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Evaluating the Impacts of Small-Scale Urban Greenspace
A Case Study of Harlem Place in Downtown Los Angeles

A 2010 Group Project Proposal

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Green LA
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ABSTRACT
Greenspace can significantly enhance metropolitan communities by increasing aesthetic appeal and providing ecosystem services that alleviate common urban problems. Studies have shown that integrating multifunctional greenspaces into existing infrastructure increases the livability of densely populated urban areas by providing both recreational space and ecosystem services, mitigating urban sprawl and its associated environmental problems. Local implications of these issues arise in Downtown Los Angeles, where greenspace is almost nonexistent. While many studies speak to the broader implications of the effects of greenspace in urban areas, little research has been done to assess the net effects of small-scale interstitial greenspace. With the use of literature reviews, GIS data, and modeling, we will use Harlem Place, a primary service alleyway in Downtown, as a case study to assess the economic, ecological, and social effects of integrating small-scale greenspace into Downtown LA. Ecosystem services evaluated in this project include reduced air pollution, increased stormwater runoff, and urban heat island effect mitigation. Other factors included in this analysis include public health issues and community awareness. Our assessment will create a tangible prototype demonstrating the potential of greenspace integration in interstitial spaces. The results of this project will serve to build a foundation for a long-term greening and design strategy and outreach tools to be used by our client, the Downtown LA Neighborhood Council's Sustainability Committee.

EXECUTIVE SUMMARY
Downtown Los Angeles is an area with ten times as many workers as residents, resulting in problems of increased commuter miles, little sense of community ownership, and lack of open public greenspace. Since 2007, however, there has been a 20% increase in the Downtown residential population due to the major redevelopment and cultural shifts taking place in the area. This influx of new residents creates a need for the kind of ecosystem services and strengthened sense of community that incentivizes Downtown living. Integrating multifunctional greenspaces into existing urban infrastructure increases the livability of densely populated urban areas by providing both recreational space and ecosystem services.

Greenspace can increase the aesthetic appeal of cities and provide ecosystem services that alleviate many common urban problems such as air pollution, stormwater runoff, urban heat island effect, public health issues, and a diminished sense of community and civic pride. Improving the environmental health and appeal of cities reduces suburban sprawl, greenfield development, and per capita energy demand and natural resource use.

Our client, the Sustainability Committee for the Downtown Los Angeles Neighborhood Council ("Sustainability Committee") was recently awarded an American Institute of Architects (AIA) Sustainable Design Assessment Team (SDAT) grant to create a long-term greening strategy for Downtown LA, addressing urban livability, equitable development, resource efficiency, and community empowerment. The Sustainability Committee works closely with local residents and businesses to understand and articulate the needs of the community, but lacks information on how to quantify the economic and environmental impacts of smaller patches of urban greenspace in order to convey its importance and mobilize support. Our project will provide this information and will specifically assess the impacts of redeveloping the Harlem Place alleyway, one of the many potential greenspace projects that the Sustainability Committee has identified Downtown, by:

1. Identifying which ecosystem services provide the greatest impact on the community.

2. Determining methods to quantify the chosen ecosystem services in appropriate metrics.

3. Creating and evaluating various design scenarios for Harlem Place by comparing the quantified data on ecosystem services and aesthetic effects.

4. Articulating our results to facilitate easy transfer to other greenspace projects and for the Sustainability Committee to use to educate and enhance accessibility for Downtown stakeholders.

Harlem Place, our project site, is currently a polluted, unappealing concrete service road running from 2nd-9th Street between Main and Spring Streets in Downtown LA. The recent boom of redevelopment in LA's historic core causes residents to increasingly use this space for dog walking and pedestrian travel between blocks despite its barren state. Recently, LA began redevelopment of two parking lots into Spring Street Park, adjacent to the Harlem Place alleyway. While the extent of surface parking and impermeable surfaces proximate to Harlem Place are formidable, this new park exemplifies the opportunities for Harlem Place to become a central spine connecting multifunctional interstitial greenspace nodes. By focusing our efforts on articulating the impacts of the Harlem Place redevelopment project, we will create a tangible prototype demonstrating the potential of greenspace integration in underutilized urban spaces. Our project will serve as a model and design guideline framework that can be extrapolated to inform other greenspace projects, furthering the impact of a Downtown greening strategy for sustainable development. Harlem Place will demonstrate the impacts of greenspace to local stakeholders and create community buy-in for other green redevelopment projects. The Sustainability Committee also intends to share the results of our assessment beyond the Downtown area to other Neighborhood Councils serving greater LA. Over the next year, the Bren School's GreenLA team will assist the Sustainability Committee by providing in-depth research and analysis on opportunities for implementing greenspace in specific land parcels.

The goal of our analysis is to first assess the impacts of the ecological services and aesthetic value of different greenspace types and scenarios. We will then compare various types of greenspace design for Harlem Place in order to foster community awareness and support for the Sustainability Committee's long-term greening strategy for Downtown LA. The results of our work will be part of the Sustainability Committee's overall greening strategy, accessible to stakeholders who can use it to develop their own solutions to urban issues specific to Downtown. GreenLA's final product will specifically express why and how greenspace can impact the community - ecologically, economically and aesthetically. Synthesizing existing information on urban greenspace, we will redefine greenspaces not just as destination parkland, but also as smaller, scattered spaces and plots of vegetation and permeable pavement integrated into existing infrastructure. GreenLA will identify if and how smaller scale greenspace parcels can offer significant benefits both on a local and a larger scale as well as create awareness of ecosystem services and the role of nature in urban areas. While our work is specific to Downtown, it will demonstrate the larger scale objectives of improved environmental health and increased appeal of urban living to educate and inspire local stakeholders.

GreenLA will capitalize on Downtown's visibility and high traffic flow by using Harlem Place as an educational demonstration to the larger community of the possibilities for small-scale, interstitial urban greenspace. By identifying and setting specific objectives for the Harlem Place project area, GreenLA will quantify the value of its transformation into greenspace. We will develop various tools for analyzing the impact of different greenspace scenarios, determining which are more useful and will have the greatest overall impact by utilizing existing literature, case studies, and data analysis. The potential localized impacts our project will reveal can enable and educate stakeholders to better carry out the Sustainability Committee's greening strategy for the Downtown neighborhood.

