

GREENING US LEGACY CITIES—A TYPOLOGY AND RESEARCH SYNTHESIS OF LOCAL STRATEGIES FOR RECLAIMING VACANT LAND

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Abstract: Dozens of older US industrial “legacy” cities are repurposing vacant lots into community gardens and urban farms, pocket parks, and green infrastructure projects as part of longer-term strategies to address concentrations of neighborhood abandonment. Recent research documents that public, private and nonprofit entities are leading initiatives to green post-industrial landscapes that can achieve a wide range of public goals while offering local governments and neighborhood residents potential health, economic, and social benefits. Part of the challenge for planners and policymakers is how to select the most appropriate urban greening strategies and implement them in an effective and equitable manner. For researchers, the challenge is reaching beyond individual disciplines and individual projects to better investigate and simultaneously assess numerous benefits of various greening strategies. In May 2015, the Metropolitan Institute’s Vacant Property Research Network⁴ concluded a yearlong inventory and synthesis of social science and public health research on the greening of vacant land from peer reviewed academic journals. It then developed web-based policy brief to help make the research more accessible and digestible for practitioners and policymakers, so they can more readily identify strategies and extract insights from the growing field of urban greening research to support their local programs. The following paper offers a typology of urban greening strategies commonly used in legacy cities. It also highlights the academic research that explores the benefits from these strategies along with the planning and policy challenges that legacy cities typically confront when reforming existing plans, development processes, and zoning codes to promote urban agriculture and other green uses.

1. Introduction

Urban greening research follows the evolution of different planning and greening movements in response to a wide array of urban challenges. Many community greening programs to address blight began in the 1960s and 1970s as cities lost population to the suburbs, leaving empty spaces behind. Several of today’s most successful community greening programs were established in the 1970’s, including Green Guerillas in New York City, Tree People in Los Angeles, Philadelphia Green in Philadelphia, P-Patch in Seattle, and many more (J. Blaine Bonham et al., 2002, Wiland and Bell, 2006, Schmelzkopf, 1995). Within the last five years, there has been mounting interest by policymakers about how urban greening strategies can address long-term challenges from large inventories of vacant and abandoned properties often found in older industrial “legacy cities.” The so-called legacy cities, or cities in transition, are older industrial cities that have experienced manufacturing decline and population loss over the past few decades, and have had a difficult time bouncing back (The American Assembly, 2011, Mallach and Brachman, 2013). High rates of vacancy created a series of problems including reduced tax base, reduced property values for remaining

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homes and increased crime as well as giving the general appearance of neglect and disuse. In several older industrial cities such as Baltimore, Buffalo, Cleveland, Detroit and Youngstown, communities are creating networks of gardens and urban farms, pocket parks, and other green settings on vacant lots as a means of addressing their blighting influence. Building on the early research about property value increasing from basic greening of vacant land, researchers have renewed their examination of a wider array of urban greening interventions and treatments, attempting to explore the impacts of these various greening programs. Contemporary research on urban sustainability examines environmental, public health, and social benefits of greening, including the use of green infrastructure to address new storm water mandates, of expansion and maintenance of healthy tree canopies as part of urban forestry strategies, and the resurging urban agriculture movement, not to mention mitigating the effects of climate change. Much has been learned with each of these different urban greening policy waves about the impacts of greening and green spaces on surrounding communities. The wide range of program types has been both a boon and a challenge for researchers, as it provides both a lot of subjects to study and makes it quite hard to generalize from any single study. Most research in this domain focuses on a single program and the benefits or drawbacks of any one program may not be generalizable to all given inevitable differences in context and implementation. This research translation paper is designed to help practitioners, policymakers, and researchers better develop and use applied research to further urban greening initiatives. While its primary focus is on the greening efforts within the context of legacy cities, it also discusses relevant research from the broader field of urban greening, summarizing key findings and observation, and offering suggestions for further research in the field (see Appendix A).

2. What is Urban Greening?

Practitioners and researchers use the term urban greening to refer to a wide range of projects – from minor and temporary landscaping improvements using plants to the development of large-scale projects, permanent parks, and recreation areas. Greening, while often connected to environmental and sustainability initiatives, can loosely include the production, preservation and development of parks, public green spaces, gardens, natural habitats, greenways, etc. (De Sousa, 2014). More than individual sites or strategies, urban greening often encompasses a network of natural and engineering elements that work together in providing ecosystem services—which often means the socio-economic, cultural, and environmental benefits that people derive from such natural systems (Eisenman, 2013). Within the context of regenerating older industrial legacy cities, urban greening takes on a special meaning, often referring to diverse treatments and interventions for reclaiming hundreds or thousands of vacant and abandoned properties (e.g., lots, homes, businesses, and industrial plants) left behind by decades of depopulation and decline (Schilling and Logan, 2008).

