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Green Alley Programs: Planning for a sustainable urban infrastructure?

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ABSTRACT

Revitalization of urban alleys, underway in cities and towns in North America, Europe, and other regions, can be seen as a manifestation of a broader movement among city agencies, planners, and community groups to expand green urban infrastructure and promote sustainability. This article analyzes alley greening programs in seven cities in the United States using the lens of sustainability planning. Study results indicate that most alley greening programs are narrowly oriented toward stormwater management. An in-depth exploration of the alley greening program in the city of Los Angeles illustrates how a more robust commitment to sustainability – through the adoption of goals related to environmental protection, economic development, and social equity – might be actualized in the context of alley greening efforts. The article also considers the role of collaboration in developing integrative sustainability programs around alleys.

Introduction

Many North American cities are taking steps to strengthen their green infrastructure, or the networks of wildlands, woodlands, waterways, and wetlands that, when combined with green roofs, permeable paving, vegetative swales, parks, and green streets, support ecological processes and contribute to human health and quality of life (Benedict & McMahon, 2002). One innovative strategy emerging among cities including Chicago, Baltimore, and Los Angeles is to green (or, in the case of Baltimore, "blue") long-neglected back alleys to achieve a suite of ecosystem service and public health goals. These cities contain extensive alley networks; for instance, the city of Chicago has approximately 1900 miles of alleys, comprising more than 3500 acres (Chicago Department of Transportation, 2007). The city of Los Angeles has an estimated 12,309 alley segments, a network of more than 900 linear miles, or approximately 1998 acres (Cassidy, Newell, & Wolch, 2008), while Baltimore's alley network encompasses over 600 linear miles (City of Baltimore Department of Public Works, 2008). Alleys are thus a significant, though typically overlooked, urban public infrastructure resource.

The potential benefits of alley greening projects are numerous. Alleys may facilitate urban runoff management through infiltration, groundwater recharge, heat island reduction, and expanded wildlife habitat (Wolch et al., 2010). Back alleys have recently been heralded by New Urbanists for their ability to reinvigorate pedestrian activity throughout neighborhoods (Duany, Plater-Zyberk, & Speck, 2001; Zelinka & Beattie, 2003). Wolch et al. (2010) have posited that redesigned alleys may provide services such as park and recreational space, improvements, and pedestrian linkages within the community. As safe, attractive, usable social spaces, converted alleys may help renew neighborhoods by fostering increased visibility and use of previously feared spaces.

Conceptualizing alleys as green infrastructure represents a new vision for an old design feature. For more than 2000 years alleys have served as spaces for neighbors to interact, children to play, as access points for infrastructure services, and a variety of other purposes (Beasley, 1996; Borchert, 1980; Martin, 2001, 2002). In the US, alleys fell into disfavor in the late nineteenth century because they were often seen as dangerous, unhealthy places (Ford,

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2001). By the 1930s, federal housing policy effectively disallowed alleys, and urban design and municipal services evolved to focus attention on streets and front yards (Martin, 2001).

This article profiles eight alley greening programs in seven US cities. Our objective is to consider the goals and practices of these programs in light of sustainability planning (Wheeler, 2004). This perspective allows us to reflect upon the extent to which alleys, as green infrastructure, fulfill sustainability objectives. Because organized alley greening efforts in the US are relatively recent developments, this analysis may provide guidance for new and emerging programs. In the next section, we elaborate on the relationship between green infrastructure and sustainability planning and contextualize our research objectives within these literatures.

Green infrastructure and sustainability planning for cities

The roots of green infrastructure can be traced to theories and practices that emerged in Western planning over the past century and a half, including Olmsted's greenway visions and New Town development (Benedict & McMahon, 2002; Kambites & Owen, 2006; Walmsley, 2006). In its present incarnation, and termed thusly, "green infrastructure" has gained rapid currency in planning theory and policy. The term now has a multitude of definitions, revealing itself to be an ambiguous and contested concept, as different interest groups attach different meanings and benefits to it (Mell, 2008; Wright, 2011). In pursuit of critical reflection on the term, Wright (2011) has identified the notions of connectivity, multifunctionality, and "green" (typically representing the infrastructural elements that act as a basis for environmental improvement) as the "core ideas" of green infrastructure, and present in nearly all definitions of the concept. Tzoulas et al. (2007, p. 169), for instance, write that green infrastructure may comprise "all natural, semi-natural and artificial networks of multifunctional ecological systems within, around and between urban areas, at all spatial scales." Turning to considerations of what green infrastructure means in practice, definitions variously identify and emphasize environmental, social, and economic benefits. Some scholars have suggested, for instance, that the US literature tends toward an environmental focus, while UK policy writing on the application of green infrastructure focuses on socio-economic functions and benefits (Kambites & Owen, 2006; Wright, 2011).

Benedict and McMahon (2002, p. 12) are among those who explicitly link green infrastructure to sustainable development, arguing green infrastructure "is the ecological framework needed for environmental, social and economic sustainability." The concept of sustainability, and especially its close sibling, sustainable development, achieved mainstream status following the release of the Brundtland Commission report *Our Common Future* in 1987. This report provided the international community with what has become the most well-known and commonly referenced definition of sustainable development, defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment & Development, 1987, p. 8). Numerous alternative definitions have since been proposed, most referencing in some fashion what are widely acknowledged to be three primary goals of sustainable development: environmental protection, economic development, and social equity (often referred to as the "Three Es"). This schema is perhaps too simplistic as it does not convey the contested negotiations (and often incompatibility) between these three objectives when planning for sustainability, but it nonetheless provides a useful construct within which to broadly conceptualize priorities.