PROJECT OBJECTIVES

Project Goals

GreenLA project goals are as follows: 1) determine which ecosystem services are most needed and will offer the largest local impact; 2) analyze ecological, economic and social impacts of greenspace which best serve the local need based upon funding available; 3) synthesize analysis collected from 1 and 2 into a framework for redeveloping Harlem Place as part of the Sustainability Committee's overall greening strategy; and, 4) communicate the impacts of greenspace and our Harlem Place prototype to the community through the Sustainability Committee's resource tools and presentations to local stakeholders. The "need" will be based on a literature review of the impact of various greenspace types and community input. This type of determination will be based on qualitative information from relevant studies. More specifically, GreenLA will:
- Identify which ecosystem services will provide the most impact to the community.
- Determine methods to quantify the chosen ecosystem services in appropriate metrics.
- Create and evaluate various design scenarios for Harlem Place by comparing the quantified ecosystem services.
- Articulate our results to facilitate easy transfer to other greenspace projects and for the Sustainability Committee to use to educate and enhance accessibility for Downtown stakeholders.

Objectives Summary

1. Assess general impacts of greenspace: economic/aesthetic/community/self-perpetuating (positive feedback of greenspace spurring on, and connecting to, more projects)
2. Transfer impacts to a specific project (Harlem Place) to suggest potential implications for Downtown LA
3. Research methods and data requirements to quantify, analyze and compare impacts of various greenspace scenarios in Downtown LA.
4. Provide information to client to enable assessment of the costs and benefits of implementing greenspace projects so that they can use our analysis as design guidelines to provide stakeholders accessible information regarding greening Downtown LA
3. Organize our research findings and recommend scenarios for Harlem Place to use in presentations to community stakeholders, and future Sustainability Committee projects.

By identifying and setting specific objectives for the Harlem Place right-of-way, GreenLA will quantify the value of transforming small, underutilized spaces into greenspace. We will develop various tools for analyzing the impact of different greenspace scenarios, determining which are more useful and will have the greatest overall impact. Utilizing existing literature, case studies, and data analysis, GreenLA will develop a metric for comparing the costs and benefits of greenspace scenarios in Harlem Place, and determine how effects relate to the aforementioned broader social context. Through the community stakeholder presentations, we will demonstrate how these services are relevant to local stakeholders and the community. GreenLA will determine if smaller parcels of greenspace within Downtown are justifiable, by demonstrating the local impacts of greening a parcel of land on a community's livability and environmental health. The potential localized impacts our project will reveal can serve to enable and educate stakeholders to better carry out the Sustainability Committee's greening strategy for the Downtown Neighborhood.

PROJECT SIGNIFICANCE

General Impacts of Greenspace

Greenspace can optimize the livability of urban communities by increasing aesthetic appeal and providing ecosystem services that alleviate common urban problems such as air pollution, stormwater runoff, urban heat island effect, public health issues, and a diminished sense of community. Integrating multifunctional greenspaces into existing urban infrastructure increases the livability of densely populated urban areas by providing both recreational space and ecosystem services. Through these amenities, greenspace incentivizes people to live in the city or stay within their community, where they are closer to work, shopping, and cultural activities. Greenspace provides places for social interaction, physical activity, and democratic expression. Improving the environmental health and appeal of cities reduces suburban sprawl, greenfield development, and reduces per capita natural resource use in terms of transportation and building energy demands, as well as increasing community interaction.

Local Significance

Downtown Los Angeles has ten times as many workers as residents, resulting in problems of increased vehicle trips and miles traveled, a decreased sense of community ownership, and a lack of open public greenspace. However, many older, existing buildings are undergoing renovations and repurposing, resulting in a 20% increase in the Downtown residential population since 2007(Zarella 2008). This trend created an even greater need for the kind of ecosystem services that make urban areas more appealing and livable.

Sustainability Committee's Needs

Our client, the Sustainability Committee for the Downtown Los Angeles Neighborhood Council ("Sustainability Committee") was recently awarded an American Institute of Architects (AIA) Sustainable Design Assessment Team (SDAT) grant to create a long-term greening strategy for Downtown LA, which addresses issues of urban environment livability, equitable development, resource efficiency, and community empowerment. The Sustainability Committee works closely with local residents and businesses to understand and articulate the needs of the community. However, they are not yet able to quantify the economic and environmental costs and benefits of smaller patches of urban greenspace in order to justify its incorporation and mobilize support; this is where our project fits in. GreenLA will assess the impacts of redeveloping Harlem Place, one of the many potential greenspace projects that the Sustainability Committee has identified Downtown. Harlem Place is an alley and service road running through the historic Downtown core, from 2nd-9th Street between Main and Spring Streets, where much of the aforementioned residential redevelopment is taking place. Harlem Place has the potential to be transformed from a polluted, concrete service road into an amenable green alleyway, forming a spine through the neighborhood which stakeholders can use to travel, relax and connect to other greenspace nodes. By articulating the impacts of the Harlem Place redevelopment project, we will create a tangible prototype demonstrating the potential of greenspace integration in interstitial spaces. While it is our client's hope to use our work to break ground on Harlem Place, our project also creates a model which can be extrapolated out to the rest of Downtown and inform other greenspace projects, furthering the impact of a greening strategy Downtown for continued sustainable development. Harlem Place will demonstrate the impacts of greenspace to local stakeholders and help create community buy-in for human-oriented green redevelopment projects. The Sustainability Committee also intends to disperse the results of our assessment beyond the Downtown area to expand the greening strategy to other Neighborhood Councils serving greater LA.

Over the next year, GreenLA will assist the Sustainability Committee by providing in-depth research and analysis on opportunities for implementing greenspace in specific land parcels, particularly Harlem Place. The goal of our analysis is to assess and recommend which ecological services and aesthetic values can

be realized from the Harlem Place project in order to guide future development and public investment and generate support for the Sustainability Committee's long-term greening strategy for Downtown LA.