Among the many potential interventions that meet the definition of urban greening, a number of strategies are commonly used to activate underutilized lots in urban settings (note these urban greening strategies are not necessarily mutually exclusive as particular projects or programs may involve one or more of these interventions):

1. *Conversion of neglected urban parcels and public rights-of-way into parks, trails, and open space.* The abundance of underutilized land offers great potential to create new permanent parks and green spaces. Particularly in densely populated cities or low-income areas with scarce access to parkland, repurposing of small vacant lots to green space can provide important social and ecological benefits for urban residents.

2. *Community gardening or greening (e.g., street landscaping, tree plantings, etc.)*. Community gardening has been often used as a strategy to address the abundance of vacant land within cities and to provide access to fresh produce to underserved urban residents.
3. *Vacant land/lot greening as neighborhood stabilization strategies*. Basic cleaning and greening strategies applied to urban vacant lots, including removing debris and trash, overgrown vegetation, and planting grass and flowers to make the parcel green and beautiful, add beauty and amenities to the community, fight urban blight, and provide neighborhood stabilization.
4. *Temporary pop-up interventions*. Pop-up gardens, parklets, guerilla interventions, "open streets" are forms of community-focused tactical urbanism strategies that aim to activate vacant spaces, connect people and places, and transform the identity of the city. Many of these strategies have green elements or involve urban greening activities while others focus more on neighborhood revitalization, community engagement, and economic development.
5. *Business/Productive Harvesting, such as urban agriculture and urban forests*. Larger parcels of vacant land can be put to use for developing commercial enterprises that grow fresh food to be sold to local restaurants, retailers or the general public. Urban agriculture is becoming a way to increase access to locally grown food and a mean to reconnect urban dwellers to the food system and to the different aspects of food productions. While some urban farms may focus on community development goals, such as community education, consumption or workforce training, others are created to improve food access in a particular neighborhood. Because food production and selling are almost always regulated activities, zoning laws dictate the environment for urban agriculture, and urban farms may require special land use, health, and business permits and licenses.
6. *Green infrastructure*. The term green infrastructure refers to greening projects designed for the primary purpose of reducing stormwater runoff. There are many types of green infrastructure projects, ranging from simple contouring to redirect and hold the flow of stormwater to highly engineered rain gardens with complex infiltration or holding systems. The ultimate goal of these programs is improved water quality through reducing the frequency of combined sewer overflow events, during which stormwater overwhelms the sewer system leading to the discharge of raw sewage into waterways.

Each of these categories includes a range of primarily local programs and policies and diverse blends of urban greening strategies and treatments (in the traditional context of landscape architecture and urban ecology, treatment means the site-specific design techniques and tools used to implement the broader urban greening policies, programs). With so many different types of urban greening interventions, what it means to be effective or successful varies among these different types of programs and policies. Local context and ecological conditions matter when reviewing research findings and determining how they may or may not apply to other places.

3. Research Approach

This paper relies on a general scan of the academic literature primarily in the fields of planning, urban policy, public health, environmental/ecological studies, and landscape architecture. It is not an in-depth literature review. We identified over 80 articles based on our own publications and dissertations, searches of academic databases, and contributions from colleagues and peer reviewers of this document. The majority of these sources were published in well respected and relevant, peer-reviewed journals, such as the American Planning Association, Planning Education Research, Landscape and Urban Planning, American Journal of Public Health, Environment and Behavior, etc.

Our research also includes several books and studies/reports by government agencies and nongovernmental organizations.

Most of the existing urban greening research studies the impacts and influences of a particular urban greening strategy, intervention or specific treatment. Successful greening projects, whether temporary or permanent in nature, can bring underused land back into productive use and reduce or eliminate many undesirable community problems (e.g., crime, litter, junk, rodents, dangerous buildings, etc.) often associated with abundance of vacant lots. The research often focuses on one or more of benefits (environmental, social/health, and economic development). Research on economic benefits is perhaps more prevalent than the other two measures. Some researchers are now exploring how to document and measure multiple benefits from the same intervention or treatment. Scholars typically examine a particular program in a particular city or neighborhood and document the benefits using a variety of research methods, such as econometric analysis and environmental data from a sample of individual sites or projects. Most of the current research does not examine the impacts and influences of deploying multiple greening strategies over the course of time.

What is critical for practitioners and policymakers is to recognize that research about one program intervention or policy may not directly translate to another intervention. Thus, practitioners should carefully understand the context of a particular study—the dynamics of a particular practice and how it compares with their local context, such environmental, political, legal, and social and community conditions.

