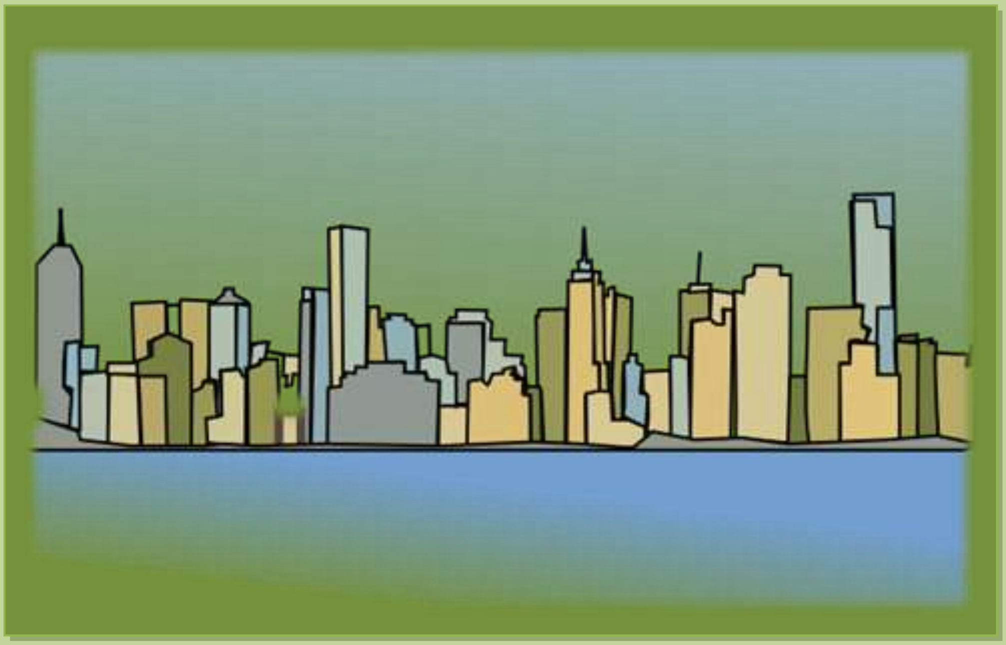
Informing the Debate

Michigan Applied Public Policy Brief

Integrated Asset Management:

Dealing with Neglected Infrastructure and Vacant Property in Legacy Cities



Authors

Mary Beth Graebert
Mohamed El-Gafy
Mark Wyckoff
Yue Cui

About the Michigan Applied Public Policy Briefs

Informing the Debate

The paper series, Informing the Debate, is generated out of grant-funded, policy-relevant research sponsored by the Institute for Public Policy and Social Research (IPPSR).

The IPPSR program, Michigan Applied Public Policy Research Program or MAPPR, generates research on current issues held in urban communities with special attention to Michigan. Policy researchers author summary briefs of their research outcomes and their implications. The funded research projects and related policy briefs focus on main headings of discussion being held in the policy arena.

When developing the paper series initiative in 1992, the topics of the papers were submitted following a two-day meeting with leaders from the business sector, nonprofit agencies, foundations, and university faculty and staff. That group evolved into the Urban Research Interest Group.

The Urban Research Interest Group recognized the pressure on urban core leaders to make critical decisions that continue to impact people long into the future. A commitment to generating background research to add to the core of debate on possible solutions to complex, urban problems was made.

The expected outcomes of the paper series include discussion that fosters and strengthens multidimensional connections between the policy, academic, and practitioner community. The series continues to cultivate research interest in policy-relevant issues for consideration of decision makers in urban communities.

Additional information about IPPSR, the Michigan Applied Public Policy Research (MAPPR) Program, and related publications as well as call for proposals is available on the website, www.ippsr.msu.edu.

Informing the Debate

MAPPR Policy Research Brief

Integrated Asset Management: Dealing with Neglected Infrastructure and Vacant Property in Legacy Cities

Authors
Mary Beth Graebert
Associate Director for Programs and Operations
Land Policy Institute
Michigan State University

Mohamed El-Gafy
Associate Professor
School of Planning, Design and Construction
Michigan State University

Mark Wyckoff
Senior Associate Director, Land Policy Institute
Director, Planning & Zoning Center
Michigan State University

Yue Cui
Assistant Professor
Center for Economic and Spatial Analysis for Planning and Management
Michigan State University

Sponsor
The Institute for Public Policy and Social Research
Matthew Grossman, Ph.D.
Director and Associate Professor
Michigan State University

Series Editors
Ann Marie Schneider, M.S.
Institute for Public Policy and Social Research
Michigan Applied Public Policy Research (MAPPR) Grant Program Manager
Michigan State University

Emily Stanewich
Institute for Public Policy and Social Research
Communications Assistant
Michigan State University

Executive Summary

The depopulation of America's cities, especially those that once specialized in heavy industry, often called "legacy cities," has led to two main land use problems for local governments. First, tax bases have shrunk dramatically, but the land area and infrastructure over which cities must supply public services has not changed, making it very difficult for cities to maintain these services and infrastructure such as roads, water and sewer systems. Second, blighted and abandoned structures now litter many urban landscapes, driving down property values, creating centers for illicit activity and requiring additional public services, such as maintenance of tax foreclosed and vacant properties. Various methods of infrastructure repurposing and land repurposing, respectively, have been proposed to address these two issues.

Infrastructure repurposing entails investing in more efficient systems, scaling down existing systems, and/or engaging in planned shrinkage. Land repurposing involves the transformation of abandoned parcels into public open space, parks and recreational areas, community gardens, commercial urban agriculture, or green infrastructure. Both infrastructure repurposing and land repurposing are methods of asset management applied in many states and municipalities.

In growing cities, the installation of underground infrastructure, like water and sewer, is scheduled in tandem with aboveground infrastructure, like roads. And the installation of such infrastructure tends to follow land development plans. Similarly, when it is time to upgrade or replace one type of infrastructure, public works departments attempt to align time schedules for maintenance or upgrades of other types of infrastructure. However, in a legacy city that is facing serious staff capacity and budget constraints, public works departments tend to operate on a reactionary approach, only responding to infrastructure emergencies. It is challenging for them to adopt a proactive approach that upgrades and provides preventative maintenance in the places that support the largest populations and/or are in the worst state of disrepair. In addition, without knowledge about future land use plans for the city, they may be repairing infrastructure that serves very few people in an area that is targeted for greening, rather than identifying innovative approaches to maintain public service in more cost effective ways.