The link between green infrastructure and sustainability planning is evident at the scale of the city. Numerous scholars and practitioners consider green infrastructure expansion as a means to foster urban sustainability (Ahern, 2007; Mell, 2009; Sandström, 2002; Schilling & Logan, 2008). Promoters cite its broad potential to advance sustainability in an array of environmental, social, and economic fronts. For example, green infrastructure may increase landscape connectivity for wildlife movement (Kong, Yin, Nakagoshi, & Zong, 2010), support biodiversity conservation (Bryant, 2006; Goddard, Dougill, & Benton, 2010), maintain or enhance natural ecosystem functions (Xiao & McPherson, 2002), facilitate climate change adaptation (Gill, Handley, Ennos, & Pauleit, 2007), and assist in stormwater management and flood alleviation (Ahern, 2007). It may increase land and property values (Conway, Li, Wolch, Kahle, & Jerrett, 2008), attract tourists, industry, and skilled workers (Deng, Arano, Pierskalla, & McNeel, 2010; Kambites & Owen, 2006), support the development of green industry (Schilling & Logan, 2008), and reduce costs associated with urban heat islands (Bowler, Buyung-Ali, Knight, & Pullin, 2010) and stormwater (Carter & Jackson, 2006; Soares et al., 2011). It also offers potential social benefits such as improved health and well-being, culture, sport, and recreation opportunities, and a stronger sense of community (Kambites & Owen, 2006; Mell, 2007; Tzoulas et al., 2007), ideally with equity in mind. Aside from distributional equity, notions of procedural equity suggest that the production of green infrastructure space must involve ensuring democratic participation in decision-making processes about the qualities of that infrastructure (Lake, 1996; Young, 1990).

Sustainability planning literature emphasizes the interconnectedness of these three Es (Beatley & Manning, 1997; Berke, 2002; Kaiser, Godschalk, & Chapin, 1995). Berke (2002, p. 31) notes,

> "When all values cannot be represented, sustainability cannot be promoted by a plan. If environmental values are not accounted for, then the basic life support process on which a community depends cannot be sustained. If economic development values are not represented, then the fundamental source of community change and improvement is denied. If social values are not reflected in a plan, then places will be created that do not meet the life and work needs of local people and do not fairly serve all interest groups."

A balance must be attained in the representation of these values; as Kaiser et al. (1995, p. 52) state, "for the [three-legged] stool to stand, every part must be in place, equally proportioned and properly joined." This planning challenge clearly plays out at the local scale, where interest groups and public agencies will often define sustainability for their own purposes (Andrews, 1997). Professional and fiscal constraints may limit planners and other entities in terms of breadth of the goals their projects represent (Campbell, 1996). Scholars acknowledge the conflicts inherent in striking a balance between these three corners of the "planner's triangle" (Campbell, 1996). Thus, seeking representation of these three perspectives in any given plan for sustainability, and developing decision-making processes for reconciling specific goals associated with these sometimes competing values, are necessities in the sustainability planning process. Layered on is the complexity of interconnected scales, so even specific, local scale projects that are incremental and iterative must also be designed with an awareness of how they influence and are influenced by broader spatial scales.

This article uses the lens of sustainability planning to interrogate US alley greening programs and to determine the breadth of engagement with sustainability evident in this form of green infrastructure intervention. Do alley greening programs embrace sustainability in its fullest sense, construed here as balanced attention to the "Three Es" in program objectives, or do they reflect a narrower commitment to select values?

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Materials and methods

Organized alley greening efforts in the United States are generally considered to date back to 2006, with the establishment of Chicago's pioneering Green Alley Program. To identify other alley greening programs throughout the country, we relied on Internet searches as well as leads provided by program representatives during correspondence. The search for programs initially occurred in 2007 and 2008, with another search conducted in 2011 and 2012. Alley greening programs that met the following five criteria were selected for inclusion in the analysis:

1. *The "program" is a designated program, pilot program, or initiative with multiple projects/pilot projects planned and/or executed*. We excluded "one-off" projects not currently part of any larger program.
2. *The program represents the "core ideas" of green infrastructure – i.e., connectivity, multifunctionality, and "green."* We excluded alley programs with goals that were entirely social or economic.
3. *The program is intended to facilitate ongoing alley greening across a neighborhood, a city, or another spatial unit of urban geography*. We excluded green alleys that were installed "in one fell swoop" (e.g., in a greenfield development project), outside of the auspices of a sustained program that provides support for ongoing and future alley greening projects.
4. *The program's literature explicitly states that it targets alleys*. We excluded programs (e.g., "green streets" programs) that did not explicitly state a focus on alleys in addition to streets, sidewalks, and other focal rights-of-way.
5. *Alleys are a major focal point rather than one target among many*. We excluded programs that do not focus substantial energy on alleys relative to their focus on other infrastructural elements.

Based on these criteria, we identified eight qualifying alley greening programs. An inventory of these programs was conducted through analysis of print and online policy and program documents; media coverage of the programs; and in-person and telephone interviews and email correspondence with key program contacts.

Alley greening programs: Sustainability planning in practice?

Table 1 describes key components of the eight alley greening programs. Using this table as a point of reference, this section first focuses on the range of objectives identified for each program and then reflects on these programs in light of sustainability planning.

Alley greening programs in the US are unquestionably oriented toward stormwater management goals. For instance, the Blue Alleys pilot effort in Baltimore aims to diminish the volume of polluted runoff into neighborhood streams and Baltimore Harbor; Washington DC's program seeks to improve the water quality of Rock Creek and other proximate water courses through improved control of stormwater; and Chicago's Green Alley Program was implemented to reduce periodic flooding and to aid groundwater recharge. Traditional urban runoff management strategies rely on channeling rainwater into city sewer systems, but peak storm events can overwhelm system capacity. To this end, all programs incorporate some type of permeable surface material (sometimes in concert with features including pitched surfaces and bioswales), which allows water to infiltrate into the subsoil (Fig. 1). A variety of permeable materials are on the market, including permeable concretes, permeable asphalts, pavers (individual concrete or stone blocks that fit tightly together but allow water to percolate), and Grasscrete®, which is a paver-grass hybrid. An efficacy study of a green streets program – Seattle's Street Edge Alternatives (SEAs) program, which installs permeable surfaces along with bioswales and tree and shrub plantings – estimated the program has prevented dry season water discharge and reduced wet season run-off by 98% (Horner, Lim, & Burges, 2002). This has improved water quality and reduced the water volumes in traditional infrastructure systems (Wise, 2008).