This research and policy paper bridges the traditional divide between research and practice by explaining the methods behind recent research along with the context and findings so that practitioners and community leaders can better understand what the research says, what the research does not say, and how it might be relevant to their respective vacant property initiatives. By understanding how current research may or may not apply to local efforts, we believe practitioners and policymakers will be better equipped to make better decisions, improve policy and program, implementation, and ultimately facilitate the regeneration of their communities.

4. Research Findings

Most of the contemporary urban greening research can be classified according to the type of intervention/strategy, the benefit(s) it can or has provided, and the methods that researchers use to assess or document those benefits. Successful greening projects can return underutilized land back into productive use, generate a range of socio-economic benefits, reduce or eliminate many undesirable externalities often associated vacant lots and contribute to broader neighborhood revitalization initiatives. In a special issue of *Cities* devoted to vacant land, guest editors Hamil Pearsall and Susan Lucas observed that urban greening efforts are transforming the traditional problems of vacant land into a wide range of positive opportunities for older industrial cities (Pearsall and Lucas, 2014).

Below we organize the key research findings from our literature scan into three general categories of how urban greening affects communities: 1) community and economic development; 2) social and public health; and 3) environment and ecosystem. This framework offers a convenient way to organize the range of impacts and benefits that researchers have found from programs, projects, and policies designed to green vacant land.

4.1 Community and Economic Development

Because of decades of population loss, many older industrial legacy cities have thousands of vacant lots and abandoned buildings that drive down property values and serve as a major barrier for future reinvestment. With a substantial surplus of vacant and abandoned properties, US legacy cities, often through specialized land reutilization corporations, have launched extensive initiatives to demolish vacant homes as a planning strategy to rebalance dysfunctional real estate markets (Johnson et al., 2014). With continual population decline and thus weak demand for housing, urban greening emerged as a viable community and economic policy to propel the regeneration of legacy cities (Schilling and Logan, 2008).

Researchers have been exploring the greening of postindustrial landscapes through the lens of brownfields redevelopment programs (De Sousa, 2014) and more recently through city wide regeneration initiatives such as Detroit Future City and Reimagining a More Sustainable Cleveland. Our European colleagues are also tracking urban greening strategies and the potential eco-system services they can provide postindustrial shrinking cities with declining populations (Haase et al., 2014).

One of the well-established research areas is the economic impacts from the greening of vacant land, such as increases in property values, that can help stabilize dysfunctional real estate markets and serve as catalysts to attract residents and investment back into declining neighborhoods (Schilling and Logan, 2008).

Beyond property values, more scholars are beginning to take a broader look at the social benefits from neighborhood greening efforts as well as jobs created or the value of food produced from urban agriculture. Within the community development literature, we also noted a trend with a handful of Community Development Corporations (CDCs) and Community Based Organizations (CBOs) shifting their programming from housing to include different dimensions of urban greening and sustainability (Schilling and Vasudevan, 2012). Below we summarize and synthesis several articles and studies about the community and economic development potential from the greening of vacant land.

4.1.1 Increases in Surrounding Property Values

With respect to vacant lots and the management of urban vacant land, existing research demonstrates that even simple greening of vacant lots can increase surrounding property values. Much of the groundbreaking research on urban greening has been done in Philadelphia with a focus on the treatments and urban greening strategies pioneered by the Pennsylvania Horticultural Society (PHS).

- Three studies of the PHS LandCare program's simple clean and green treatment—where they remove debris, plant grass and trees, and construct a split rail fence to prevent dumping—showed increases in property values located nearby the greened lots. One neighborhood study examined homes immediately adjacent to the green lot and found that they were worth 30% more than other homes in the same neighborhoods (Wachter, 2005). A subsequent city-wide replication of the original study found adjacent property values increased 11% (Wachter and Gillen, 2006). The third study looked at price differences for properties within 500 feet of green lots before and after greening and compared these to changes in price for lots that were not greened. Results showed that values increased more rapidly for properties in the vicinity of the greened lots (Heckert and Mennis, 2012).
- In New York City they compared property values around vacant lots before and after they became community gardens and found a significant increases in property values within 1,000 feet of the garden with positive gains increasing over time (Voicu and Been, 2008).

- A study of community gardens in St. Louis found that rents increased in close proximity to newly established community gardens more than they did in the larger surrounding communities, indicating a willingness to pay more to live near community gardens (Tranel and Handlin, 2006).

Two of these five studies further found that these impacts of greening vacant land are stronger in some neighborhoods than others, and that greening may have no impact on property values in some areas.