"Infrastructure repurposing and land repurposing can be targeted through empirical methods that integrate asset management processes to optimize their effectiveness."

Infrastructure repurposing and land repurposing can be achieved through empirical methods that integrate asset management processes to optimize their effectiveness. The authors have engaged in an effort to assess the feasibility and applicability of this innovative approach to address issues of vacant properties and inadequate infrastructure systems in legacy cities – specifically, underground sewer infrastructure —using Saginaw, MI, as a pilot study. The project team worked with key stakeholder groups in order to ensure that the optimization model is designed in an easily understandable format for water system providers and land use planners to utilize. The anticipated outcome of this effort was proof of methods that could be used in other legacy cities to provide immediate assistance to community leaders to more effectively implement integrated asset management. It is expected that, as a result of this innovative approach, policy makers will be better informed on the implications of land use options in the context of water infrastructure management, and vice versa.

The results of the Saginaw case study analysis were used to develop this policy brief on simultaneous land use and water system decision making for legacy cities, including a background on this policy issue, literature review on best practices, description of the methodology, outcomes of the scenario analysis, policy recommendations and proposed follow-up research. The concept, model and preliminary results were shared with key leaders in the City of Saginaw in order to gather feedback and refine results. In addition, this model was presented at the 2015 Innovations in Collaborative Modeling Conference hosted by Michigan State University, where it was critiqued by academics and practitioners who use a variety of quantitative systems modeling techniques to tackle social and environmental problems. Findings will be shared with local officials, as well as land use planning and wastewater systems staff in Michigan's legacy cities. These findings are intended to inform their decision making processes and to gather feedback for further refinement of the model. A webinar targeted toward legacy city practitioners, state administrators, and academics will be the main outreach mechanism to reach these audiences.

HISTORICAL CONTEXT AND IMPORTANCE OF THE PROBLEM

American legacy cities, such as Detroit, MI; Flint, MI; Saginaw, MI; Pittsburgh, PA; Cleveland, OH; and Gary, IN, were industrial capitals, hubs for many businesses and home to large populations back in the first half of the 20th Century. Beginning around the 1950s, these cities have seen sustained loss of jobs and population, and now face overwhelming economic, social, physical, and operational challenges. They all experienced losses of 25-55% of their populations over the past 40-50 years. This has resulted in thousands of vacant lots, as well as fragmentation of population, nearly abandoned neighborhoods, reductions in the value of properties, reduced tax base, increased cost of living, and few prospects for economic growth or improved public services. A growing number of land use solutions to the problems of vacancy, such as land banking, demolition and temporary conversion to green space, are being contemplated and implemented.

Additionally, these cities have also faced serious problems related to their current infrastructure needs and requirements. According to the General Accountability Office (GAO), which provides audit, evaluation and investigative services to the United States Congress, 41 percent of U.S. wastewater utilities did not generate sufficient revenue to cover the cost of their service in 2004 (GAO, 2004). Roughly one-third of the wastewater utilities have deferred maintenance because of insufficient funding, while 20 percent or more of their pipelines are nearing the end of their useful life (Ana, 2007). Water and wastewater providers are in need of better information, tools and policies to help them meet community needs. Neighborhoods with high vacancy and planned for long term open space uses, provide the potential for decommissioning portions of existing infrastructure, repurposing them, or even closing down complete systems as a way to address infrastructure maintenance issues (NRC, 1994). However, agencies responsible for these systems often lack the tools to reduce the scale of the subsystem appropriately, including corresponding data on land use and underground water infrastructure needs, examples of best practices and information on the implications of these decisions.

"Ultimately, infrastructure decisions that take into account the changes to the land use on the surface will be most effective in simultaneously meeting land and infrastructure policy objectives."

Faced by the aforementioned land use and infrastructure problems, local governments must find the most efficient ways to repurpose infrastructure and vacant land without compromising quality of life for residents. Due to budget constraints (and in some cases, time and staff constraints), public works departments often address failing infrastructure through a reactionary approach, rather than a proactive, preventative approach. In addition, current land use and future visions may not be taken into account under a reactionary approach, resulting in inefficient overall solutions. Ultimately, infrastructure decisions that take into account the changes to the land use on the surface will be most effective in simultaneously meeting land and infrastructure policy objectives. Local government fragmentation, sprawl, and inconsistent state and federal policies all exacerbated the challenges and contributed to the condition of today's legacy cities.

This policy brief advocates for an integrated asset management approach that addresses short, medium and long term considerations and provides flexibility on the most resilient course of action. Additionally, it lays the framework for developing a comprehensive, transdisciplinary approach to assist policy makers and water system providers in addressing economic, social and environmental objectives simultaneously. It also helps community leaders make informed land use and infrastructure decisions based on what is happening on and below the ground without causing unintended, adverse impacts. Finally, the proposed policy testing tool lays the foundation for additional analysis, tool development and outreach that will help cities to address a variety of issues related to the legacy of unsustainable infrastructure systems. This approach is desperately needed in legacy cities, but can also be beneficial in any city experiencing infrastructure and land use challenges.

Current policy options

Currently, there is not yet consensus concerning the most effective methods of managing urban land vacancy. Different policies have been explored in the areas of infrastructure repurposing and land use repurposing. The following section provides an overview of the policy options in focus and highlights the need for them to be integrated in the proposed framework.

INFRASTRUCTURE REPURPOSING

In urban settings, local governments are typically responsible for delivering municipal infrastructure such as street lighting, road and sidewalk maintenance, bridge reinforcement/fortification, and water/sewer systems to all residents. When faced with widespread vacancy and thus diminished tax inflows, governments must decrease the cost of providing these services without sacrificing quality. An array of solutions, known collectively as infrastructure repurposing, has been proposed to rectify this imbalance. Broadly, these solutions can be categorized three ways:

1. Investment in more efficient infrastructure;
2. Right-sizing of existing systems; and
3. Planned shrinkage.

Because urban planning for a shrinking city is a relatively new phenomenon, many of these policies have not yet undergone empirical evaluation.