The pervasiveness of stormwater abatement goals may be tied to the availability of federal, state, and city funding for stormwater management. In 2004, Los Angeles voters passed Proposition O, which provides up to $500 million for water-related projects, many of which are focused on stormwater capture, clean-up, and re-use. A number of alley projects in LA have emerged due to this funding mechanism. Baltimore's Blue Alleys Program and Washington DC's Green Alley Program are partially funded through stormwater-related sources. Stormwater funding may help to expand the Green Alley Program in Dubuque, Iowa, where a proposal for $8 million toward alley reconstruction is targeting funding from the interest to a state revolving fund (SRF) loan. This SRF loan is financing the city's new wastewater treatment plant. Program staff are proposing to exercise the option to use the interest toward projects that reduce stormwater, rather than to pay all of the interest to the state; should this be approved, the funding would cover 50% of Dubuque's alleys (Jon Dienst, February 2012, personal communication).

Two of the alley greening programs identify a larger suite of environmental protection goals. In addition to stormwater management, the Chicago and Los Angeles programs seek to mitigate the urban heat island effect and avoid exacerbation of urban light pollution (Longcore & Rich, 2004). Chicago's oft-referenced *Green Alley Handbook* depicts light-colored, high albedo pavement and energy efficient lighting which directs light downward and outward, rather than upward into the sky (Chicago Department of Transportation, 2007). Stakeholders in the Los Angeles program identified an additional green goal in harvesting rainwater for use, and in Chicago, energy conservation is specified.

Objectives related to public health and safety, beautification, community empowerment and community building, and education are stated in a smaller number of the programs. A number of Los Angeles projects feature lighting to foster walkability and enhance safety. Baltimore's Alley Gating and Greening Program originated from concerns about crime, dumping, and pest-control problems associated with alleys, and it has since evolved to encompass a stormwater management vision. In this two-tiered program, residents may apply to gate their alleys in order to eliminate noise, littering, and loiterers, and they may also apply to green an alley. In early projects, greening was construed in the sense of beautification, in order to enhance an alley's amenity value. The first completed project, referred to as the Luzerne-Glover alley, has reduced crime and illegal dumping, features elements including potted flowers and seating, and functions like a residential pocket park, a social space that has reconnected neighbors (Cassidy et al., 2008). Beautification is to be achieved in some Los Angeles projects by planting vegetation and by creating valued community spaces that residents are likely to monitor and care for.

Baltimore's Alley Gating and Greening program is one of the two programs that identifies a commitment to building and empowering communities. Ashoka Community Greens, one of the collaborating organizations, offers leadership training to Baltimore residents to develop their capacity as community organizers. Gating and greening is at the behest of residents, 80–100% of adjacent residents must signify agreement with the proposal, and residents have some latitude in proposing to the city what "greening" will constitute in their alleyways. Thus the training is meant to as-

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Table 1
Key aspects of US alley greening programs.

Location	Program name and year established[a]	Objectives	Features (implemented and anticipated)	Project counts (as of March 2012)	Collaborating agencies and organizations	Maintenance of green technologies	Funding
Chicago, IL	Green Alley Program (2006)	SWM; UHI; LIG; ENC	PER; IMP; PIT; DRP; GRA; INF; HAP; RCM; DAR; ENE	100 + Completed	Chicago Department of Transportation (CDOT); Department of Environment; Department of Water Management; Mayor's office	CDOT	Chicago Department of Transportation; Alderman funds
Baltimore, MD	Alley Gating and Greening Program (2007)	SWM; EMP; BEA; SAF; GRE; BUI	PER; IMP; PLA; BEN; GAT; LEA	4 + Completed; 100 + applications	Department of General Services; Department of Public Works; Ashoka's Community Greens	Adjacent residents	Adjacent residents
Los Angeles, CA	Green Alley Program (2008) *Also referred to as Green Streets and Green Alleys Program*	SWM; HAR; UHI; GRE; TRA; ACT; CON; BUI *Consult Table 2 for additional objectives associated with specific projects*	PER; IMP; COL; GRA; DRC; DRY; INT; BIO; HAP; RCM; PLA; BEN; PED; LGT *Consult Table 2 for additional features associated with specific projects*	3 + Completed; 8 + planned	Green Alleys Subcommittee (Department of City Planning; Board of Public Works; Bureau of Sanitation; Community Redevelopment Agency of Los Angeles (CRA/LA); University of Southern California Center for Sustainable Cities; Trust for Public Land) *Numerous additional collaborators on a project-by-project basis; consult Table 2 for examples*	City and county departments; adjacent businesses; adjacent residents; varies project to project	City and county funds; CRA/LA; in-kind support; varies project to project
Dubuque, IA	Green Alley Program (2009)	SWM	PER; COL; PIT; DRP; GRA; HAP; RCM	4 Completed; 3 planned for immediate future	Public Works Department; Engineering Department; Housing and Community Development Department; Economic Development Department; Planning Services Department; Water Department	City departments; private contractors	American Recovery and Reinvestment Act of 2009; city funds
Richmond, VA	Green Alleys Initiative (2009)	SWM	PER; COL; PIT; DRP; GRA	2 Completed; 2 under construction; 1 planned for immediate future	Department of Public Utilities	Department of Public Utilities	National Fish and Wildlife Foundation grant; Virginia Department of Conservation and Recreation; Department of Public Utilities
Seattle, WA	Ballard Green Alleys (2010)[b]	SWM	PER	6 Planned	Seattle Public Utilities	Not determined	Seattle Public Utilities
Baltimore, MD	Blue Alleys (2011)	SWM; BEA; EDU	PER; DRP; GRA	3 Planned for immediate future	Blue Water Baltimore	Community associations	National Fish and Wildlife Foundation grant; City of Baltimore; donated services
Washington, DC	Green Alley Program (2011)	SWM	PER; DRP; GRA	3 Planned for immediate future; 15 + in design phase	District Department of Transportation (DDOT); District Department of the Environment	DDOT Street and Bridge Maintenance Division	American Recovery and Reinvestment Act of 2009; DDOT funds; MS4 funds; Transportation Enhancement funds from the Federal Highway Administration