- One study of the Philadelphia LandCare program found that property values increased in distressed neighbourhoods more than they did in more stable real estate markets, but that the most distressed areas of the city did not see property value improvements as a result of greening. It further found that increases in property values also seemed to be contingent on the percentage of vacant land that had been greened, with higher rates of greening associated with increased property values (Heckert and Mennis, 2012).
- The study of community gardens in New York also found that neighborhood conditions influenced the effect of garden establishment, with gardens increasing property values in low-income but not high-income areas. It further found that garden quality influenced the garden impact, with high quality gardens leading to higher property value increases (Voicu and Been, 2008).

These findings are consistent with the general literature on parks and green spaces. Numerous studies have found that parks, trees, and vegetation are all associated with higher property values. However, though the "proximate principle" that parks increase property values in close proximity is widely accepted, other studies have shown that these impacts may vary based on both neighborhood and park characteristics, such as crime rates (in high crime areas, parks are associated with lower property values (Troy and Grove, 2008), park amenities and park maintenance levels (Troy and Grove, 2008, Crompton, 2001).

4.1.2 Supplements Food Security Initiatives

Another new area of research examines the economic and community development potential from urban agriculture and other types of productive urban greening strategies. In recent years, urban agriculture has received increasing support as a strategy for food security and urban sustainability. Using vacant land as a resource for local production is expanding worldwide as a response to community food insecurity and urban food deserts (Colasanti et al., 2012, Gardiner et al., 2013). Many community gardeners see economic benefits to gardening in the food that is produced, either for their own consumption, sharing, or sale in local communities. Below we highlight some of the recent research about urban agriculture and community gardening from a broader sample of cities.

- An ethnographic study of gardens in New York City's Loisada neighbourhood noted that many gardeners see economic resources as the primary motivation for growing food (Schmelzkopf, 1995).
- Estimates of the agricultural potential of Oakland, California's vacant lots, open space, and underutilized parks found, in the most conservative scenario, that these sites could potentially contribute between 2.9 and 7.3% of current consumption of recommended vegetables, depending on production methods, or 0.6–1.5% of recommended consumption (McClintock et al., 2013).

- Early data suggest that in some markets urban specialty crop cultivation could yield 2-7 kg/m² depend on the type of crop and conditions (Beniston and Lal, 2012).
- A study of the Mantua neighbourhood in Philadelphia --using observations and interviews with gardeners-- noted that gardeners tended to share their produce with neighbours and members of their churches (Hanna and Oh, 2000).

4.2 Public and Social Health

Green space is widely regarded as a health-promoting characteristic of residential environments, and has been linked to health benefits such as reduced stress, increased positive emotions, and increased physical activity (Tzoulas et al., 2007). The evidence, however, mainly concerns the short-term restorative benefits of single experiences with nature, while consistent and objective measurement of both exposure to nature and long term health-related outcomes remains elusive. Nonetheless, research findings bear potentially important implications for the future study of urban vacant lot greening as a tool to enhance health. With respect to individual health, long standing environmental psychology research suggests that green space availability can contribute significantly to the physical and psychological well-being of individuals (Lafortezza et al., 2009). Most of this evidence concerns short-term restorative health benefits from a particular place and surveys of participants from a single visit or experience with nature, as opposed to consistent and objective measures of both exposure and long-term health related outcomes (e.g., working in a particular community garden over two years reduced certain health risks or risk factors, etc.). For example, a study of participants in one community gardening organization in Salt Lake City, Utah found that active men and women community gardeners' s had lower BMIs than non-participating neighbors, spouses and siblings. Women community gardeners had significantly lower BMIs compared to their sisters and men community gardeners compared to their brothers. Even though findings may not generalize to gardening organizations elsewhere, results of this study suggest that community gardens could be a neighborhood feature that promotes health (Zick et al., 2013). Passive experience of a green environment has been linked to a greater sense of safety and wellness, reduced stress, and diminished driving frustration (Ward Thompson et al., 2012, Cackowski and Nasar, 2003, Kuo et al., 1998b). Exercising while being directly exposed to nature has a positive effect on self-esteem and mood (Pretty et al., 2005). Furthermore, living and playing in a green space can improve children school performance and lessen the symptoms of Attention Deficit and Hyperactivity Disorder (ADHD) (Taylor and Kuo, 2008, Wells, 2000).