Process

The results of our work will be part of the Sustainability Committee's overall greening strategy, accessible to stakeholders who can use it to develop their own solutions to urban issues specific to Downtown. GreenLA's final product will specifically express why and how greenspace can impact the community-ecologically, economically and aesthetically. Synthesizing existing information on urban greenspace, we will redefine greenspaces not just as destination parkland, but also as smaller, scattered plots of vegetation and permeable pavement integrated with existing multiuse spaces. GreenLA will identify if and how smaller scale greenspace parcels can offer significant benefits both on a local and citywide scale by creating awareness of ecosystem services and the role of nature in urban areas. While our work is specific to Downtown, it will demonstrate the larger scale objectives of improved environmental health and increased appeal of urban living to inform and activate local stakeholders as well as attract new residents to the area. GreenLA will capitalize on Downtown's visibility and high traffic flow, serving as an educational demonstration to the larger community of the various possibilities for small-scale, interstitial urban greenspace.

Political Climate

Recent California programs and legislation such as SB375 and the LA Green Alleys Program provides context and political force behind the value of urban greenspace. Los Angeles initiated the Green Alleys Program to decrease the runoff of pollutants from LA streets into the ocean by better utilizing, and increasing infiltration within, LA's 900 miles of alleys, while also creating safer amenity spaces. SB375 discourages urban sprawl as part of a larger effort to decrease California's GHG emissions by requiring that the Air Resources Board develop curbing targets for passenger vehicles, largely driven by urban sprawl. GHG emissions can be mitigated by transit-oriented development, transforming commercial corridors into mixed-use communities, expanded transit opportunities, and urban infill projects. Metropolitan planning organizations, together with their member cities and counties, will create specific sustainable community strategies similar to the efforts of the Sustainability Committee.

LITERATURE REVIEW

I.   **Benefits of Greenspace:**

A. Societal benefits of greenspace in urban areas

Greenspace disincentivizes sprawl & creates more appealing urban living
Highway and road infrastructure improvements contribute to urban sprawl. In LA, only 21% of the metropolitan area's employment was located within 10 km of Downtown, adding to the problem of long commutes and urban sprawl. The average annual household gasoline consumption in LA is about 1,128.6 gallons/year, while in New York City, the average is 783.577 (Kahn, 2006). Furthermore, LA's population is growing while the number of workers commuting by public transit remained the same (0.07) from 1980-2000 (Kahn, 2006). Although many Americans prefer single-family homes, three-fourths of the 250-plus local ballot initiatives in the U.S. that pushed for growth management and development restrictions passed in 1998 (Richardson, 2001). Reacting to the issues of sprawl in CA and LA, California passed legislation in 2008 preventing development of urban sprawl in order to mitigate state GHG emissions. Senate Bill 375 mandates California's Air Resources Board to develop transportation plans that reduce GHG emissions from vehicles. One of the main objectives of this

legislation is to work with city planning boards to create sustainable community plans that disincentive driving (Geiselman 2008); implementation of urban green space could be part of these community sustainability strategies by encouraging dense but livable city centers.

Environmental problems associated with urban sprawl:
Lack of adequate public transportation accompanying increasing urban flight creates societies completely dependent on car travel. Social problems associated with sprawl include racial polarization in degraded urban cores, lack of affordable housing and public education, and a lost sense of community (Bullard et al. 2001). Land use patterns associated with urban sprawl increase air pollution, degrade water bodies, destroy sensitive ecosystems, decrease biodiversity, increase soil erosion, and necessitate vehicular travel (Maya 2008; Buzbee 1999). Sprawling development means amenities such as roads, sewer, and power lines have to be constructed farther away from the city, increasing the amount of building material demanded and encouraging vehicular traffic. Furthermore, suburban development leads to health problems associated with an inactive lifestyle, fragments and degrades natural greenfield habitats, and contributes to global climate change through deforestation (Orr 2008). In the United States, it is estimated that $22,000 worth of federal subsidy is implied in every home constructed on a greenfield site via indirect costs of roads, sewers, lighting and services (Rogers, 2001).

Green space creates more appealing cities for residents and workers:
City greenspace reduces sprawl by making urban living more appealing, reducing environmental issues associated with sprawl. An environmental Kuznet's Curve can be applied to urban environments in that poor cities are often stuck on wrong side of curve. More important to LA, the externalities of urban environment exist on the global scale, and often even cities with relatively good health may give an incomplete picture of urban growth and environment impact. For example, city greening faces obstacles of the free-rider problem, whereby each city has little incentive to voluntarily reduce GHG emissions (Kahn, 2006).

Non-ecological value of green space and sense of community:
Urban green spaces provide various social, economic, and ecological services including social integration and community development (Balram and Dragi´cevi, 2005). "Open spaces – streets, alleyways, passageways, avenues, parking spaces, malls, left-over triangles, parks, playgrounds, waterfronts, railways, rooftops, and more – are all places we use and which create the communal life we call 'city' " (Halprin 1979, pg. 3). No matter the size and scope of an urban greening project, greenspace contributes to city life in ways that should not be underestimated. Just as important as a large park built in the middle of the urban jungle are small green alleyways, vegetated rooftops, or traffic medians to increase urban aesthetic quality. The combined effects of these interstitial greenspaces can make for a higher quality of life that research is just beginning to investigate and reveal.

Crow et al. (2006) conducted a study of two adjacent, but contrasting neighborhoods. Results of study demonstrated that all respondents held nature in high regard, and acknowledged general benefits of nature, including, tranquility and improved mental health. Additionally, the study showed that residents in both communities perceived proximity to nature as contributing to their overall sense of well being, satisfaction, and comfort. Stewart et al. (2004) found that the presence of public or semi-public outdoor gathering places promotes community identity. The study also found that by designing in a manner that connects people with each other and to their local landscape, the desirable end-state of planning is more complete and opportunities for community-building are gained. Owens (1993) conducted a study comparing two Seattle neighborhoods and the effect of conventional planning. This study specifically looks at the question of physical qualities that might influence pedestrian life in urban areas and reviews literature that support the notion that pedestrian activity is a critical component of social interaction and community in urban locations. Open space, such as parks and community gardens increase residents'

sense of community ownership and stewardship, connect people from different backgrounds, and reduce crime by cleaning up vacant lots. Neighborhood residents with greenery in common spaces are more likely to enjoy stronger social ties than those who live surrounded by barren concrete. Among urban public housing residents, levels of vegetation in common spaces predicted the formation of neighborhood social ties (Sherer 2003). Understanding the value that local stakeholders place on urban green space, in addition to the non-market values such as sense of community, plays a large role in how we will measure and quantify total benefits of urban green space.