OBJECTIVES

SWM – Stormwater management
HAR – Harvest rainwater
UHI – Urban heat island mitigation
LIG – Light pollution mitigation
ENC – Energy conservation
EMP – Empower community members to change their neighborhoods
BEA – Beautification
SAF – Enhance safety
GRE – Expand greenspace
TRA – Encourage or facilitate non-motorized transportation (such as walking and biking)
ACT – Facilitate active recreation/physical activity
CON – Increase connectivity between local destinations
BUI – Build community
EDU – Environmental education

FEATURES

PER – Permeable asphalt, concrete, and/or pavers (may be alternated with grass)
IMP – Impermeable concrete or asphalt paving
COL – Collar to hold pavers in place (often impermeable)
PIT – Pitched surfaces/subsurfaces
DRP – Subsurface drainage pipe
GRA – Subsurface gravel/rock/sand layer
DRC – Concrete drainage channel
DRY – Dry well
INT – Grease interceptor
BIO – Bioswale
INF – Infiltration trench
HAP – High albedo pavement
RCM – Recycled construction materials
DAR – Dark sky compliant light fixtures
ENE – Energy efficient light fixtures
PLA – Plantings (trees, shrubs, vines, and/or other greenery, including potted plants and flowers)

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Table 1 (*continued*)

OBJECTIVES	FEATURES
	BEN – Benches or chairs PED – Pedestrian walkway LGT – Lighting for pedestrian use or decorative purposes GAT – Gates LEA – Leasing agreements

[a] In some cases, program websites, program literature, key contacts, and media coverage referred to programs and initiatives using slightly different names (e.g., Green Alley Program versus Green Alleys Program versus Alley Greening Initiative); in most cases, the table displays the name given on the program website.

[b] This pilot program is currently on hold. Plans to install the six green alleys in 2012 and 2013 have been pushed back "a few years" as efforts are currently being focused on other types of green stormwater infrastructure for the city (Arnel Valmonte, February 2012, personal communication). The program is dated here to 2010 as in that year two porous concrete panels were installed into an alley to test the materials; the program is seated within the city's Green Stormwater Infrastructure program which dates to 1999.

Fig. 1. Stormwater management retrofits in US alleyways. (a) A flooded, impermeably paved alley in Chicago. (b) The alley was resurfaced with permeable pavement. *Source*: Photo courtesy of the Chicago Department of Transportation (2010). (c) Dubuque's first green alley, being paved with permeable asphalt. *Source*: Photo courtesy of J. Dienst (2009).

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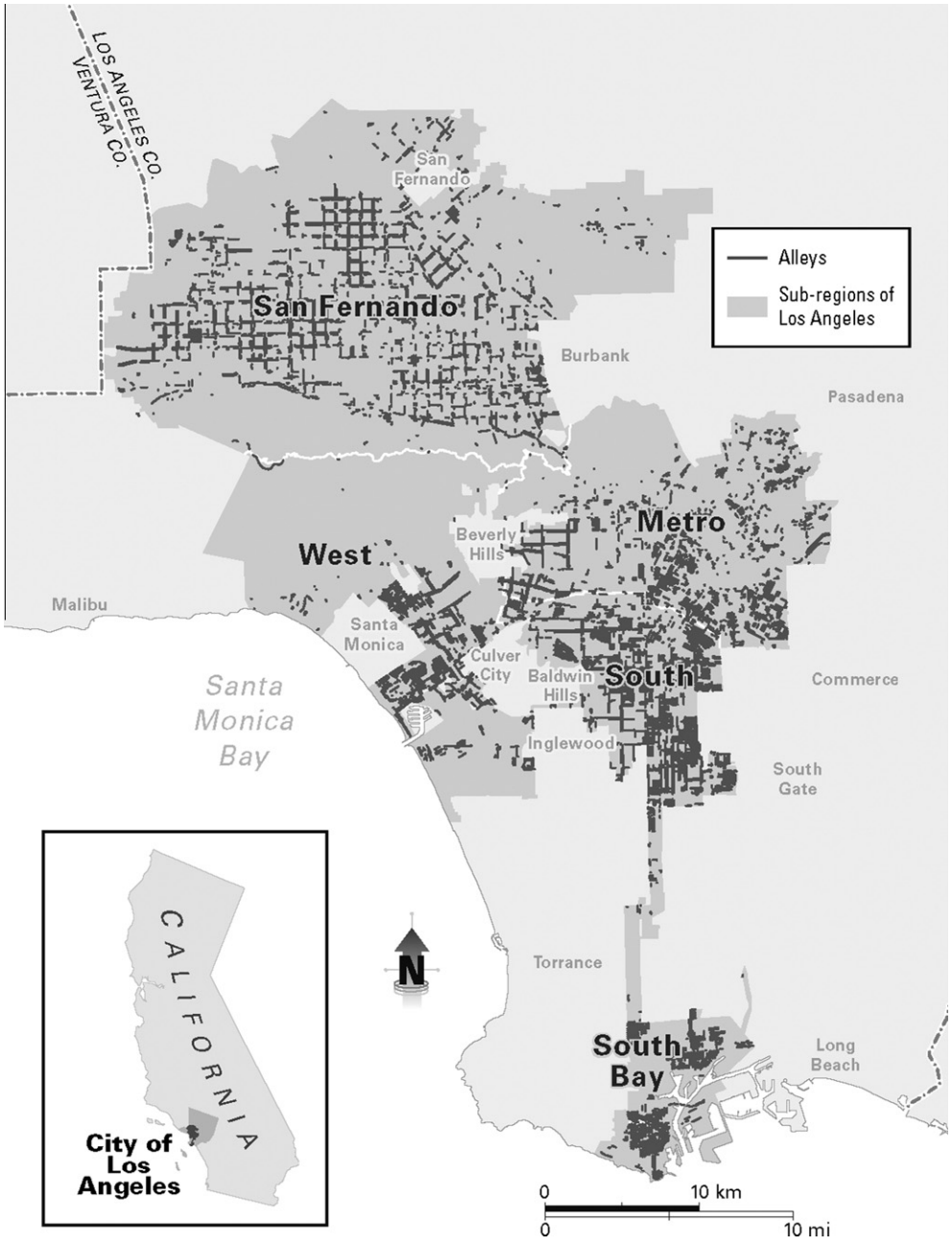