4.2.1 Facilitates Social Interactions

Several studies also document the role of greening projects in facilitating social interaction. The general idea is that green spaces can provide both physical space and a purpose for neighborhood cohesion and identity. A survey of community gardeners of four greening sites in Chicago found positive outcomes, a sense of ownership in the neighborhood and feelings of empowerment, but that social cohesion does not automatically happen at the community garden but organizers and participants must be mindful and active in creating the right atmosphere and activities that can support and nurture social cohesion. Methods of implementation and degree of participation of many diverse community members are part of the recipe for success. When residents felt involved and received support, they felt empowered and thus it enhanced a sense of community (Westphal, 2003). Of course, the social dynamics of greening can be complex and may lead to disagreements or resentments within communities.

Another Chicago study found that residents living closer to common green spaces, in comparisons with those that do not, tended to enjoy and engage in more social activities, know their neighbors, etc. Common green spaces facilitate the development and preservation of social ties (Okvat and Zutra, 2011, Kuo et al., 1998a).

4.2.2 *Supports Social Justice & Equity*

Environmental gentrification is the process of environmental quality renewal accompanying the influx of affluent people often displacing old time residents that find themselves priced out of their own neighborhoods as they become more sought-after and valuable. An emerging view in the literature is that environmental improvements, such as vacant lots beautification and creation of community gardens, can become a catalyst for or contribute to gentrification of the neighborhoods they aim to revitalize. Most of the studies, however, have been conducted in areas with strong real estate markets. Research findings, in fact, appear to suggest that gentrification tends to happen in cities with tight housing markets and in a select number of neighborhoods. In legacy cities that have suffered from extensive housing vacancy and abandonment, the modest levels of community revitalization brought by environmental improvements do not lead to significant levels of displacement pressure. While some recent research also calls into question the potential negative impacts from urban greening related to social justice, affordable housing and gentrification, other research from legacy cities seems to support positive influences on social justice and social equity. A study of the Philadelphia LandCare program found that more than 45,000 people of diverse racial and ethnic backgrounds and 16,000 households in the city now have access to green space within a half mile of their residences (Heckert, 2013). Research on displacement and gentrification from high profile, large-scale urban greening projects (such as the Highline in New York City) seem more prevalent in cities and neighborhoods already undergoing rapid growth and redevelopment. However, the lessons from these projects raise legitimate concerns about social justice if greening leads to neighborhood change that causes displacement of existing residents (Wolch et al., 2014).

4.2.3 *Positive Impacts on Neighborhood Crime*

Another strand of the social/public health literature is urban greening's positive impact on neighborhood crime. While greening vacant spaces cannot reduce crime *per se*, changing the physical appearance of a neighborhood can make it more difficult for people to conduct illegal activities, creating a neighborhood where people feel safer. This is consistent with social and psychological research on physical and social disorder under the rubric of the Broken Window Theory (Pitner et al., 2012).

A study of the impacts of the PHS LandCare program in Philadelphia found that incidence of police-reported crimes decreased around greened lots when compared to areas surrounding vacant lots that had not been greened. Regression modeling showed that vacant lot greening was linked with consistent reductions in gun assaults across four sections city (Branas et al., 2011).

Interviews to residents surrounding green and non-green lots in Philadelphia found the residents felt safer after greening had occurred. The Philadelphia study is consistent with the literature that examples the relationship between vegetation and crime in inner city neighborhoods under the concept of Crime Prevention Through Environmental Design (CPTED). For example, crime rates for 98 apartment buildings with varying levels of nearby vegetation found that public housing buildings with high levels of vegetation has 48% fewer report property crimes and 56% fewer violent crimes than buildings with low levels of vegetation (Kuo et al., 1998b, Kuo and Sullivan, 2001).

4.3 Environment & Ecosystem

The expanding field of urban greening continues to include new studies that document the environmental and ecosystem benefits of greening vacant land. Ecosystem services are direct and indirect benefits provided to humans by functioning ecological systems (Farber et al., 2006). These services encompass provisioning of food and water, as well as regulating climate, air and water quality, cultural services, such as recreation and aesthetic enjoyment, and supporting services, i.e. activities that contribute supporting ecosystems, such as pollination and soil formation (Costanza et al., 1997, de Groot et al., 2010).

Stormwater management is one of a wide range of "ecosystem" services that vacant lot greening specifically can provide. In many "legacy" cities, green infrastructure is emerging as a viable strategy to address policy challenges associated with stormwater runoff and aging combined-sewer systems (Shuster et al., 2014, Jaffe, 2010). Vacant lots can be transformed into lot-scale rain gardens or aggregated into larger scale landscape features such as constructed wetlands providing stormwater mitigation and alleviating combined sewer overflows (Barkasi et al., 2012). A study of 52 vacant lots (former urban demolition sites) in Cleveland, OH demonstrated that properly designed and managed infiltration type green infrastructure on vacant lots can have sufficient capacity for detention of average annual rainfall volume (Shuster et al., 2014).