Installing more efficient infrastructure, although requiring a substantial upfront investment, could significantly diminish long-term costs. One option is to purchase machinery that automates and expedites processes; for example, garbage pickup once required multiple workers at a time, but new trucks require just one worker to operate (Patton, 1981). For fixed grid infrastructure such as sewers, where such automation is not possible, another option is to install lighter, smaller-scale systems that serve isolated parcel groups. For example, cluster sewer systems collect wastewater from a small number of homes and transport it via an alternative sewer to a pretreatment and land absorption area that involves no surface discharge. These are often used in rural towns where lot sizes are too small to support individual septic tanks but where there is enough open space to establish a designated land absorption area, as is true of high-vacancy urban neighborhoods. Cluster sewer systems are comparatively cheap and easy to install, but require frequent inspection and maintenance, and cannot accommodate any substantial increase in population (Jones et al., 2001).

Right-sizing existing infrastructure is an alternative to new installation that avoids maintenance costs altogether. Right-sizing involves scaling back or "decommissioning" infrastructure that is already in place so that blocks or neighborhoods with extremely high vacancy are either removed from the service area, receive limited service, or receive service provided in a different way. The most common example is the reversion of high-maintenance asphalt roads into unpaved gravel ones. This change would spare local governments the cost of repaving roads—particularly in the Rust Belt states where freezing winters routinely destroy pavement (Feng et al., 2010)—and minimize inconvenience for residents and travelers if only implemented in low-traffic areas. Reversion to gravel roads has occurred in some counties of southwest Texas, among other American communities since the recession, in response to insufficient state and federal funding (Latif, 2013). Decommissioning more complex infrastructure, such as cable lines and water mains, may be less feasible. Electrical, physical or chemical balances which depend on the system as a whole sometimes encompasses the entire city.

Even where more complex right-sizing is possible, it can be prohibitively expensive. The United States Environmental Protection Agency (EPA) used data from the Michigan Department of Transportation (MDOT), the Washington State Department of Transportation (WSDOT), geographic information systems (GIS), and Google Maps to estimate the cost of decommissioning a typical city block in Saginaw, Michigan. This estimate includes line items such as labor; foundation and soil stabilization; the removal of all pipes, valves, poles, and wiring related to water, sanitation, cable, and telephone services; the removal of all roads, sidewalks, and driveways; engineering costs; and contingency allocation. The total cost per block would be approximately $236,000 (EPA, 2014). While decommissioning would save the city the cost of maintaining utilities and pavement each year, it could take many years for these savings to surpass the upfront cost of decommissioning. Thus, in neighborhoods where repopulation and redevelopment are never anticipated to occur, this investment could be profitable in the long-run; however, for temporary vacancy, decommissioning is likely impractical.

On the other hand, it is important to note that not all infrastructure needs to be completely removed in order to be decommissioned—such as underground sewer and water pipes. The EPA's model in Saginaw addressed the removal of every aspect of the built environment for a city block. "Planned disrepair" of roads and unneeded pipes is an alternative that entails simply blocking off segments of infrastructure and allowing them to deteriorate naturally. This is a much cheaper option than manual decommissioning because the only cost to cities is the erection of physical barriers to prevent the infrastructure from being used (EPA, 2014). However, if the infrastructure is on the surface of the land, this option may contribute to blight rather than detracting from it, and it means that the infrastructure would have to be repaired or replaced before redevelopment could occur.

Planned shrinkage is a third method of infrastructure repurposing in which the government uses incentives to compel scattered residents and businesses to relocate into targeted neighborhoods, usually near a downtown area that includes amenities such as public transit. This would create 100% vacancy in many fringe neighborhoods, but would result in high density and its associated socioeconomic benefits in the urban core. For example, Youngstown, OH, has offered up to $50,000 to its residents in high-vacancy neighborhoods in exchange for their relocation to their choice of more desirable districts (Busa, 2013). Clearly, this can become expensive if enough residents must be relocated, and it can also result in sociopolitical costs if executed poorly.

Related to planned shrinkage are zoning changes that preserve open space in areas planned for long term open space, and encourage new development and redevelopment in targeted areas. These changes restrict which land areas are eligible to receive sophisticated municipal services, thereby incentivizing new development to occur only in those zones. The resulting density and walkability is thought to attract businesses and young talent, creating a strong and stable economy. For example, in 1967 architect Ian McHarg helped design the "urban-rural demarcation line" of Baltimore County, Maryland. Beyond this boundary, all development would have to rely on well water and septic tanks rather than the highly networked water and sewer systems found within the boundary. As a result, 90% of the county's population resides on just 30% of the land area, and the remaining 70% is used for agriculture and natural resource reserves (Busa, 2013). The City of Midland, Michigan, currently has an urban growth area, with no municipal water provided beyond the boundary. The scale of such efforts in a legacy city would be much smaller, but no less significant in the areas they were deployed.

LAND USE REPURPOSING

In addition to managing vacancy through infrastructure repurposing, land use repurposing provides some potential tools. When homeowners cease to pay property taxes, either because they cannot afford to pay or because they have abandoned their property, ownership of the parcel often defaults to the county treasurer. In a favorable housing market, the treasurer is then able to sell the foreclosure at public auction to find a new owner and recoup lost taxes. However, for cities that have experienced large chronic population loss, it is often the case that no bidders exist because tax-foreclosed properties have virtually no market value. For example, in Detroit in 2012, the county treasurer was unable to sell thousands of properties for as little as $500 each (CBS Detroit, 2010). Thus a local unit of government, usually the city, becomes responsible for maintaining these properties, yet they often lack the funds to do so. As a result, abandoned buildings continue to deteriorate, becoming safety hazards and contributing to neighborhood disinvestment through their negative effect on property values.

"Land repurposing encompasses a wide range of strategies to return vacant properties to productive use with the ultimate goal of making communities safer, more prosperous, and often more environmentally friendly."

Land repurposing encompasses a wide range of strategies to return vacant properties to productive use with the ultimate goal of making communities safer, more prosperous, and often more environmentally friendly. There is also evidence that managing abandonment could improve the financial situation of the city itself. For example, regression analyses have shown that the demolition of abandoned properties not only results in higher property values and lower foreclosure rates (Griswold et al., 2014), but is also associated with better fiscal health for municipalities as measured by the National League of Cities (Hummel, 2013). Following demolition, there are five main options for land repurposing ventures, aside from immediate redevelopment: (1) open space, (2) parks and recreational areas, (3) community gardens, (4) commercial urban agriculture, and (5) green infrastructure.