Fig. 2. Alley density in the city of Los Angeles, by subregion. *Source*: Compiled by the authors.

sist residents in garnering support for projects and in building a community of neighbors working toward (and later reaping the benefits of) a common goal. Some projects associated with the Los Angeles program similarly seek to build community and to empower residents to improve their neighborhoods, such as through the involvement of residents in the alley design process (this will be discussed in more detail in the following subsection).

To increase public acceptance for stormwater management practices on a larger scale, a goal of Baltimore's Blue Alleys Program is public education. Outreach has suggested that Baltimore residents are generally unaware of relationships between stormwater, waterway pollution, and health. In Los Angeles, interpretive elements to be placed in greened alleys are intended to educate residents about green infrastructure benefits including pollution prevention and community health.

All of the documented alley greening programs in the US embrace visions of environmental protection, with several implementing features that speak to safety, health, and community building outcomes. Among them, only the Green Alley Program of Los Angeles states goals that align with additional sustainability planning values of social equity and economic development. The following section relates the genesis of this program and discusses its objectives, doing so in part through vignettes of several projects.

The Los Angeles Green Alley Program

The Green Alley Program originated in part from a research project entitled *Back Alley LA*, a collaborative effort spearheaded in 2006 by the Center for Sustainable Cities (CSC) at the University of Southern California and drawing on expertise from local nongovernmental organizations including the Trust for Public Land (TPL), TreePeople, Pacoima Beautiful, and the Los Angeles Neighborhood Land Trust. This research initiative resulted in a series of

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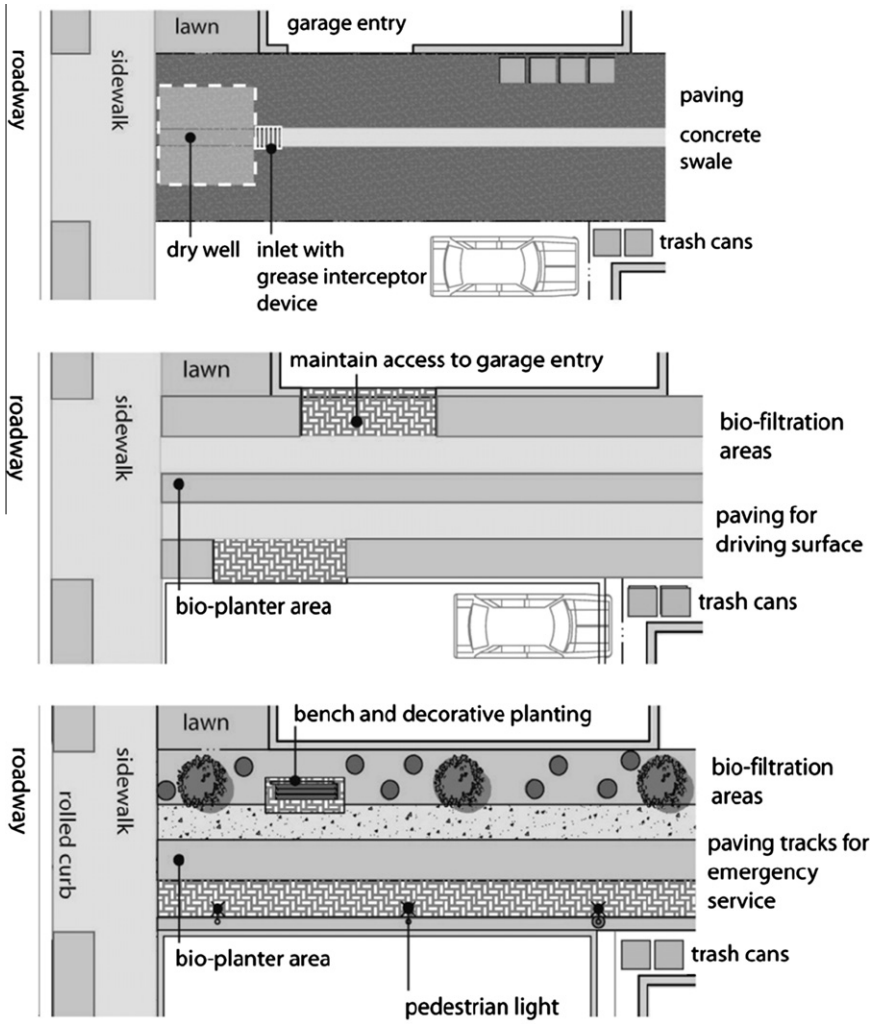

Fig. 3. Select options for alley greening, City of Los Angeles Green Alleys Subcommittee. From top: infiltration of rainwater with drywell; use of biofiltration borders and reduced paving; full conversion to pedestrian use. *Source*: Ahbe Landscape Architects (reproduced with permission).

studies: extensive mapping of alley resources in the Los Angeles region and audits to assess the physical attributes and activity patterns of the alleys (Seymour, Reynolds, & Wolch, 2010; Wolch et al., 2010); alley-adjacent resident focus groups in five neighborhoods in the Los Angeles region (Seymour, Wolch, Reynolds, & Bradbury, 2010); measurement of soil contamination levels in unpaved alleys (Devinny & Longcore, 2008); and a guide to organizing an alley revitalization project (Ben-Horin, Drayse, & Imhoff, 2008).