Trends in attitudes towards greenspace:
Widespread trends in cities are recognizing the value of "natural" urban areas to offer residents spaces to be active and interact with their community without contributing to urban sprawl. There is increasing awareness among planners that citizens value green spaces more for their non-market characteristics than the economic and utilitarian benefits that have guided planning and management endeavors (Hague and Siegel, 2002). Trends increasingly recognize how spending time in urban green spaces has the potential to reduce stress, alleviate headaches, and increase overall sense of balance (Hansmann et al. 2007). Open space encourages exercise, which increases health and lowers the risk of disease, as well as anxiety and depression (Sherer 2003). A review of 16 years of *Landscape and Urban Planning* contributions analyzed studies addressing issue of contact with nature in urban settings and document various ways that contact with nature contributes to improved quality of life, "even if the encounter is only a brief opportunity" (Matsuoka and Kaplan, 2008 pg. 10). This review of LUP contributions illustrates the consistent message that urban residents greatly value natural environments in their community, with nature providing a sense of community identity and cohesiveness (Matsuoka and Kaplan, 2008).

Perceptions of Greenspace
A study by Stephanie Pincetl (2005) analyzed how to enhance urban greening and determine local perceptions of greenspace. Pincetl's definition of "urban sustainability" provides the context that, "urban sustainability means enhancing economic and social well-being, and ameliorating ecological processes and environmental quality"(Pincetl 2005 pg. 366). There is a unique opportunity in cities to make broad-sweeping changes in the name of greater sustainability. Pincetl's study focused on a Los Angeles high-density, low-income neighborhood lacking public parks and other types of greenspace.

Utilizing surveys to determine what values local residents see in greenspace, the study found that focus groups understood that trees help cool the atmosphere, buffer noise, and absorb air pollution. The Latino focus group in particular had strong opinions on how there was a definite lack of open space, and complained about the crowdedness of Griffith Park or the dangerous reputation of MacArthur Park. The respondents wanted more outdoor greenspace shopping areas and green rooftop experiences. Perhaps most poignant were the comments of respondents with children who have nowhere to play and therefore either stay in and watch TV or "sit on [street] curbs outside to watch cars go by"(Pincetl 2005 pg. 375). Mothers strongly approved of tree-lined streets because they have to walk their children to school and there is currently no shade. Many everyday citizens of Los Angeles, it seems, are desperate for greenspace.

Increased safety by crime reduction:
Studies reveal that within inner-city neighborhoods, vegetation increases the number of eyes on the street by incentivizing residents' use of local outdoor spaces and creating more engaging, dynamic environments. "A series of studies conducted in inner-city neighborhoods has shown that treed outdoor spaces are consistently more well used by youth, adults, and mixed-age groups than are treeless spaces; moreover, the more trees in a space, the greater the number of simultaneous users" (Kuo, 2001 p. 346).

Simultaneous users and increased exposure decrease crime as visibility reduces potential criminal behavior. Some roadway planners are wary of planting trees due to the concern that in some cases, trees can decrease road safety. To the contrary, however, many studies find that well-situated trees integrated with street design can also calm traffic, and reduce road threats to other cars and pedestrians (Dixon, 2007).

B. Environmental benefits of greenspace in urban areas

Urban areas need the ecosystems services provided by nature outside of city limits, but cities can also benefit from internal ecosystem services. Several of these internal ecosystem services have been studied, and include: street trees, lawns/parks, urban forests, cultivated land, wetlands, lakes/sea, and streams. With a specific focus on Stockholm, these ecosystems are addressed with respect to air filtration, micro climate regulation, noise reduction, rainwater drainage, sewage treatment, and recreational and cultural values. These internal services have a significant impact on the quality of urban living, so much so that they should be considered in land-use planning and major development plans. (Bolund and Hunhammar, 1999).

"Green Cities" are defined as having clean air and water, pleasant streets and parks and have minimized negative ecological impacts. They are also resilient to occurrences of natural disasters, and they encourage green behavior such as the use of public transit. Kahn developed a Green City Index equation which is a function of the following parameters: environmental morbidity, mortality, pollution avoidance expenditure, local disamenities, ecological footprint (each parameter X b_1… index weight) (Kahn, 2006). Integrating the aesthetic benefits of greenspace with their desired ecological services, such as erosion prevention, heat island effect mitigation, air and water filtration and stormwater runoff reduction, offers quantifiable monetary and social benefits.

Urban tree values have been studied extensively and are well-understood. City trees absorb air pollution and particulates (as much as 7000 dust particles/liter of air), block incoming solar radiation (up to 95% in some areas), reduce building energy use by up to 50%, and transpire 100 gallons of water each day of the growing season (equivalent to the cooling effect of 5 air conditioners running for 20 hours) (Girling and Kellett 2005).

Water Infiltration and Filtering:
Trees are more cost-effective in managing the flow of stormwater runoff than concrete sewers and drainage ditches. Trees intercept rainfall and unpaved areas absorb water, slowing the rate at which it reaches stormwater facilities. Vegetation also intercepts and absorbs stormwater runoff and decreases peak loads during storm events. In areas with combined sewers, vegetation captures runoff and slows flow, which can preclude the occurrences of combined sewer overflows and degraded water quality in proximate water bodies. Polluted runoff is the greatest source of ocean pollution. Vegetated areas intercept and filter some of the pollutants that stormwater runoff otherwise carries into water bodies. A 5-year study in Los Angeles determining the effects of six bioretention areas accepting runoff from parking lots and streets found that "none of oils, fecal matter, heavy metals, chemicals and other storm water pollutants monitored… had a negative effect on the groundwater after filtering through plants and soil" (LA Times, 2009). Thus, bioretention can be an effective means of filtering out pollutants before water is released into the Santa Monica Bay, known for its water quality issues and beach closings

The Chicago Green Alley Program is implementing four pilot approaches to improve drainage: 1. Use green pavement materials such as optional inlet structures that connect to underground drainpipes. 2. Cover the entire alleyway in permeable pavement. 3. Cover the center of the alleyway in permeable

pavement, and slope the alleyway slanted so that water drains towards the alley center. 4. Slant the concrete alley towards perforated sides to allow stormwater to seep into an infiltration trench (Fiegel 2009).

