Property Values Associated with Blight

- On average, commercial and industrial properties near brownfields are 10% lower in property values (Paul, 2008)
- Property values within a 1.5-mile radius increase by at least 10% when a brownfield parcel is redeveloped (Paul, 2008)

Environmental Impacts

- The US EPA estimates that 136 million tons of construction and demolition waste are generated each year. This volume of waste constitutes approximately ¼ of all landfill waste.
- Environmental Impacts
- It is estimated that there are more than 450,000 brownfields in the U.S.
- Cleaning up and reinvesting in these properties increases local tax bases, facilitates job growth, utilizes existing infrastructure, takes development pressures off of undeveloped, open land, and both improves and protects the environment.
- As 2016, there were 1,328 Superfund Sites listed
- Michigan has 65 on the National Priority List - www.epa.gov/superfund/national-priorities-list-npl-sites-state#MI

WHO PAYS FOR THIS? – You Do!

- In general, when no responsible party can be held accountable, the taxpayer pays for blight removal and contaminated sight clean up.
- For example, in brownfield redevelopment the public foregoes future tax revenues to finance cleanup.
- In superfund sites (the dangerous places) we pay just to remove the toxic materials

To Summarize the key points

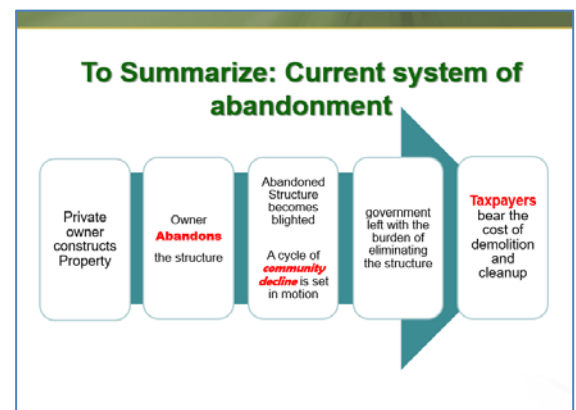
- Structural abandonment is NOT GOOD for people and places:
- It presents clear health and safety hazards
- It is expensive, and we are paying for it
- It is an unsustainable use/abuse of resources
- And it is our issue!

So Why Do We Allow It?

- What if we decided that abandonment was not acceptable. What would we do?
- How would we secure the financial resources to remove obsolete structures?
- What would we do with the already abandoned (or soon to be abandoned) structures
- What would we do to end future abandonment?

A New Structural Paradigm

- Would recognize that the built environment *has a life cycle*
 - Structures have an end of useful life!



- We would *plan, design, construct, use, reuse, deconstruct* with this life cycle in mind
- We would develop public policies to provide *financial assurances* that at the end of a structures useful life there would be the necessary resources *to remove the structure*

The Alternative Paradigm

- Owner constructs facility and anticipates end of useful life and designs accordingly
- Over time structure is used and reused
- Structure *deconstructed* with funds from the bond/insurance
- The parcel is returned to the original state
- Blight and abandonment prevented!
- Consumer-occupant assumes cost of deconstruction NOT GENERAL TAXPAYER!

Accounting for the End of Life of a Structure

- Goal: to reduce/eliminate the financial burden of structural removal from vulnerable communities and the general taxpayer
- To Date we have examined three possible alternatives:
- Bonding
- Insurance
- Local Reuse Ordinances Bonding

Bonding

- Developer purchases the bond and it is secured with the local government entity for the cost of deconstruction
 - This is already a practice for certain structures such as Wind Turbines, Cell Towers, Oil Rigs
- Cost of the bond can be assessed at the time of final building inspection.
 - The bond will be necessary for the issuance of the occupancy permit.