One of the major research findings from this initiative was that alley density is generally highest in regions (namely, South and East Los Angeles) where communities have dramatically less access to park resources than do residents in other areas of the city (Fig. 2) (Wolch et al., 2010). These park acreage-poor neighborhoods tend to be low-income communities populated by Latinos, African Americans, and Asian-Pacific Islanders (Sister, Wolch, & Wilson, 2010; Wolch, Wilson, & Fehrenbach, 2005). Focus groups revealed that residents were wary of alleys and considered them dirty, poorly maintained, and potentially dangerous, only using them when necessary. Residents were open to a variety of greening and other redesign strategies, though not without reservation; concerns about maintaining ingress/egress and attracting undesirable users were among those voiced (Seymour, Wolch, et al., 2010). The soil contamination study examined trace metal deposits such as lead, chromium, and arsenic, and petroleum compounds common in fuel and motor oil, measured as Total Petroleum Hydrocarbons (TPHs). It referenced California Human Health Screening (CHHS) standards set at levels believed to be appropriate to protect the health of residents who might contact soils through the suspension of dust, gardening and other yard activities, and children who may accidentally ingest soils. Three alleys in the 10-alley sample displayed trace metal contamination levels of arsenic, lead, or chromium higher than CHHS standards, and would require some level of remediation (Devinny & Longcore, 2008). The findings indicated that green designs for urban runoff management could be useful in rehabilitating contaminated soils.

Preliminary findings from these studies were disseminated to local government at a time during which programmatic commitment to addressing LA's stormwater management problems was growing. As the *Back Alley LA* project neared completion, the Los Angeles Department of Public Works established the Green Alleys Subcommittee in 2008, nesting it within the city's existing Green Streets Committee. This subcommittee included representatives from the City's Community Redevelopment Agency (CRA/LA), Board of Public Works, Bureau of Sanitation, and Department of Planning along with representatives from the CSC and TPL. In fall 2008, the Los Angeles City Council adopted a green alleys program for the city. The program was initially designed to achieve multiple objectives, including: improving urban runoff management; cooling the urban heat island; harvesting rainwater; promoting physical activity through walking, cycling, and playing; increasing

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connectivity between homes, schools, and parks; encouraging non-motorized transport; expanding green and open space; and building neighborhoods and communities. These broad objectives were confirmed by the subcommittee as desirable, although no specific law or ordinance mandated them. In 2009, the subcommittee formalized a "menu" of six green design scenarios for alleys, meant to guide the engineering and design of alley projects (Fig. 3). All strategies variously included features such as high-albedo pavement, bioswales, and permeable pavers. The final scenario integrated stormwater management features with modifications intended to increase walkability, including lighting, benches, decorative plantings, and limited vehicular access (City of Los Angeles Department of Public Works, 2009).

A primary task of the subcommittee was to determine how to implement this program at a city-wide scale. As noted previously, Los Angeles contains over 900 linear miles of alleys, or just over 3 square miles of surface area. A number of demonstration projects were identified to refine project selection criteria, partnership arrangements, and design guidelines. After the green alley design principles were established and pilot projects were underway, the Green Alley Subcommittee concluded that its core tasks were fulfilled and its responsibilities were folded into the broader Green Streets Committee. This committee and the Watershed Protection Division of the Department of Public Works Bureau of Sanitation continue to promote alley conversion and other green infrastructure projects across the city.

Planned, in-progress, and completed alley projects have points of commonality in terms of stormwater management goals and green design elements, which reflects the city departments' commitment to these objectives. The green infrastructure project master list – managed by the city's Department of Public Works for the Green Streets Committee – has over 150 planned or completed green infrastructure projects, including the aforementioned alley-related projects. Almost all of these projects focus on best management practices (BMPs) designed to manage runoff and improve runoff water quality, such as through the use of bioswales and permeable pavement (City of Los Angeles Department of Public Works, 2011). Yet some alley projects exhibit considerable differences with respect to other objectives and features, which signify the role of outside partners in project visioning and implementa-

Table 2
Select Los Angeles Green Alley Program projects.

Project name	Objectives	Features (implemented and anticipated)	Collaborating agencies and organizations	Status
North Hollywood Alley Retrofit Project	SWM; BEA	PER; IMP; GRA	Department of Water and Power; Department of Public Works (DPWs)	Completed in 2011
East Cahuenga Cosmo Pedestrian Alley	SWM; PUB; COM	PER; PIT; GRA; INO; PLA; PED; LGT; SEC	Community Redevelopment Agency (CRA/LA); Council District 13; DPW; Hollywood Property Owners Alliance; Hollywood Business Improvement District; Cahuenga District Coalition; Hollywood Entertainment District	Completed in 2012
Avalon Green Alley Network *Also referred to as South Park Green Alley Network*	SWM; HAR; UHI; LIG; HAB; AIR; COV; EMP; BEA; SAF; GRE; TRA; ACT; CON; BUI; EDU; ACG; ACF; MEN; PUB	PER; PIT; GRA; DRC; DRY; BIO; INP; INO; HAP; RCM; LCM; DAR; ENE; NPL; DRO; PLA; GAR; PED; LGT; SIG; ART; EDS; FIT	Trust for Public Land; CRA/LA; Bureau of Sanitation	Grant application/ construction document preparation for two demonstration projects