Particulate Capture:
Greenspace can incentivize pedestrian movement by creating enjoyable passageways that buffer street noise, and offer shade and engaging streetscapes for human-centered movement. Thus, they can decrease automobile use and the associated vehicular exhaust and smog. Trees not only reduce emissions by disincentivizing vehicle use, but also proper trees siting can block, absorb, and decrease gaseous pollutant concentrations in the air by intercepting airborne particulates as they pass over the leaf stomata or adhere to the bark. Studies show that busy roads can degrade air quality within a 50-100 meter radius and even exposure in short durations can degrade human health. Studies found that up to 40% of pollutants from road sources can travel 100 meters. While pollution removal rates depend on levels of air pollution, length of in-leaf season, rainfall and weather, large trees (77cm+ diameter) on average remove 1.4kg.yr of air pollution (Nowak). Air pollution not only affects city residents, but also the aquatic and terrestrial environment. For example, LA's air pollution is source of toxic metal pollution into the Santa Monica Bay. A 2001 study found that air pollution contributes 50% of the chromium and 99% of the lead pollution in the Bay (Jahagirdar, 2006).

Improved Microclimate:
A microclimate is the interaction of the built environment with weather on localized scales; air temperature, solar radiation, humidity, precipitation, topography, vegetation and buildings all affect the microclimate. In cities, impervious and dark surfaces absorb greater proportions of incoming solar radiation than the vegetated land surface they replaced, creating an urban heat island effect. Heat is stored and released slowly from low-albedo surfaces, thereby altering microclimates via elevated near-surface air temperatures. Additionally, this heat island effect will likely be intensified with climate change and can be more drastic during heat waves, a common summertime problem when LA experiences low wind speeds and high temperatures. (Rosenzweig et al., 2005). Replacing or shading low-albedo surfaces with higher-albedo surfaces and vegetation decreases the amount of radiation absorbed. Through shading and transpiration, individual urban trees have significant impacts on energy conservation for buildings, depending on tree size and location, as well as building energy use and structure (Carver et al. 2004).

Within buildings, tree shading of windows and walls can decrease air conditioning use by 25-50%. Furthermore, the evapotranspiration from one outdoor adult tree can result in a cooling effect comparable to 10 air conditioners (room size) running 20 hours/day (USDA pamphlet #FS-363; Sherer 2003). Within greenspace around a building, the temperature can be 3°C cooler than outside the greenspace (Nowak 1993). While trees yield the greatest mitigation effects on particulates and the heat-island effect, well-sited shrubs, green roofs and walls also provide these benefits to urban microclimates (Currie 2005). As air temperature is related to the formation of smog, the shading and evapotranspiration that trees provide can reduce air temperature and thus lower smog production. In areas with intermittent trees, such as within cities, the range of maximum mid-day air temperature reductions from trees is 0.04°C-0.2°C/ percent tree canopy cover increase. In parking lots, trees can reduce evaporative emissions from automobiles; one study found increasing canopy cover from 8-50% could reduce vehicle VOC evaporative emissions by 2% in Sacramento (Nowak). Trees also act as natural air conditioners to help keep cities cooler, mitigating the effects of concrete and glass that can drastically heat cities under warm summer conditions.

Pollution Abatement :

The U.S. Forest Service calculated that over a 50-year lifetime one tree generates $31,250 worth of oxygen, provides $62,000 worth of air pollution control, recycles $37,500 worth of water, and controls $31,250 worth of soil erosion (Sherer 2003). Trees in New York City removed an estimated 1,821 metric tons of air pollution in 1994 (Sherer 2003). Tree spacing, canopy size, and leaf distribution all influence how cool air and pollution mixes together and flows in and out of urban canyons (Sherer 2003). The effect of planting ten million urban trees annually in the US was modeled for impact on atmospheric CO_2 over a 50 year time period. In the year 2040, these trees would have stored 85 million tons of carbon and prevented the production of another 315 million tons of carbon (Nowak 1993).

II. Community Buy-In Aides Successful Greenspace Implementation

A. Success of client goals requires community buy-in

Despite a growing city-wide emphasis on sustainability and passage of several ordinances and policies that encourage sustainable development, such as the Green Streets Initiative and Proposition O, the Sustainability Committee needs a way to communicate complicated environmental and planning issues to diverse community stakeholders in a relevant and meaningful way (Zarella 2009).

By communicating benefits of sustainable planning to Downtown stakeholders, the Sustainability Committee seeks to create community buy-in to motivate and unite local support. Citizens are making greater demands for a more active role in the planning and decisions that are made about the green spaces in their communities. These demands are motivated by reasons such as a desire to improve the quality of community life, environmental protection, and participation in decisions that will affect their lives (Balram and Dragi´cevi 2005). As the concept of sustainable development, however, is a broad and subjective goal, educating local residents on definitive goals and strategies of achieving greener communities is imperative (Jensena et al. 2000). Mobilizing citizens to activate policy in support of green space measures strengthens open space projects. Thus, open space implementation only works if the local community values open space (Kline 2006). Public mistrust in planners' intentions can hinder successful development of green space projects, and stakeholder involvement is an essential component of the planning process (Nilsson et al. 2007). Harnessing public input will also heighten the city's sense of ownership over the project in a symbiotic way (Kaplan 1980). By including citizen input, the public will better understand tradeoffs faced by planners, and planners will to better understand the needs of the community and the non-monetary values that local residents place on urban green space (Balram and Dragi´cevi 2005).

It is important for local users and residents to have input on the management of their green spaces. This fosters a sense of ownership and responsibility of the resource. Some research analyzes how local user groups can manage urban green areas to support biodiversity and ecosystem services. Research focuses on allotment areas, domestic gardens, and golf courses. Incorporating locally managed lands with co-management designs can improve conditions for urban biodiversity and reduce transaction costs in ecosystem management (Colding et. al 2006).

Engaging local stakeholders in sustainable design projects increases overall sense of community efficacy and satisfaction with the process (Semenza and March, 2009). Greenspace provides areas for social interaction, fosters a greater sense of community, and improves the quality of life for urban residents (Inerfeld and Blom 2002). In the aftermath of Hurricane Hugo, Charleston, SC residents mourned urban forest damage as the most significant loss for the city, citing environmental, aesthetic, recreational, and

personal justifications. These opinions, however, were not fully recognized until after these open spaces were damaged; there is a pressing need for public education about the values of urban green space on a current timescale (Hull 1992). Using public outreach and education to focus the public's attention on particular ecosystem services aimed at alleviating local environmental problems, as well as aesthetic and recreational values, fosters community support for green space projects (Jim and Chen 2006).