End of Structures Useful Life Insurance Policy

- Developer/owner is required to carry insurance to cover the cost of deconstruction, removal, restoration, environmental damage, and threats to public safety and health
 - Industries such as the railroads purchase a similar form of insurance to cover accidental spills from train wrecks
 - Michigan Fire Insurance Withholding Program
- Premium Amortized over the entire lifetime of the structure
 - Accommodates changes in structure use/environmental risk
- This would require public policy leadership

Local Ordinances

- Can reduce the practice of landfilling C&D material for both new construction and structures at their end of life
- Variety of methods employed:
 - Requiring deconstruction of dwellings built before a certain age
 - Milwaukee requires this for a structure built in 1929 or earlier
 - Debris Diversion requirements
 - Specifies by volume or weight a % of structural material from C&D projects that must be diverted from a landfill- examples Cook County, Ill.& Austin, TX.
 - Require a Deconstruction Survey
 - To obtain a demolition permit a deconstruction survey required that identifies and values reusable materials and usually coupled with a debris diversion requirement - Palo Alto California

Welcome to the world of Domicology!!

- Domicology is the study of the economic, social, and environmental characteristics relating to the life cycle of the built environment.
- Domicologists

- Recognize that manmade structures have a life cycle
- Examine the life cycle continuum of the built environment and plan, design, construct, and deconstruct in order to maximize the reuse of materials and minimize the negative impacts of a structure's end of useful life
- Identify innovative tools, models, policies, practices, and programs that can sustainably address a structural life cycle
- Conduct research on the technical, economic, and policy challenges present in a structure's life cycle and seek to reduce the negative social, economic, and environmental impacts associated with structural abandonment
- Support a circular structural economy that creates jobs for vulnerable people and forms new business in distressed places

Muskegon Deconstruction Economic Cluster Feasibility Study

- Michigan State University Center for Community and Economic Development
- West Michigan Regional Shoreline Development Commission

Purpose

- Designed to examine the feasibility of deconstruction as an alternative solution to the economic, social, and environmental problem of structural abandonment.
- Focuses on Midwest legacy cities with high concentrations of structural abandonment.
- Tests the economic feasibility of using deconstruction practices rather than demolition as a way to reduce blight.
- Explores the feasibility of establishing a deconstruction based, repurposing sector economy in Muskegon, Michigan.
 - This cluster economy would require a skilled labor force, supplied by job training programs in an area that has suffered from high unemployment rates.

Process

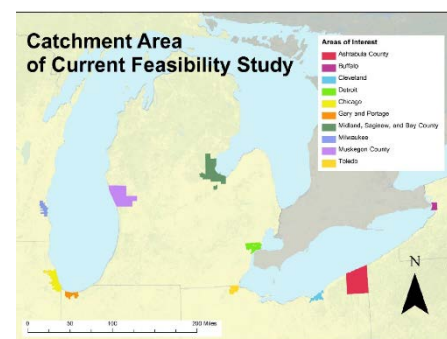
- The catchment area of cities targeted by this study was selected with specific criteria, including:
 - cities with high concentrations of structural abandonment,
 - an active port to transport deconstructed materials to Muskegon, and
 - a land bank to facilitate the acquisition of abandoned houses eligible for deconstruction.
- All cities in the catchment area for this study are in close proximity to a deep water port.
- Data was collected with the collaboration, advice, and guidance of a local and regional advisory committee, and land banks in the catchment area.

Methodology

- Online survey of Great Lakes land banks and associated organizations.
- Phone and in-person interviews with land banks and associated organizations.
- In-field analysis of vacant residential structures and the materials they yield during a deconstruction operation.
- Existing studies and reports.

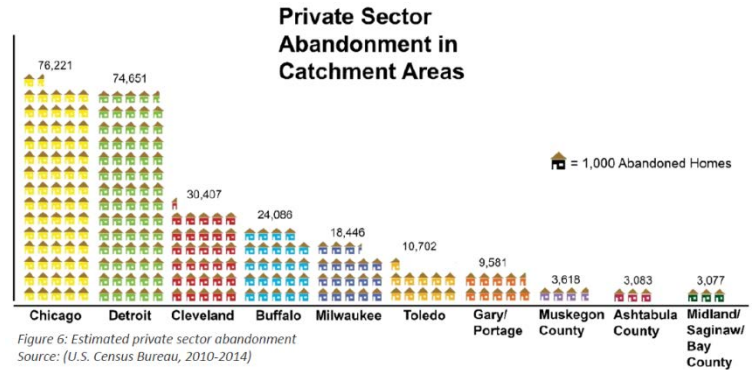
The Catchment Area

- The catchment area includes:
 - Ashtabula County,
 - City of Buffalo,
 - City of Chicago,
 - City of Cleveland,
 - City of Detroit,
 - City of Milwaukee,
 - Muskegon County,
 - City of Toledo
 - two amalgamated areas: the cities of Portage and Gary, and Bay County and the cities of Saginaw and Midland.