Passive open space results from the conversion of single parcels of abandoned land into well-maintained green spaces. This is accomplished by removing blighted structures and performing inexpensive, periodic maintenance on the natural greenery of the property (EPA, 2014). Open space is generally associated with a neighborhood property value premium (Irwin, 2002; Bolitzer and Netusil, 2000), and it allows communities to inexpensively delay selecting a permanent use for the property until the optimal use has been determined.

Parks and recreational areas entail the conversion of multiple contiguous parcels of abandoned land into playgrounds, sports fields, or trails. This type of greenway offers a concrete use for neighborhood residents, but it may also require investment in lighting, equipment, and public restrooms in addition to periodic maintenance costs (EPA, 2014). A review of empirical research on public parks confirms the long-held notion that parks are positively associated with property values, all else equal, and that this premium begins at around 20% for properties adjacent to a park (Crompton, 2005). Furthermore, there is evidence that the best type of park for increasing home values is the small neighborhood park, meaning that a small area of contiguous vacant land as described above is ideal (Espey and Owusu-Edusei, 2011). Higher property values translate into increased tax inflows for local governments, which can help to offset the cost of maintaining the parks. This capitalization process is known as the proximate principal and has been supported by dozens of studies (Crompton, 2011). On the other hand, it is important to note that in neighborhoods with exceptionally high crime rates (more than four times the national average of 366 violent crimes per 100,000 people in 2014), some types of parks have the potential to become liabilities in terms of community safety (Troy and Grove, 2008).

"…research on public parks confirms the long-held notion that parks are positively associated with property values, all else equal, and that this premium begins at around 20% for properties adjacent to a park (Crompton, 2005)."

Community gardens involve the reuse of abandoned parcels to supply neighborhoods with a source of fresh, healthy food. This can be especially beneficial in urban food deserts, where grocery stores and produce markets are in short supply due to high operational costs or low perceived demand. Voicu and Been (2008) found that community gardens in New York City had significant positive effects on neighboring property values, especially in poorer neighborhoods. On the other hand, Gorham et al. (2009) found that community gardens in Houston, TX, could not be shown to have a positive impact on crime rates. They did find that residents near gardens reported perceived neighborhood revitalization and that some community members adopted gardening practices on their own land as pioneered in the community gardens.

There are several hurdles to establishing community gardens. From a public health perspective, some vacant lots contain contaminants from their previous structures or they simply lack the topsoil to support vegetation, both of which can be expensive to fix. In addition, maintenance of gardens demands more frequency and nuance than simple lawn mowing and snow removal, creating an additional financial burden for local governments or neighbors (EPA, 2014). The success of community gardens is highly dependent on the commitment of volunteers. Finally, zoning ordinances and other laws may explicitly or inadvertently prevent the establishment of community gardens, sale of produce, or raising of livestock in urban areas (Goldstein et al., 2011).

Commercial urban agriculture entails the large-scale production of food and other agricultural products in urban areas. This differs from a community garden in that it relies on private operation rather than public maintenance and typically requires a large swathe of contiguous vacant land (EPA, 2014). Commercial urban agriculture is a relatively new method of returning abandoned urban areas to productive use, but it has already been implemented in cities throughout the country. For example, Food Field is a four-acre commercial venture in central Detroit that has transformed an abandoned elementary school site into a produce and livestock farm that practices triple bottom line (social, environmental and financial) sustainability (Peck Produce, LLC, 2012). In some cases, community gardens created on land bank lots can evolve into for-profit markets, as has been the case in Cleveland, OH (Goldstein et al., 2011). Barriers to commercial urban agriculture include regulations and zoning (Goldstein et al. 2011) and nuisances to neighbors such as unwanted noises and odors (Flesher, 2015).

Green infrastructure manages stormwater naturally by soaking up, storing, and filtering runoff to prevent storm drain overflow, which can otherwise result in polluted lakes and rivers. Infiltration-based green infrastructure, such as bio-retention swales and rain gardens, work best where the below-ground water table is low. Non-infiltration-based infrastructure includes wetlands, green roofs, and rain barrels, and it is most useful where water absorption is difficult. Green infrastructure is not only beneficial to the environment; it can also help avoid expensive repairs and expansions of sewer systems and water treatment facilities, and it can make neighborhoods more aesthetically pleasing (EPA, 2014).

"Green infrastructure is not only beneficial to the environment; it can also help avoid expensive repairs and expansions of sewer systems and water treatment facilities…"

BEST PRACTICES

Ideally, every blighted neighborhood would see its land repurposed and its infrastructure restored in order to attract social and economic value. In reality, the local governments that are tasked with delivering public services and managing abandoned and vacant properties rarely have sufficient resources to do so. And even if they did, there is little reason to believe that these neighborhoods would be repopulated to former levels in the near future. Thus, they must make strategic decisions about where to direct public services and perform repurposing projects. While the best strategy varies by situation and is difficult to objectively determine, some methods have been empirically evaluated, and there exist some best practices in implementing infrastructure and land repurposing.