Other potential environmental and ecosystem benefits include habitat for local wildlife and addressing aspects of climate change, such as mitigating urban heat island effects. Much of this research, however, does not take place only on vacant lots, but in a wide variety of urban settings. It is important to recognize and leverage these expanding areas of urban greening and urban sustainability research that could apply to the context of reclaiming vacant land in legacy cities. Underutilized urban land can be converted into vegetated open space that serve multiple functions and provide multiple ecosystem services; community gardens support biodiversity and habitat conservation and allow residents to cultivate for flowers, fruit, and vegetables (Gardiner et al., 2013). Functionality provided by green space in urban environments has becoming increasingly relevant in the context of planning for mitigation and adaptation to climate change. Conversion of underutilized vacant land into green infrastructure with combined social–ecological amenities could provide increased resilience to predicted near-term effects of climate change, such mitigate urban heat island effects and provide biological benefits by the recycling of carbon to help reduce GHG emissions (Nowak et al., 2013, McPherson and Simpson, 2003, Lovell and Taylor, 2013). Urban forested areas contribute to carbon sequestration and storage and to air temperature reduction (Nowak et al., 2013, Haase et al., 2014). In addition, vegetation can be used to cost-effectively remediate mildly contaminated brownfields sites. A whole body of literature exists on brownfields remediation techniques using plants (phytoremediation) and fungi (mycoremediation) to stabilize or reduce soil pollution (Wilschut et al., 2013, LaCroix, 2010).

4.4 Implementation Opportunities and Challenges

Within the fields of community development and urban regeneration, we also found research on emerging examples of pioneering community-based organizations expanding their neighborhood stabilization and vacant property efforts to include a wide array of urban greening strategies. Community development corporations (CDCs) in the US have a long history of leading neighborhood revitalization projects, such as housing development and rehabilitation for low to moderate-income residents, along with rebuilding the civic infrastructure and capacity of distressed communities. For many legacy city neighborhoods, it makes little sense to build or rehabilitate homes in light of weak demand and declining property values caused by on-going population loss.

A new type of green CDC is emerging as new organizations such as the Youngstown Neighborhood Development Corporation (YNDC) or People United Sustainable Housing (PUSH) Buffalo deploy a variety of urban greening strategies to stabilize transitional and severely distressed neighborhoods. In many respects, these nonprofits, working in collaboration with the city government, are filling a critical void caused by a dwindling city revenues and capacity to intervene. They also have great potential to reverse the social dynamics of declining neighborhoods by rebuilding social capital that could be especially critical for the regeneration legacy cities and districts (Nassauer and Raskin, 2014). For example, a yearlong case study of Groundwork USA—a national network of 20 community-based intermediaries or “trusts” examines how the Groundwork model integrates the physical restoration of brownfields, vacant lots, and polluted urban rivers with community renewal programs, such as training youth in urban natural resources stewardship (Schilling and Vasudevan, 2012). Acting as green intermediaries, the Groundwork Trust model offers researchers, policymakers, and practitioner’s new insight.

Recent research further documents that formally chartered public gardens, as cultural institutions, are emerging as a nontraditional community development partner in providing resources for urban greening interventions, engagement, and education (Gough and Accordino, 2013). For example, the Cleveland Botanical Garden, thanks to research grant from the Great Lakes Protection Fund, is testing the green infrastructure capacity of different urban greening treatments in Cleveland and Milwaukee.

Beyond these opportunities, researchers are also documenting the common policy challenges that prevent the scaling of urban greening initiatives, such as complex vacant land acquisition processes, out dated zoning regulations, and inadequate resources for long-term ownership and maintenance (Courtney Kimmel et al., 2013, LaCroix, 2010). While more legacy cities have adopted special zoning ordinances and development regulations for urban agriculture, these new rules remain relatively untested and can create conflicts with remaining residents. Maintenance of vacant lots has also become a major public policy challenges for the expanding number of land bank authorities and land reutilization corporations in Michigan, New York, and Ohio. Demolition techniques (e.g., burying of foundations and debris) and common household strategies for mowing and gardening (e.g., use of chemicals) can pose unforeseen threats to the vacant lot’s ecosystem and perhaps negatively impact the health of local residents (Schilling and Vasudevan, 2012). Interventions on vacant lands are typically decided on a case by case basis, with specific greening strategies depending upon environmental and social characteristics of the community (Colbert et al., 2010). Given the contamination problems common in urban soils, for example, a soil quality assessment is necessary to optimize use for crop production and functional green space (Beniston and Lal, 2012). Because of the complexities associated with the greening of vacant, urban land, Nassauer and Raskin stress the necessity for transdisciplinary research about the planning and policy implications of transforming vacant land as “socio-ecological systems” (Nassauer and Raskin, 2014). It is critical to recognize that research about one program intervention or policy in one community may not directly translate to another community or another type of urban greening strategy, as ecological and social outcomes of greening projects may vary greatly across neighborhoods and thus need to be managed through informed planning policies (Jenerette et al., 2011). Despite this limitation, the recent urban greening research, as described in the previous sections, documents that many of these strategies and techniques are working.