Abandonment in the Catchment Area

- As a region, the Midwest is estimated to have 3,481,986 vacant housing units, large portions of which are concentrated in the Chicago [341,014], Cleveland [155,403], and Detroit [221,533] metropolitan areas (U.S. Census, 2015).
- Commercial and industrial abandonment is defined and measured differently than residential vacancies and is therefore difficult to measure in an aggregate statistic. This makes cost/benefit analysis of deconstruction in large Midwestern cities with high concentrations of residential, commercial, and industrial abandonment difficult.



High-volume/low-value materials

- The materials salvaged in the third skim are typically high-volume/low-value materials that need to be taken to a central facility for further sorting and processing.
 - The value of the third skim materials lies in their product consistency and volume since these types of materials are typically used in bulk on new construction projects.
 - Second skim materials hold value due to their unique attributes.

Types of Material in Abandoned Houses

- The most ubiquitous material found in abandoned houses is wood. This exists in structural (i.e., framing members, roof trusses, floor joists) and non-structural (i.e., roof and wall sheathing, fireplace mantles, flooring, siding, trim/architectural material) forms.
- Other materials include:
 - Gypsum boards or plaster and lathe (found in interior walls)
 - Asphalt shingles, asphaltic and asbestos-based siding products
 - Wood, vinyl, and aluminum siding
 - Brick

Structural Material Reuse & Recycling Market Study

- Muskegon Study Identified a weak deconstruction & reuse supply chain in Michigan.
- This study aims to identify where the stakeholders in structural reuse exist in Michigan and the businesses that connect these stakeholders.

Study Purpose & Scope

- The purpose of this study is to identify all the Michigan businesses involved in the:
 - handling of material derivatives of structural demolition and deconstruction; and
 - 2) processing these derivatives in a way that reuses, recycles, and/or repurposes the material.
- From this industry profile, data including annual sales volume, number of workers employed, and other metrics about this industry, will be analyzed.

Primary NAICS:

- Michigan businesses involved anywhere along the supply chain within the structural material reuse/recycling industry

Secondary NAICS:

- Michigan Businesses involved anywhere along the supply chain within the construction and demolition industry.

Method

- North American Industrial Classification System (NAICS) code Analysis.
- ArcGIS Business Analyst Software.
- Excel data skimming.
- Spatial analysis using dot density ArcGIS tool, among others.

Current Market

- Reuse Industry
- Over 2,700 Businesses
- 6.6 Million \$ average annual sales volume
- 52% are Used Merchandise Stores NAICS
- Highest average sales and employee number is recyclable material merchant wholesaler NAICS

Construction & Demolition Industry

- Over 17,000 Businesses
- 3.5 Million \$ average annual sales volume
- 63% are Construction of Buildings NAICS
- Highest average sales and employee number is gypsum product manufacturer NAICS

Business Size According to Sales Volume: A Comparative Analysis

- Primary NAICS: Michigan businesses involved anywhere along the supply chain within the structural material reuse/recycling industry
- Key Points:
 - Detroit, Grand Rapids and Flint have the most dense reuse economies in Michigan.
 - The upper peninsula is lacking a dense reuse economy hub.
- Secondary NAICS: Michigan Businesses involved anywhere along the supply chain within the construction and demolition industry.
- Key Point:
 - Detroit and Grand Rapids C&D market is highly developed and dense compared to the rest of the state.
 - C&D industry is similarly sparse in the Upper Peninsula.



Structural Material Reuse Industry Schematic

Density of Construction, Demolition, and Reuse Industry in Michigan

- Areas with above average densities are Detroit, Grand Rapids, and Flint.
- Efforts to connect Primary and Secondary businesses may be most effective in either Detroit or Grand Rapids.
- The Lower Peninsula’s Western shoreline maintains a higher density than most of its eastern shoreline.

Avenues for Further Research

- Further define the structural reuse market in Michigan from the dataset created during this study.
- Better understand what drives a strong reuse economy?