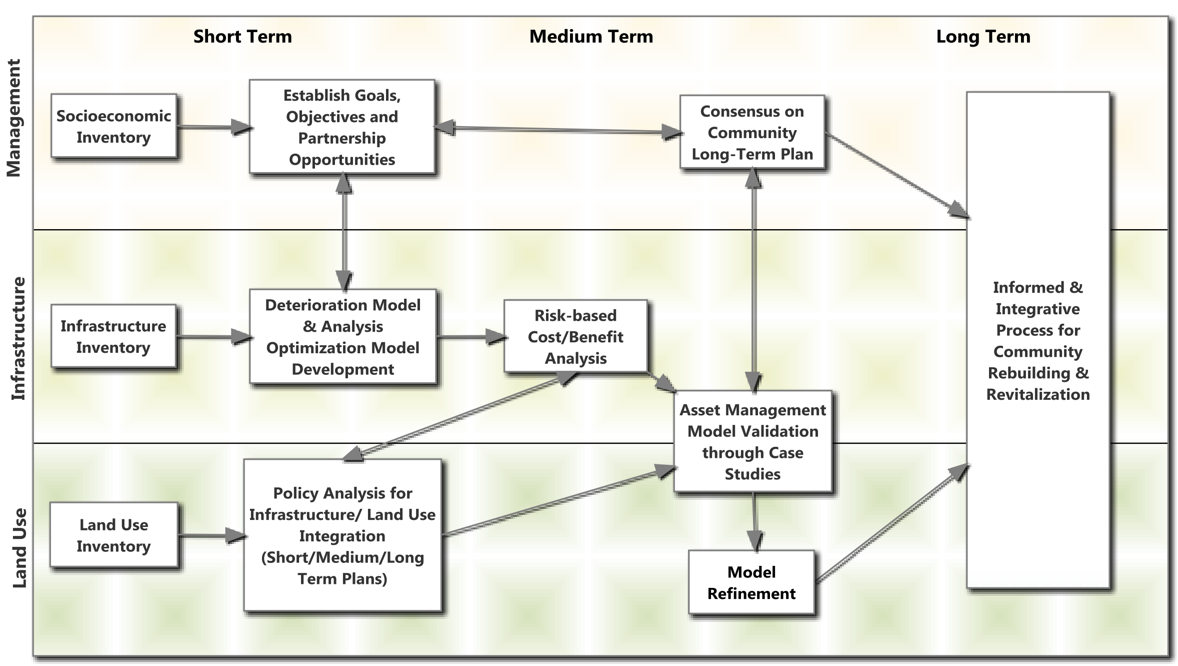
The Reinvestment Fund, a national Community Development Financial Institution, has developed a Market Value Analysis (MVA) approach to determine which neighborhoods should be the focus of any citywide resource redirection. The MVA uses indicators like median home value, home value variability, and foreclosure and vacancy rates for each census block group to perform cluster analyses. This process groups neighborhoods into "constellations" that have shared characteristics. Each constellation is described by one of four market types: competitive, strong, transitional, or distressed, and their geographic distribution is used to target resource dissemination. For example, Baltimore, Maryland, used MVA analysis in 2008 to determine where distressed and transitional neighborhoods bordered competitive and strong ones. The city then targeted its urban renewal efforts at these border blocks in an effort to prevent the blight from spreading to stronger markets. By focusing on these areas, the city was able to curtail much of their distress, whereas the previously random distribution of resources over all distressed neighborhoods had failed to bring about any noticeable revitalization (Goldstein, 2012).

Similarly, empirical analysis can also be used to predict which areas of geographic networks are likely to become most costly for the city in the future. For example, Moteleb (2010) developed a statistical method of determining pipe failure probability, modeling the deterioration of sewers over time, and identifying the most critical system assets based on GIS mapping, historical data, and Monte Carlo simulations. This could allow cities to target pipe maintenance where the probability of pipe failure is highest, thus preventing expensive repair and rebuilding following such failures. Savings realized from this optimization could be shifted to other infrastructure and blight problems that could not otherwise have been addressed.

"Savings realized from this optimization could be shifted to other infrastructure and blight problems that could not otherwise have been addressed."

POLICY RECOMMENDATIONS

This policy brief calls for an integrated asset management model that integrates the aforementioned solutions while



simultaneously addressing infrastructure repurposing and land use repurposing challenges. The following chart (Figure 1) outlines the process steps of the integrated infrastructure and land use analysis and the flow of information between specified activities. The core principles of the proposed integrated asset management model **Policy-Driven -** Resource allocation decisions are based on a well-defined and explicitly stated set of policy goals and objectives. These objectives reflect desired system condition, level of service, and safety provided to customers, and typically are tied to economic, community and environmental goals as well;

- **Performance-Based -** Policy objectives are translated into system performance measures that are used for both day-to-day and strategic management;
- **Analysis of Options and Tradeoffs -** Decisions on how to allocate resources within and across different types of investments or solutions are based on an analysis of how different allocations will impact achievement of relevant policy objectives. Alternative methods for achieving a desired set of objectives are examined and evaluated. These options are not constrained by established organizational unit boundaries. The best method is selected considering the cost (both initial and long-term) and likely impacts on established performance measures. The limitations posed by realistic funding constraints must be reflected in the range of options and tradeoffs considered;
- **Decisions Based on Quality Information -** The merits of different options with respect to the policy goals are evaluated using credible and current data. These data may apply to specific functions or reflect a more integrated, corporate view; and
- **Monitoring to Provide Clear Accountability and Feedback -** Performance results are monitored and reported for both impacts and effectiveness. Feedback on actual performance may influence the goals and objectives, as well as resource allocation and utilization decisions.

These principles are not unfamiliar, nor are they radical. Most policy makers and public works providers would agree that investment decisions should be based on weighing costs against likely outcomes, that a variety of options should be considered and evaluated, and that quality information is needed for decision-making. Many municipal and local agencies are now pursuing

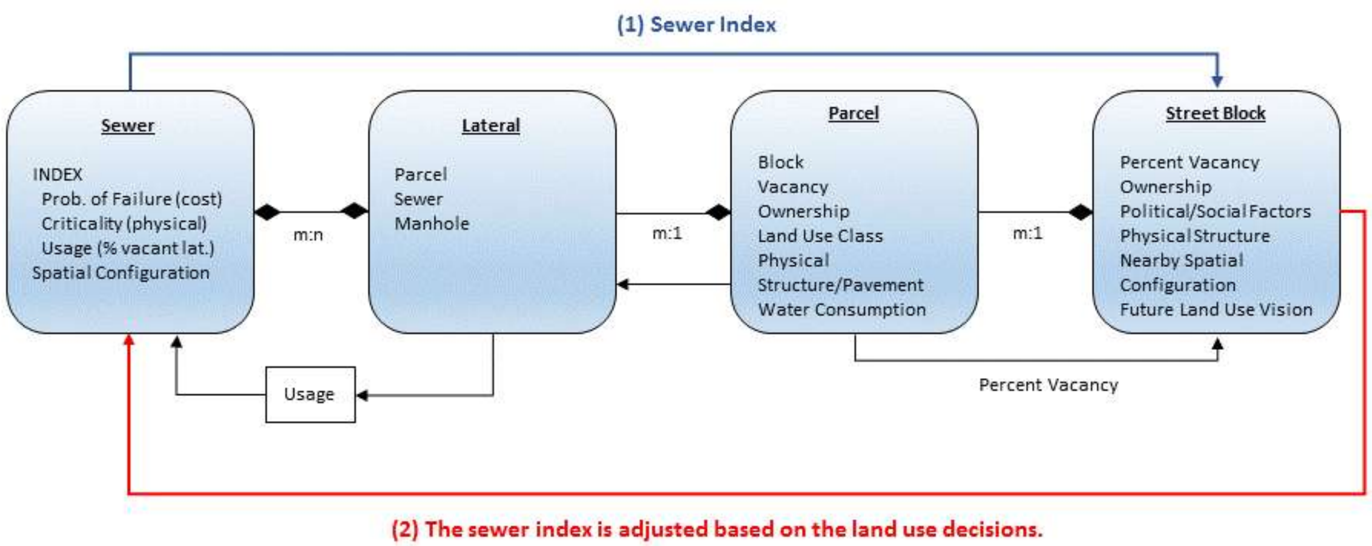
"Most policy makers and public works providers would agree that investment decisions should be based on weighing costs against likely outcomes, that a variety of options should be considered and evaluated, and that quality information is needed for decision-making."

performance-based approaches to planning and programming, monitoring system performance, and developing more integrated data and analysis tools to evaluate tradeoffs among capital expansion, operations, and preservation activities.