5. Conclusions

Urban greening bridges many divides. Fast growing cities and legacy cities are each adopting and adapting urban greening strategies and treatments as part of broader initiatives to create more sustainable, healthy and just communities. Legacy cities can deploy urban greening to reclaim vacant lots and abandoned properties that help stabilize declining neighborhoods and dysfunctional economic markets while many growing cities, especially those on the coasts, are beginning to view urban greening as a front line response to mitigate the impacts of a changing climate. Urban greening work and research also involves diverse fields (e.g., public health, planning, policy, design, engineering, etc.) and seems to span the divide of academic inquiry and practice. As a specialty field, urban greening now has a strong following among groups of local leaders, CBOs, NGOs, and academic institutions. Much of the research discussed in this paper documents what practitioners know first-hand—that planning and implementation of urban greening projects is complex, difficult, and sometimes controversial; thus urban greening initiatives require the meaningful engagement from various levels of government, the private sector, and local NGOs. Ecological and social outcomes of greening projects may vary greatly across neighborhoods and thus should be managed through informed planning policies. Given the wide range of urban greening strategies and the complex and dynamic nature of implementing initiative for greening vacant land in urban areas (e.g., the community, political, strategic, and technical dimensions of urban greening initiatives, etc.), only truly holistic planning processes can help ensure that green reuse of urban vacant areas will happen in ways that are suitable and useful for the entire community.

Any time researchers and practitioners explore the landscape of such a complex and dynamic topic as urban greening our thoughts drift to posing outstanding questions to which existing research does not or has not yet given us clear answers. In some fields of inquiry, the gap is wide between intriguing intellectual questions and those issues that plague practitioners and policymakers. With respect to urban greening, its practical nature and emerging community of practice has a strong connection between academic inquiry and work on the ground. We have compiled a preliminary list of Future Research Topics that we believe would be relevant for practitioners and researchers to work together to answer (see Appendix A). Many of these ideas again are derived from our own research activities and publications along with a few contributions from our colleagues and peer reviewers. It is neither comprehensive nor complete, but this list could serve as the preliminary foray into developing a more robust urban greening in legacy cities research agenda.

One major conclusion from our research is the promise of urban greening to deliver multiple benefits to communities from increasing property values and reducing stormwater runoff to facilitating social cohesion. Certainly some of the findings in this paper merely confirms what practitioners perhaps intuitively already know—the collaborative power of urban greening as diverse communities coalesce around its ethos and goals. In many respects this body of research provides an objective and reliable second opinion that practitioners and policymakers can point to when making the case for supporting or expanding urban greening initiatives in their communities.

Despite the positive news from these studies, it becomes critical to ensure the reliability of the data, acknowledge the limitations of the research, and document the problems and potential negative impacts along with the benefits. In order to unleash the environmental, economic and social psychological benefits of greening urban spaces, practitioners and researchers will need to develop a common understanding about the research itself and find new partnerships for expanding the research on policy analysis and decision-making. We believe this paper is one major step in that direction.

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Appendix A. What do we not know? What would we like to know more about? Implications for the Design and Development of Future Research Projects and Collaborations

Below is a list of future research issues and questions that we believe would be relevant for practitioners and researchers to work together to answer. Many of these ideas again are derived from our own research activities and publications along with a few contributions from our colleagues and peer reviewers of this paper. It is neither comprehensive nor complete, but certainly this list could serve as the preliminary step into developing a more robust urban greening in legacy cities research agenda.