OBJECTIVES	FEATURES
SWM – Stormwater management	PER – Permeable asphalt, concrete, and/or pavers (may be alternated with grass)
HAR – Harvest rainwater	IMP – Impermeable concrete or asphalt paving
UHI – Urban heat island mitigation	PIT – Pitched surfaces/subsurfaces
LIG – Light pollution mitigation	GRA – Subsurface gravel/rock layer
HAB – Habitat for native species	DRC – Concrete drainage channel
AIR – Improve air quality	DRY – Dry well
COV – Expand tree canopy coverage	BIO – Bioswale
EMP – Empower community members to change their neighborhoods	INP – Infiltration planter
BEA – Beautification	INO – Other/unspecified infiltration system
SAF – Enhance safety	HAP – High albedo pavement
GRE – Expand greenspace	RCM – Recycled construction materials
TRA – Encourage or facilitate non-motorized transportation (such as walking and biking)	LCM – Locally-sourced construction materials
ACT – Facilitate active recreation/physical activity	DAR – Dark sky compliant light fixtures
CON – Increase connectivity between local destinations	ENE – Energy efficient light fixtures
BUI – Build community	NPL – Native plantings
EDU – Environmental education	DRO – Drought-tolerant plantings
ACG – Facilitate access to greenspace for underserved communities	PLA – Plantings (trees, shrubs, vines, and/or other greenery, including potted plants and flowers)
ACF – Facilitate access to food for underserved communities	GAR – Community gardens, fruit trees, and/or edible landscaping
MEN – Enhance mental health and wellness	PED – Pedestrian or exercise path
PUB – Create useable public open space	LGT – Lighting for pedestrian use or decorative purposes
COM – Extend shops, cafes, and other commercial uses into alley	SEC – Security system or program
	SIG – Signs, pavement markings, and other tools to encourage pedestrian use
	ART – Murals and other artwork
	EDS – Interpretive or educational signage
	FIT – Fitness equipment

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tion. While reconfiguring alleys into recreational and social space is in line with the Green Alley Subcommittee's original vision, the representation of these goals in specific projects has thus far hinged upon nongovernmental partners such as the Trust for Public Land and the Hollywood Property Owners Alliance. Table 2 provides a selection of green alley projects in Los Angeles, including project objectives, features, and collaborating entities.

The North Hollywood Alley Retrofit Project involved several contiguous alley segments. A strip of permeable pavers was installed down the center of each segment (Fig. 4). This redesign, performed to alleviate flooding in the alley and to recharge groundwater supplies, was also intended to improve the neighborhood. The Department of Water and Power provided most of the funding for the $800,000 project. With its focus on stormwater abatement, the project is representative of the majority of projects listed in the city's green infrastructure project master list.

The East Cahuenga Cosmo Pedestrian Alley project is located in the Hollywood district of Los Angeles. The vision for the T-shaped alley, located just south of Hollywood Boulevard, involved transforming the alley segments into a pedestrian-friendly space that capitalizes on its adjacency to numerous restaurants and other businesses. Visitors should be able to mingle in the alley and enjoy al fresco dining outside of the cafes that line the segments. The project was also designed to help manage stormwater (Fig. 4). Before the project broke ground, the Hollywood Business Improvement District agreed to a supplemental tax – estimated to generate

(a)

(b)

Fig. 4. Alley greening projects in Los Angeles. (a) North Hollywood Alley Retrofit Project. (b) East Cahuenga Cosmo Pedestrian Alley. *Source*: Photo courtesy of T. Trindle (2012).

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US $125,000 annually – to pay for alley cleanup and to provide security services for a larger network of alleys along the 18-block stretch of Hollywood Boulevard (Berg, 2009; Meinert, 2008). This sort of attempt to reinvigorate alley life is reflected in other alley programs around the US, such as Seattle's Clear Alleys Program, which bans dumpsters and other receptacles from downtown business districts in order to enhance the attractiveness, safety, and walkability of alleys.

A more extensive project is represented by the Avalon Green Alley Network. This project centers on transforming a network of approximately 10 alley segments in the South Los Angeles region, one of the most underserved parts of the city, into green, connective tissue linking together two parks and two school sites. Demonstration projects are in the planning stage; one of these projects targets a T-shaped alley in the northeastern corner of the network, and the other targets segments located between a Food 4 Less and a high school (Fig. 5). The project proposes to implement numerous stormwater BMPs, including the harvesting of rainwater for trees and vines planted along the sides of the alleys: stormwater collected from permeable paving or drain inlets will flow toward the plants' roots through a sloped subgrade or through infiltration planters. Proposed features include interpretive elements on green infrastructure and the Los Angeles River watershed, espaliered fruit trees intended to provide supplemental food for local residents, and outdoor fitness equipment such as pull-up bars. Project literature highlights that alleys in this region are polluted and unsafe and that identifying health and safety goals may be realized through increased usage and stewardship by residents.

In December 2010, the CRA/LA was funded to develop the *South Los Angeles Green Alley Master Plan*, a plan for additional networks of green alleys, streets, and community connections in South Los Angeles that would build on the Avalon Green Alley Network. The plan includes design guidelines and policy recommendations for three to five networks of green alleys and streets, "with an emphasis on how to create green alley networks that promote infill development, improve community walkability (thereby reducing Vehicle Miles Traveled), develop new and attractive spaces for outdoor exercise and promote multi-benefit infrastructure improvements with a focus on stormwater capture and infiltration" (City of Los Angeles Community Redevelopment Agency, 2010, p. 2). Plan collaborators include the CRA/LA, TPL, California State Polytechnic University-Pomona's Department of Landscape Architecture graduate project studio (606 Studio), Jefferson High School Green Academy, and the Los Angeles and San Gabriel Rivers Watershed Council (now the Council for Watershed Health).

The Los Angeles Green Alley Program represents a commitment to sustainability planning in a more complete sense than the other alley greening programs we analyzed. Environmental protection objectives are omnipresent in associated projects, deployed primarily through stormwater management practices. Yet some projects clearly also embrace economic development and social equity goals. The East Cahuenga Cosmo Pedestrian Alley has been envisioned as a destination for locals and tourists, "a new walkable, public space that will help attract more visitors to our local businesses" (Hollywood Property Owners Alliance Executive Director Kerry Morrison, quoted in Newton, 2011). The city's green infrastructure project master list contains two additional projects similarly oriented toward economic development, with goals to create public open space and facilitate outdoor dining opportunities (along with the implementation of stormwater BMPs).