B. Funding and support available:

The $15,000 AIA Grant will provide downtown LA with a comprehensive approach to sustainability by developing a Toolkit for all community stakeholders to use to contribute to a greener Downtown LA. The timeline for our group project is in accord with the overall Sustainability Committee of the Downtown LA Neighborhood Council (Zarella 2009). Funding sources for greenspace projects include the LA County PLACE Program and other local government initiatives through the Department of Transportation and the USDA (Urban Forestry).

C. Issue with cities and fragmented groups/disparate knowledge:

Cities can be fragmented along economic and ethnic lines. Such cities typically have lower levels of social cohesion and social capital, culminating in greater difficulty resolving collective action problems. Studies on this phenomenon found that "public goods provision is lower in more diverse communities" as their may be less civic engagement (Kahn 2006 p.108). Considering the relevance of this issue to a socially and economically diverse and rapidly expanding population in Downtown LA, our project must articulate the benefits of green space to a range of stakeholders to promote widespread support and increase local basic knowledge of green spaces ability to mitigate urban problems.

III. The Problem Is Yet to Be Solved

A. There is a need for greenspace in Downtown LA:

With only 30% of LA residents living within walking distance of a nearby park, there is a clear need for more open spaces Downtown. Other cities, such as Boston and New York provide parks so that 80-90% of the residents are within ¼ mile of open space, whereas only 30% of LA's residents live within a ¼ mile of a park (Sherer, 2003).

B. Addressing the lack of research focused on small-scale interstitial greenspace:

While many studies exist that research different methods of alleviating urban environmental problems on the larger scale, our project will fill a niche by assessing the value of smaller parcels of greenspace. Furthermore, we will demonstrate these quantified ecosystem services to local stakeholders, which will provide information that is tailored to the community. For example, projects that address a larger scope of the entire LA ecosystem include the Million Trees Project, and Low Flow and Urban Runoff Diversion project for Santa Monica Bay. Our project will build upon the work of others and synthesize information in a way that is relevant to local stakeholders Downtown.

Many open space studies focus on regional benefits of conservation on the urban fringe using tools such as conservation easements and private land conservation to enhance quality of life for the community and strengthen ecosystem services in urban-wildland interfaces (Wallace et al. 2008). Other studies focus more on the ways greenspace mitigates urban environmental problems, such as air and noise pollution from vehicular traffic, but are conducted on a regional scale (Ridder et al. 2004). Many studies outline

the benefits of green roofs and individual urban trees, such as energy efficiency and reduced water runoff (Kravitz 2008; Marinelli 2007). Our project will attempt to fill in knowledge gaps by focusing specifically on smaller greenspace nodes in Downtown LA.

Having already developed into a dense urban center, it would be difficult for LA to find space for those greenspaces that first come to most people's minds, namely parks of varying sizes. Furthermore, "given that Los Angeles also faces an extreme housing shortage, especially of affordable housing, designating land for park development often represents an unacceptable trade-off between scarce housing and park provision" (Pincetl 2005 pg. 368). Considering this situation, the Pincetl study modeled a greening scenario which would add trees to parking lots and other private properties, add permeable surfaces for parking lots, driveways, and medians, transform vacant lots into small parks, and improve alleyways into aesthetic, pedestrian streets. The study used CITYgreen and determined benefits of $275 per cubic foot of stormwater reduction, reduced energy bills of 10-20%, and measurable reductions in air pollution.

C. Design & technology:

Geographic Information Systems (GIS) increased the feasibility of spatial analysis of environmental and health problems. GIS can pinpoint areas of fastest population growth, study landownership patterns, and locate key parcels for possible green space before development demand drives up property prices or destroys the open space. GIS can also help determine connecting park spaces, or connect larger parks with linear greenways. (Sherer 2003). Many analytical studies create tools for quantifying the benefits of urban green space but leave out social and aesthetic values, which are harder to assign numerical value. Models such as CITYgreen 5.0 evaluate the monetary costs and benefits of urban green space and consider ecosystem services but neglect other values of green space (Wang and Zhao 2007). For a better understanding of the effect of urban trees on local microclimate, models are being developed that relate subcanopy climate to the local landscape. Water and energy fluxes may also be studied to determine the effect that urban green spaces have on the hydroclimate (Nowak 1993).

The software CITYgreen4.0, an extension of GIS ArcView, calculates the economic values of parks and other greenspace in urban settings (Longcore 2004). This software is designed to assess the impacts of landscape features like trees, stormwater runoff, air pollution, and carbon sequestration. Longcore uses CITYgreen in a densely populated urban area, 146 acres in a Los Angeles neighborhood, which includes residential, commercial, and institutional uses. It is important to note two main shortcomings of the CITYgreen software that inhibit its ability to perform accurate assessments of dense urban environments. First, it does not calculate energy savings for buildings larger than a single-family home. This renders CITYgreen virtually useless when trying to determine the energy savings to a high-rise apartment complex, such as those found along Harlem Place. Second, CITYgreen is able to successfully model stormwater runoff reduction from greenspace such as trees, shrubs, and impermeable pavements, but it is not able to assess stormwater reduction when these greenspaces are used in combination with one another. This suggests that in our ecological assessment of Harlem Place, there will be some difficulty in accurately determining numbers for runoff reduction since our scenarios utilize the combined impacts of different greenspaces types.

IV. The Approaches Being Considered Are Feasible

A. Many cities have successfully implemented green space programs:

Recently governments, communities, and environmental organizations in countries such as the US, Canada, and Europe recognize the need to incorporate green space into their sustainable management plans. Ecologists also recognize the role that complex urban ecosystems play in mitigating urban environmental problems and improving quality of life in densely populated cities. Studies show that people desire to be close to nature, have attractive surrounding environments, and have proximate places for recreation. Urban planners, landscape architects, and citizen groups should recognize these desires as they attempt to mitigate the loss of natural landscape as a result of growing urbanization and sprawl (Schell 1999).