- *Characteristics of Successful Urban Greening Projects and Programs*: Few studies examine how neighborhood characteristics/dynamics affect results (in other words, do programs have the same effect in all places).
 - What are the critical variables or ingredients to success, both from a technical sense and from a policy and planning perspective?
 - What effect, if any do urban greening interventions have on the longer term trajectory of vacant land? Do they not only stabilize markets or neighborhoods, but do they contribute to the slowing of the vacant land inventory.
 - Are lots that get interim vacant land management treatments (greened), more likely to be redeveloped or used for productive reuse (such as urban Ag or GI) compared with vacant lots that do not get greened?
- *Green Jobs and Green Businesses*: What kinds of jobs do urban greening initiatives generate? Are they worthwhile investments and can they be taken to scale?
- *Land Banking and Urban Greening*: How effective or productive are land bank urban greening strategies and interventions? Existing research on land banks tends to focus on the economic benefits from the acquisition and demolition of surplus housing and other types of vacant properties. As land banks, particularly in Michigan and Ohio, seem to be the primary legal entity involved in developing and

maintaining vacant lots in legacy cities, practitioners could benefit from new research that compares the environmental and social benefits derived from these land bank greening programs, especially the perplexing policy problem of how to finance and maintain increasing inventories of green vacant lots over time.

- *Resources for Urban Greening and Green Infrastructure:* Within the past several years the federal and state governments have created new avenues for local governments to access dollars for demolishing vacant homes caused by the mortgage foreclosure crisis. While some of these programs, such as the US Treasury's Hardest Hit Funds, provide for post demolition greening and maintenance, they come with fairly prospective eligibility rules and at this point these funds are short term and temporary. In light of the scale of property abandonment, legacy cities certainly need more consistent and flexible resources for demolishing thousands of vacant properties. These resources must acknowledge that in many legacy cities demolition is a precondition to many urban greening strategies and treatment; however, many current demolition funds do not typically support the property maintenance responsibly or urban greening treatments/interventions. Thus, local governments, land banks, and green CBOs would benefit from new research on the funding challenges for converting, maintaining and monitoring vacant lots with green stabilization treatments; perhaps such research might help advocate for reallocating demolition resources to cover such property maintenance costs. Any new research should also explore ways of leveraging private-sector financial resources and expertise to support a range of urban greening projects.
- *Comparison and Suitability/Feasibility of Urban Greening Interventions across Different Cities:* Urban greening research could create a framework for comparing different urban greening interventions and the inherent tradeoffs that could arise between multiple desired outcomes. From a planning perspective, the research might help communities better understand the goals, potential outcomes and benefits from various urban greening interventions. Not every vacant lot can become a revenue- and food-generating urban farm, thus more research on the design and development of different types (a menu) of urban greening interventions could help communities more clearly articulate the goals/benefits of urban greening strategies at different scales (e.g., regional, city wide, neighborhood) and test the feasibility of such approaches. As part of the Reimagining a More Sustainable Cleveland, Kent State facilitated a working group that developed a preliminary decision tree to help guide city planners and neighborhood leaders in making informed decisions about the what type of urban greening treatment might be best suited for particular properties in particular neighborhood.
By articulating the goals (short-term stabilization vs. permanent installation) and benefits based on existing research, local governments and urban greening intermediaries could strategically leverage their resources and engage the community residents in a more thoughtful understanding about the potential benefits, tenure and placement of urban greening interventions in their community.
 - In order to realize the true potential that urban greening can provide, especially to better document the environmental and social benefits, longer term research projects are necessary that can track results over time.
 - Comparing similar urban greening programs and policies across cities would better facilitate and solidify a community of practice and facilitate the transfer of lessons learned across cities.
- *Urban Agriculture Economic Costs and Benefits:* what does the research show on the current and potential economic returns on investment in urban farms and urban forestry businesses as many current farms receive grants and other types of support from foundations and government along with in-kind support from and community groups? Can Urban Agriculture become a productive and economically viable business? Can it help create private sector green jobs? How does Urban Agriculture contribute to the creation/development of jobs in associated regional or local businesses, such as restaurants and food service industries?
- *Urban Greening Applied to Suburbia:* What are lessons learned from urban greening models that could be applied or adapted successfully to more isolated, poverty-stricken suburban neighborhoods? For example, urban greening organizations, such as Groundwork Trust USA are working on large scale vacancy and abandonment challenges in several suburban neighborhoods that are part of their network of 21 local trusts. Compared with their work in urban communities, they note the lack of a critical mass of people, neighborhoods engaged along with lower community awareness about the benefits of greening vacant

spaces; thus, these preliminary greening efforts seem somewhat isolated compared with the high-impact, high visibility transformative projects they have managed in traditional urban neighborhoods. Community based organizations may need to approach urban greening in declining suburbs differently.

- *Roles of CBOs and NGOs:* New research should explore in more depth the pivotal roles that CBOs are playing in providing local governments and communities with supplemental capacity to organize and lead urban greening initiatives; perhaps develop a typology of CBO models to understand how they are funded, their technical expertise and their linkages to other policy dimensions of urban greening such as the potential for green jobs; use social network analysis to examine cross sector collaboration among institutions, foundations, and urban greening groups in a particular city or across cities.