PILOT POLICY APPLICATION

The following model (Figure 2) was developed by the authors to analyze different policy options and tradeoffs and could be easily adopted in any city experiencing infrastructure and land use challenges. It highlights the interaction between infrastructure repurposing policy and land use repurposing policy and investigates the consequences of a decision in either policy on the other part.

Figure 2. Integrated Infrastructure & Land Use Model



SOURCE: MICHIGAN STATE UNIVERSITY CENTER FOR ECONOMIC AND SPATIAL ANALYSIS FOR PLANNING AND MANAGEMENT

This model was used in a pilot case study analysis for the Green Zone, a neighborhood experiencing high vacancy that has been targeted for greening, in the City of Saginaw (see Figure 3).

Figure 3. Map of the Saginaw Green Zone

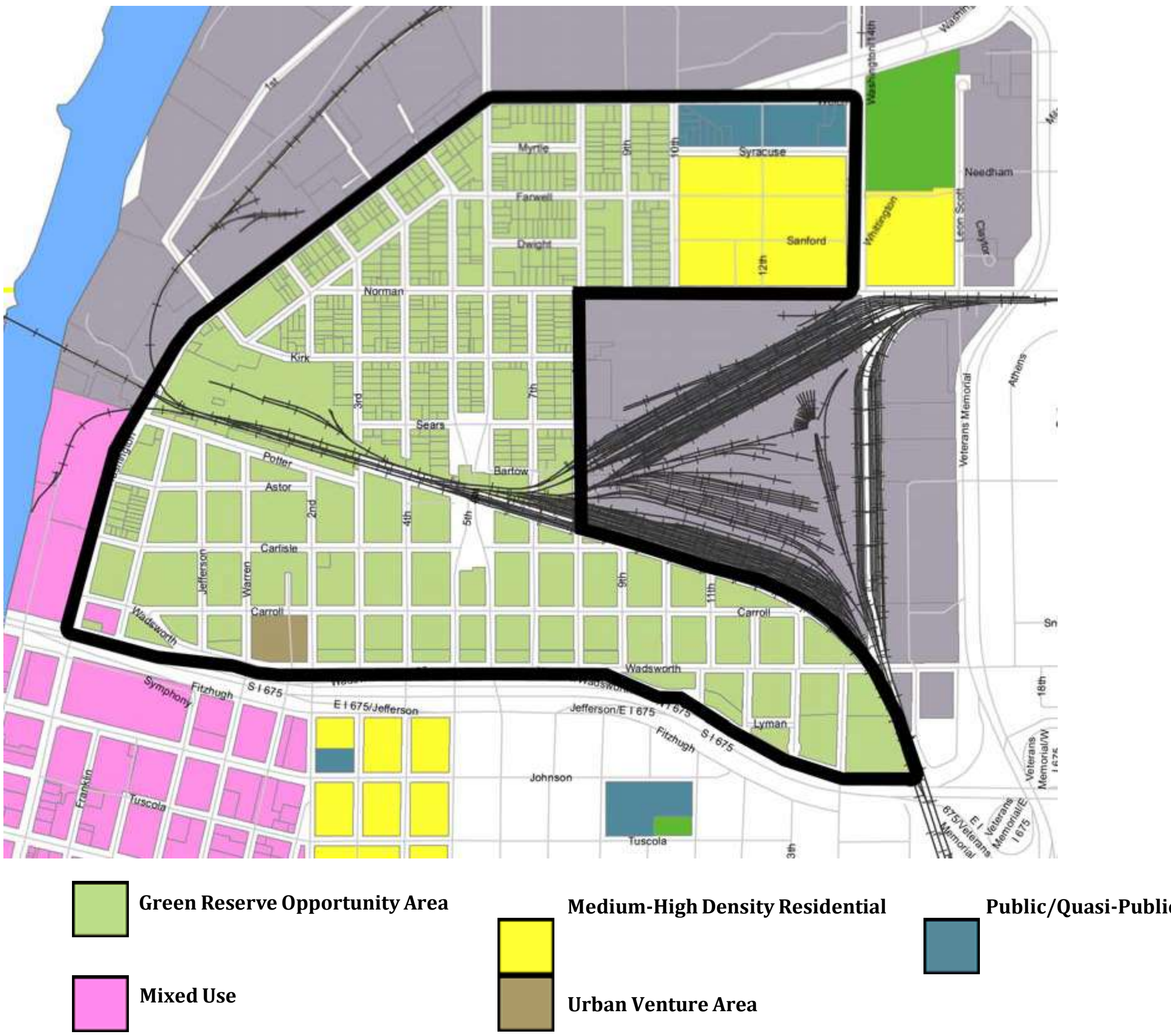


Figure 27 Designated future land uses located within the Green Zone. *Data Source: City of Saginaw GIS/Master Plan*