Examples of greening projects include New York's PlanNYC2030, developed to increase the quality of life for New Yorkers and reduce GHG emissions by 30%. The plan ensures that all residents live within a 10-minute walk of a park, brownfields are remediated, and 90% of waterways are opened for recreation. It will also create 1800 miles of bicycle lanes, plant one million trees, and improve pedestrian movement (Schell 1999). For Delaware, the Civic Vision was created by 4,000 locals' new vision for the riverfront to offer recreational space and attract retail activity. The Philadelphia Stormwater Management Guidelines stress how multifunctional green space design elements such as bioswales, permeable and grass pavers and vegetated buffers can mitigate urban runoff load (PA Water Department).

Other examples reveal how green space can be tailored to specific local needs. After widespread damage from El Nino mudslides in Bahia de Craquez, Ecuador, the city declared itself an "Ecological City". With the help of the Planet Drum Foundation, the city raised awareness of urban environmental issues and revegetated the barrio with native trees, using vegetation to reduce mudslide risk. The City of Bogota implemented a 45-km greenway, as well as a network of integrated bicycle paths, and city-wide closures of selected roads during non-peak hours. In an arid, warm climate like LA, the city of Melbourne removed pavement and designed building facades to accommodate and engage pedestrians. As a result, the city experienced a 40% increase in pedestrian traffic and witnessed increased jobs and property values (Newman 2008).

B. Political and local momentum:

The political climate of LA is increasingly receptive to open space initiatives, as demonstrated by the recent passage of several progressive city ordinances. LA's long-term *General Plan,* developed by the Dept. of City Planning, includes a chapter on open space and conservation, demonstrating a commitment to reconciling the inherent conflict between development pressure and open space conservation. Strides made towards open space conservation include the 1992 passage of Proposition A, which allocated $550 million for parks ($126 million of which designated specifically for LA city parks), and the passage of Proposition K in 1996, a park bond worth $750 million for LA county and $25 million annually for the next 25 years ("Proposition 40" 2008).

Advances for open space conservation came in 2002 with Proposition 40, the CA Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act, which provided $1.186 million to CA State Parks, with $956 million towards local parks. In May 2007, the LA Board of Public Works (BPW) adopted its Green Streets Initiative to proactively handle water quality issues in the city, but also acknowledge the various benefits of green streets, such as decreased urban heat island effect and aesthetic improvements for the city. The Green Streets Initiative Committee is currently identifying pilot

projects, sourcing funding options, creating design criteria for green streets, and synthesizing knowledge from experts and academics (Daniels 2008).

The City Council motioned for the creation of a feasibility report for implementing a Green Alley Program in January 2008. The Green Alleys Program would be similar to an existing program in Chicago, which retrofits existing alleyways with green design features and permeable pavement to reduce stormwater runoff and create aesthetically appealing neighborhoods. In October of that year, the BPW produced the requested feasibility study, which stated that more than 900 miles of alleyways exist, widely distributed across LA, which could be utilized for the Green Alley Program. Furthermore, a March 2008 study found that almost 40% of LA County's requirements for mitigating polluted runoff could be met by implementing low impact development (LID) projects on existing public lands (Daniels 2008).

Also in October of 2008, the LA County Board of Supervisors unanimously passed three progressive green building ordinances for low impact development. Included in these ordinances are requirements for all new development of a certain size to treat all stormwater runoff and install irrigation control; buildings greater than 10,000 sq. ft. must be LEED certified and buildings greater than 25,000 sq. ft. must qualify as LEED Silver; new buildings must reduce energy demand by 15% compared to usage permitted under the 2005 Energy Efficiency Standards; landscaping must be at least 75% drought-tolerant species. LA is becoming increasingly committed to the idea of open space conservation, not just for environmental reasons but for social and aesthetic as well.

Currently, a prominent tree planting initiative in LA is the Million Trees LA project (Daniels 2008). This project performs a tree canopy analysis in LA to identify areas that need more tree cover to site trees strategically. It will also quantify future benefits associated with planting one million trees. A Canopy Cover Assessment Final Report was submitted as an overview of the project and includes an overview of the history of LA's urban development and the Initiative, as well as the cost and benefits of urban forests.

V. Cost-Benefit and Effectiveness Analysis

A. Runoff:

Cost of Lost Beach Days: Due to urban stormwater runoff from LA, water pollution in Santa Monica Bay is the worst in all of California. The main reasons public health officials close CA beaches is when human pathogens are detected, usually due to sewage spills or "unknown sources." According to State Water Resources Control Board, Santa Monica beach attendance declined 56% since 1983. This is a significant loss of a natural amenity to the population of LA, as well as in revenue as Santa Monica State Park Beach receives 7,342,250 visitors annually. In 2004, CA officials posted or closed beaches 3,985 days and 60% percent (2,408 beach-days) of these occurred in LA and Orange County. 93% of advisories and closures were caused by unknown sources of fecal indicator bacteria (Given et al. 2006). This information could be used for cost-effectiveness analysis to determine the benefits of stormwater reduction by greenspace using a valuation method based upon the cost of lost beach days.

Water runoff reductions and energy savings of green space's potential to infiltrate and retain water: A mature city tree can provide about $35,000 worth of water recycling to dense urban areas (USDA Forest Service, NYC DDC). Trees in the nation's metropolitan areas save $400 billion in the cost of building stormwater retention facilities (Scherer 2003). 50 million gallons per day of runoff flows into Santa Monica Bay on dry days because of overwatering of lawns and sidewalk cleaning. With stormwater infiltration and capture (via low impact development), Southern CA alone could save 151,000-304,000 metric tons of

C02 equivalents/year (Garrison 2009). Information is needed on the infiltration capacity for specific soil types and permeable pavers/square area to calculate the reduction in stormwater runoff possible.

B. Heat island mitigation:

Tree planting is one of the most cost-effective means of mitigating urban heat islands. "Trees that shade pavement can reduce asphalt temps by as much as 36°F and fuel tanks by nearly 7°F." (Dixon 2007 p.4). A study conducted by the USDA Forest Service and UC Davis found that LA could increase its benefits (monetary value of $1.64-1.95 billion) over the next 35 years by increasing tree canopy by 1.3 million trees (Greenstreets LA). Permeable pavement also mitigates the heat island effect as it lowers surface temperature via evaporative cooling; water passes through the paving and later evaporates when warmed by the sun, drawing heat away from the pavement (Wong et al. 2005)

Albedo: Every 10% increase in solar reflectance can decrease surface temperatures by 7 °F (4 °C) (Wong et al. 2005). One study found that a combination of mitigation measures in LA including increased trees and vegetation as well as solar reflectance changes could decrease temperature by 1.5 °F (0.8 °C). A study quantified the benefits associated with these temperature improvements and indirect benefits (energy savings and smog decrease) in LA from pavement albedo improvements would be more than $90 million/year (1998 dollars) (Wong et al. 2005).