The explicit commitments to improving access to recreational and food resources in projects such as the Avalon Green Alley Network and the related *South Los Angeles Green Alley Master Plan* align with social equity values. The *Master Plan* seeks to increase access to green space "in one of the most underserved and economically challenged areas of the City of Los Angeles. Approximately 30% of [the city's] alleys are located in South Los Angeles, a blighted urban community with very little green space. Residents of South Los Angeles are disproportionately affected by poor air quality, have high rates of obesity, diabetes and heart disease, and have few or limited places to play outdoors" (City of Los Angeles Community Redevelopment Agency, 2010, p. 3). Similar text on providing recreational opportunities for residents living in a community with few safe green open spaces is found in Avalon Green Alley Network

Fig. 5. Avalon Green Alley Network project area. *Source*: Trust for Public Land (reproduced with permission).

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project documents. The demonstration project includes the planting of fruit trees, "a source of sustainable food production for a community where 33.1% of households are defined as food insecure" (The Trust for Public Land, 2011, p. 14). Although not identified as a project goal, the construction of stormwater management infrastructure in South Los Angeles may also address an inequity in terms of the distribution of flood risks. This region has the second highest "flood complaint density" (reports of flooding and/or inadequate drainage) in the city (Wolch et al., 2010), a testament to its deficit of permeable surfaces and its aging stormwater infrastructure.

Along the lines of procedural equity, there is some attention in the proposed South Los Angeles projects to the voices of local residents in alley design; for instance, in the context of the *Master Plan*, collaborating agencies propose to survey residents on their needs and priorities related to alleys and to use the results as a design template. The Avalon Green Alley Network demonstration project included community outreach as well. Through meetings and workshops, TPL staff have broached ideas of alley greening and asked residents to share their visions for the alleys. Residents' priorities included alley cleanliness and safety and they were open to TPL's design suggestions. Due to these preoccupations with alley safety and sanitation and to high residential turnover (a large proportion of residents are renters), it has been challenging to involve residents in the design phase. So staff have focused on organizing alley cleanups and on working with the community to develop a neighborhood watch program to address residents' needs (Tori Kjer and Laura Ballock, February 2012, personal communication).

In its conception, the Los Angeles program represents a commitment to environmental protection, economic development, and social equity. In contrast to alley greening programs in other US cities, projects associated with the Los Angeles program are planned and executed with a wider and varying range of collaborating agencies and organizations. This model may confer benefits in terms of broader visions and enhanced capacity, and may result in creation of green alleys well-attuned to the needs of proximate residents and businesses. However, this commitment to all three values is not apparent on a project-by-project basis, and there are no codified means to ensure that any given project represents and balances environmental protection, economic development, and social equity goals. Nonetheless, the fledgling Los Angeles Green Alley Program currently provides the most robust model of sustainability planning among contemporary alley greening programs in the United States.

Conclusions

By cataloging and analyzing program objectives and design features of eight alley programs, this article has documented how alleys in the US are being operationalized as green infrastructure. Greening alleys is primarily being done to realize environmental sustainability objectives such as urban runoff mitigation and urban heat island reduction, though goals around business development and addressing social inequities including park resource distribution are apparent in a small number of projects. The Los Angeles Green Alley Program demonstrates possibilities for a more integrative approach to implementing sustainability – though, again, not holistically on a project-by-project basis.

Collaborations that underlie the programs provide insight into the narrow focus of most alley greening efforts in the US. By and large, these programs are based in city departments with responsibilities for public infrastructure maintenance and enhancement, or are the initiative of environmental nongovernmental organizations. The orientation of these programs toward stormwater management is indicative of the availability of stormwater management funding and also of existing urban governance structures, which run counter to the kind of interdepartmental collaboration and public–private coalitions needed for integrative green alley projects. Planners and engineers are typically trained to see vehicular traffic, service infrastructure, and pedestrian traffic as conflicting rather than integrated activities – and seek to separate these uses. The Green Streets and Complete Streets movements are a response to this dilemma, working to dismantle the barriers between municipal service delivery, vehicular transportation planning, and pedestrian oriented street design. Indeed, the Los Angeles Green Alley Program is part of the larger multi-departmental Green Streets Committee designed explicitly to foster collaboration across city departments that historically existed in separate silos, and even went so far as to incorporate nonprofit organizations and university researchers into their operations. Collaborations between city departments and civil society groups that align with different or additional sets of sustainability-related values have been crucial to the deployment of Los Angeles projects that demonstrate more complete commitments to sustainability.

Ultimately, most of the programs discussed here are in their infancy, and though heavily stormwater-focused, have the potential to expand in terms of their commitment to sustainability planning. Aiming for "low-hanging fruit" or actions that are relatively easy to implement (here, "easy" in the context of their home agencies) can provide a foundation from which to build programs that advance more complete visions of sustainability (Conroy & Beatley, 2007; Jepson, 2004). These initial forays into alley greening may help to attract attention from a diversity of actors and build support and capacity for more integrative programs.

As local government agencies, nongovernmental organizations, and community groups increasingly recognize the potential for alleys to become a backbone of green infrastructure, it would be useful to evaluate post-construction how effectively these alley greening initiatives have met their objectives. Analyses of stormwater management performance, effects on residential and commercial property values and retail sales, and health and wellness outcomes will help to specify and establish the value of alleys to sustainability planning. Paying attention to other forays into alley greening – for instance, those not connected to established initiatives or programs – may reveal more integrative sustainability planning models and insight into how to catalyze alley greening efforts outside of city government. Further research will strengthen the platform for additional green infrastructure efforts around alleys and to extend the theorization of neglected urban features as spaces that may be reclaimed in order to broadly foster urban sustainability.

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