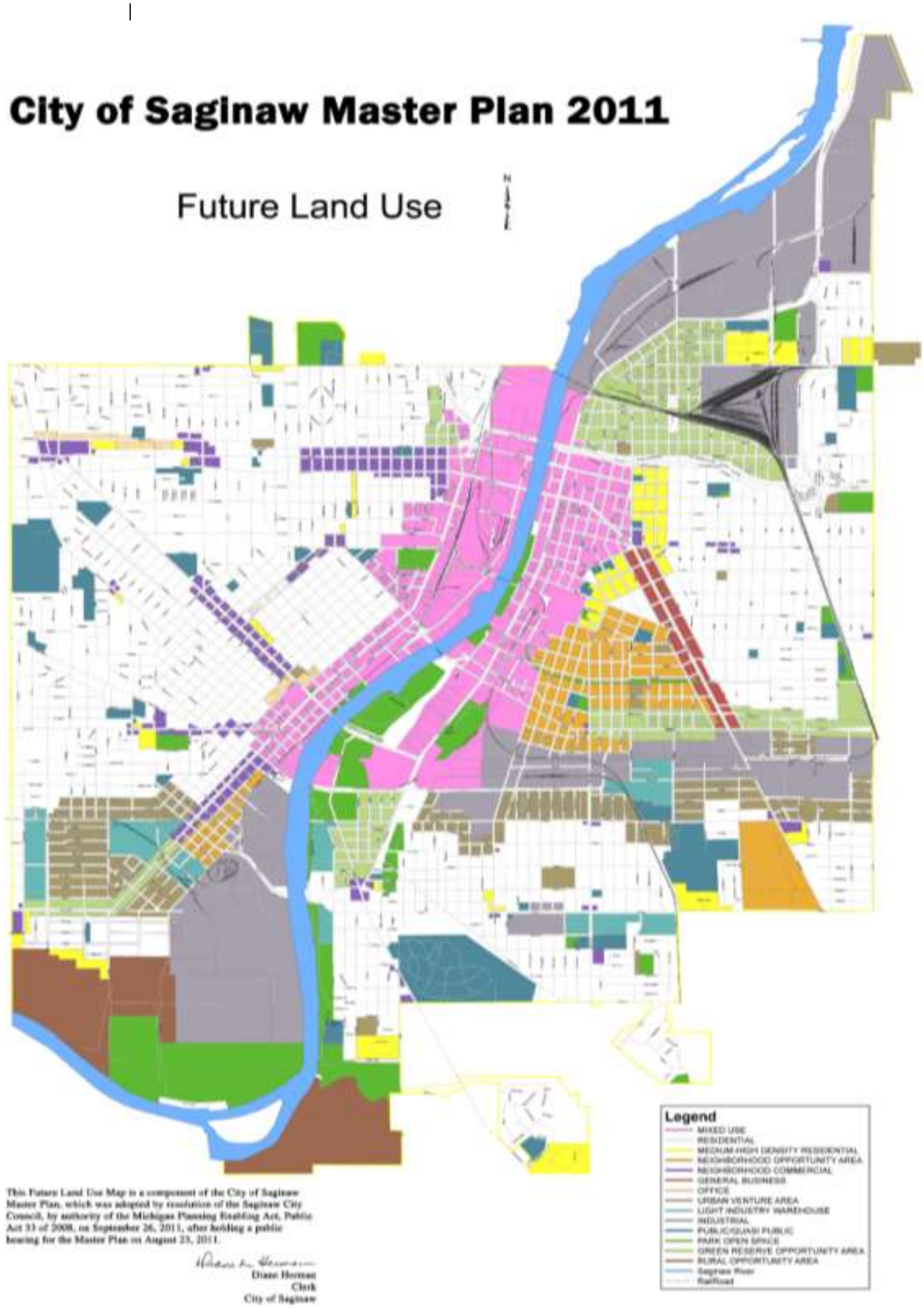
The first step in this analysis was to develop a criticality score based on the typical infrastructure characteristics that would allow public works departments to prioritize wastewater system segments for maintenance and upgrades. These characteristics include probability of failure (based on age), sewer size and water consumption along the segment. The next step was to add land use characteristics to the scoring system, including the percent of vacant parcels along the segment, public versus private ownership and future land use vision (see Figure 4 below). Adding these factors changed the criticality score, and thus the prioritization of segments for maintenance and upgrade. It also allowed for the identification of segments that could be considered for installing more efficient systems, right-sizing the system and planned shrinkage. Similarly, the vacant parcels associated with sewer segments that were deprioritized could be further considered for land repurposing strategies, while areas planned for redevelopment and densification could be supported with reliable infrastructure.

Coincidentally, the Michigan Department of Environmental Quality (MDEQ) started administering a new Stormwater, Asset Management, and Wastewater (SAW) grant program in 2013. This program is available to assist communities in developing an asset management program for stormwater and wastewater collection systems and treatment plants, stormwater management plans, and/or planning and design of stormwater and wastewater projects. The City of Saginaw is using its SAW grant to conduct a criticality analysis of its combined wastewater/stormwater system to identify places where serious preventative maintenance or upgrades are needed to avoid more costly repairs in the future. They are taking into account current land use and large users of wastewater infrastructure (like hospitals), and are considering the addition of future land use plans to the criticality analysis.

It is important to note some challenges to applying this approach in other cities, including legacy cities, and some lessons learned through conversations with key stakeholders. First, while the City of Saginaw is fairly data rich for this type of analysis, it needed to gather some additional data for this process through the SAW grant, including a sampling inventory of the condition of underground wastewater/stormwater infrastructure and maintenance records.

Second, while the quantitative method put forth in this policy brief creates an “automated” method for identifying priority infrastructure and vacant land, it would benefit from the “human element”; that is, the people who work on this infrastructure are very familiar with it, and often know things that the data systems do not show. There are times when a decision tree, rather than a scoring system, would be more effective to the optimization process. Finally, this analysis was focused on one neighborhood in the City of Saginaw; in order to achieve the most effective result, the entire city would need to be included in future analyses.

Figure 4. Saginaw Future Land Use Map



CONCLUSION

The state of disrepair and excess capacity of public infrastructure (e.g. water, sewer, roads, bridges, etc.) in legacy cities depicts a critical situation for these local governments, but it also presents a unique opportunity for developing interdisciplinary strategies that address these coinciding challenges while serving as a model for other cities worldwide that currently face, or soon will face, related crises. Saginaw is one of many legacy cities in Michigan and the Midwest that face chronic vacancy, infrastructure dilapidation and diminished tax base, and all of the negative socioeconomic factors that both result from and feed back into this downward spiral. On the other hand, simultaneously addressing related challenges can lead to upward spirals that improve a blighted landscape, reduce public works costs and improve quality of life for residents across these cities. Policies at the local level that support integrated asset management, and programs at the state and federal level that support them, are critical to the future success of legacy cities.

"...addressing related challenges can lead to upward spirals that improve a blighted landscape, reduce public works costs and improve quality of life for residents across these cities."

FUTURE RESEARCH

The project partners will use this initial study to seek funding to apply the same type of optimization model in other Michigan legacy cities, such as Flint and Detroit. As other communities are assessed, it will be possible to establish parameters for identifying which different infrastructure and land use repurposing options best fit certain circumstances (e.g., 25% versus 80% vacancy). In addition, this project lays the framework for adding factors, such as fiscal health, social equity, public health and environmental protection, to the model to optimize integrated policies and strategies. It will also provide a platform for public works agencies from neighboring jurisdictions to begin conversations about how they can help each other better maintain infrastructure and serve the public at a regional scale. Finally, future research will include an estimation of costs and benefits associated with the various infrastructure and land repurposing strategies, so that legacy cities can appropriately weigh the options.

REFERENCES

Ana, E. (2007). "Sewer Asset Management – Sewer Structural Deterioration Modeling and Decision Making in Sewer Rehabilitation Projects Prioritization." PhD Dissertation.

Bolitzer, B. and N.R. Netusil (2000). "The impact of open spaces on property values in Portland, Oregon." *Journal of Environmental Management*, 59(3): 185-193. Available at: http://www.sciencedirect.com/science/article/pii/S0301479700903517; accessed August 24, 2015.

Busa, M.S. (2013). "A Sustainable Neighborhood in the Shrinking City: Re-Imagining Burke Lakefront Airport in Downtown Cleveland." Thesis submitted to the Faculty of the Graduate School of the University of Maryland, College Park.

CBS Detroit (2012). "County Officials Giving Away Detroit Homes For $500; Taxes Must Be Delinquent." Published online February 6, 2012. Available at: http://detroit.cbslocal.com/2012/02/06/detroit-squatters-may-be-allowed-to-keep-homes/; accessed March 4, 2015.

Crompton, J.L. (2001). "The impact of parks on property values: a review of the empirical evidence." *Journal of Leisure Research*, 33(1): 1-31. Available at: http://www.actrees.org/files/Research/parks_on_property_values.pdf; accessed August 24, 2015.

Crompton, J.L. (2005). "The impact of parks on property values: empirical evidence from the past two decades in the United States." *Managing Leisure*, 10(4): 203-218. Available at: http://www.tandfonline.com/doi/abs/10.1080/13606710500348060#.Vds9cvlViko; accessed August 24, 2015.

Data Driven Detroit (DDD) (2010). "Housing Vacancy Rate, by Census Block Group: Detroit, Michigan." Web. Available at: http://datadrivendetroit.org/wp-content/uploads/2010/04/HsgVacRateBG.pdf; accessed September 25, 2014.

De Zeeuw, H., R. Van Veenhuizen and M. Dubbeling (2011). "The role of urban agriculture in building resilient cities in developing countries." *Journal of Agricultural Science*, 149: 153-162. Available at: http://journals.cambridge.org/download.php?file=%2FAGS%2FAGS149_S1%2FS0021859610001279a.pdf&code=bd6ba8b6ff2360b39ea5e022a6df2e32; accessed August 24, 2015.

Environmental Protection Agency (EPA) (2014). *Managing Vacant and Abandoned Property in the Green Zone of Saginaw, Michigan.* Office of Sustainable Communities, Smart Growth Program. Available at: http://www2.epa.gov/sites/production/files/2014-07/documents/saginaw-sgia-report-final-071614.pdf; accessed May 26, 2015.

Espey, M. and K. Owusu-Edusei (2001). "Neighborhood parks and residential property values in Greenville, South Carolina." *Journal of Agriculture and Applied Economics*, 33(3): 487-492. Available at: http://illinoisonline.org/krassa/ps410/Parks/Neighborhood%20Parks%20and%20Property%20Values.pdf; accessed August 24, 2015.

Feng, D., J. Yi, D. Wang, L. Chen (2010). "Impact of salt and freeze-thaw cycles on performance of asphalt mixtures in coastal frozen region of China." Cold Regions Science and Technology, 62(1): 34-41. Available at: http://www.sciencedirect.com/science/article/pii/S0165232X10000285; accessed September 26, 2014.

Flesher, J. (2015). "Panel opposes legal shield for city, suburban livestock." The Detroit Free Press. 15 March, 2015. Available at: http://www.freep.com/story/news/local/michigan/2015/03/15/chicken-livestock-urban-suburban-agriculture/24812249/; accessed August 26, 2015.

GAO (2004). "Water Infrastructure: Comprehensive Asset Management Has Potential to Help Utilities Better Identify Needs and Plan Future Investments." Report to the Committee on Environment and Public Works, GAO-04-461. Washington DC, US GAO.

Goldstein, I. (2012). "Market value analysis: a data-based approach to understanding urban housing markets." The Reinvestment Fund. Web. Available at: http://www.federalreserve.gov/publications/putting-data-to-work-market-value-analysis.htm; accessed September 26, 2014.

Goldstein, M., J. Bellis, S. More, A. Myers and E. Ura (2011). *Urban agriculture: A sixteen city survey of urban agriculture practices across the country.* Turner Environmental Law Clinic. Available at: http://www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-a-livable-future/_pdf/projects/FPN/Urban_Community_Planning/URBAN_AGRICULTURE_A_SIXTEENCITY_SURVEY_OF_URBAN_AGRICULTURE_PRACTICES_ACROSS_THE_COUNTRY.pdf; accessed August 26, 2015.

Gorham, M.R., T.M. Waliczek, A. Snelgrove, and J.M. Zajicek (2009). "The Impact of Community Gardens on Numbers of Property Crimes in Urban Houston." *HortTechnology*, 19(2): 291-296. Available at: http://horttech.ashspublications.org/content/19/2/291.short; accessed August 24, 2015.

Griswold, N.G., B. Calnin, M. Schramm, L. Anselin, P. Boehnlein (2014). "Estimating the Effect of Demolishing Distressed Structures in Cleveland, OH, 2009-2013: Impacts on Real Estate Equity and Mortgage-foreclosure." Report by Griswold Consulting Group for the Western Reserve Land Conservancy. Available at: http://www.neighborhoodindicators.org/library/catalog/estimating-effect-demolishing-distressed-structures-cleveland-oh-2009-2013; accessed June 6, 2015.

Hummel, D. (2013). "Right-Sizing Cities: Strategies and Fiscal Health." A dissertation submitted to the faculty of The College of Design and Social Inquiry at Florida Atlantic University. Available at: http://www.researchgate.net/publication/265461784_Right-sizing_Cities_in_the_United_States_Defining_its_strategies; accessed May 26, 2015.

Informing the Debate

Michigan Applied Public Policy Research
(MAPPR)
Institute for Public Policy and Social Research
www.ippsr.msu.edu
@IPPSR
Michigan State University