Reduced Building Load: Trees provide shade, which can decrease building energy demands. The degree of cooling energy savings a tree provides is a function of placement and canopy density, size and shape. For example, west shade and broad spreading crowned is optimal, and canopy density providing 75% or more sunlight blockage. Using Micropas4, a building energy analysis program, one study estimated cooling loads using hourly shading coefficients on a 1,761 sq. ft building with a tree assumed to block 85% of incoming solar radiation during in-leaf periods. A 15 year old tree that is 24 ft tall can save approximately 340kWh of energy annually (McPherson 1993). In terms of the cost-effectiveness of shade trees on reduced building loads, the analysis of six conservation treatment conducted by an Arizona Corporation found that despite the time delay before optimal shading benefits while trees grow, small shade trees was second to increased building attic insulation in cost-effectiveness (McPherson 1993).

C. Air Pollution Reduction:

One study found that Chicago's urban forest canopy saves the city over $1 million annually in pollution control services, such as reduced CO, SO_2, NO_2, O_3, and particulates (Scheer 2001). A Sacramento tree-planting initiative in the 1990's reduced city CO_2 levels by 200,000 metric tons annually, subsequently reducing taxpayer burden by $3 million each year (Scheer 2001). Through shading and transpiration, individual urban trees have significant impacts on energy conservation for buildings, depending on tree size and location, and building energy use and structure (Carver et al. 2004). A study by the Forest Service found that one urban tree (over the duration of a 50 year life) can control $31,250 worth of soil erosion, provide over $30,000 worth of oxygen, recycle $37,500 worth of water and yield more than $60,000 worth of air pollution control (USDA Forest Service, NYC DDC). The city of Chicago estimated that its trees removed 591 metric tons of air pollutants annually and the pay-back of benefits overwhelmed maintenance and planting costs by 3 to 1.

D. Hedonic price methods - Increased real estate value of greenspace:

A study found that the existence of trees proximate to property increased the selling price of a residential unit between 1.9 - 9%. "Neighborhood commercial corridors in "excellent" condition (including a green streetscape) are correlated with a 23% net rise in home value within ¼ mile of the corridor, and an 11% net rise for those within ½ mile. Rental rates of commercial office properties were about 7% higher for sites having a quality landscape that included trees" (Dixon 2007 p.7). We can utilize previous hedonic pricing analysis as a means to conduct cost benefit analysis of greenspace on real estate values. "Hedonic analyses of residential housing prices consistently reveal an inverse relationship between housing prices and distance to urban environmental amenities" (JunJie 2003 p.288). One study estimates that redevelopment of the brownfields into greenspaces would increase property values for the 890 neighborhood residences between $2.40 and $7.01 million (Kaufman et al. 2006). Additionally, a Chay and Greenstone study found that 10% reduction in total suspended particulates increased home prices by 3% (Kahn 2006 p.18, 23).

E. Well-being and health benefits of green space:

Greenspace enhances mental and physical well-being, and develops of social capital. Identified health benefits from exposure to nature reveal how exposure to greenspace strengthens community ties and improves overall quality of life for urban residents (Stone et al. 2002; Maas et al. 2006). A study by Chay and Greenstone found that a 10 microgram/cubic meter reduction in particulates reduces infant mortality by 55 infant deaths per 100,000 live births at the LA county level. (LA witnessed a reduction of over 30micrograms over last 30 years) (Kahn 2006 p.15). For smog days in LA, citywide alerts are provided when forecasted ozone levels exceed 0.2ppm. There is a correlation between smog days and sick days in LA. To calculate the cost of sick days many studies use state-mandated changes in highway speed limit laws to infer the value of life (when state raises speed limits the implied tradeoff is hours commuting which decline against traffic fatalities, which increase). The value of statistical life in the US ranges between $2- $6 million. Another means to quantify the benefits of air pollution reduction by greenspace is through defensive expenditures, or investments in self-protection as an alternative measure of urban "greenness."

APPROACH

Methods
We will research different types of greenspace, such as tree plantings, rain gardens, bioswales, greenwalls, permeable pavers, planters, and privately-owned public open space in conjunction with potential development along the alleyway, in order to identify their respective benefits or impact, and set specific ecological and community goals. For example, alley and street design incorporating vegetation and vegetative buffers along roads calms traffic and can make pedestrian walkways more inviting. Once we identify the vegetation types and design features that meet our ecosystem services goals, we will compare potential greenspace scenarios for Harlem Place. This comparison will be conducted by developing a means to compare the various impacts of different urban greenspace scenarios for Harlem Place. Our final recommendations to the Sustainability Committee of appropriate greenspace implementation for Harlem Place will reflect maximized benefits, minimized costs, feasibility, and community need. Our project will use Harlem Place as a means to develop design guidelines that encourage the transformation of underutilized interstitial spaces such as alleyways. Harlem Place can demonstrate how alleyways must be programmed for maximized functionality and local benefit. Service roads and alleys such as Harlem Place should connect to existing, upcoming and potential parks, and should be destinations as well as service alleys and pedestrian transit paths.

We will use GIS data, infrastructure, and currently used pedestrian routes to identify opportunities for greenspace that maximize ecological, social, and economic benefits. Ultimately, our goals include overlaying the ecological, economic, infrastructural, and cultural data from various scenarios to determine optimal greenspace plans. Our results will demonstrate various greenspace scenarios for Harlem Place and how respective effects relate to other projects; we will display our findings in presentations to local stakeholders, Business Improvement Districts (BID), the Downtown Los Angeles Neighborhood Council (DLANC) and its Committees, and the City of Los Angeles' Planning Department..

Our project must prioritize the local environmental and aesthetic needs of the Downtown community, and then determine how each of the various repercussions of greenspace serves those needs. Using existing research on specific effects of ecosystem services, we will select the desired services, and determine where the services can be installed, and how their benefits will be quantified for comparison. Both direct and indirect social and environmental impacts will be assessed and quantified. For example, some impacts, such as a stronger sense of community and aesthetic value, are harder to quantify but are important aspects to consider.

1. Research
Methods and data requirements to quantify, analyze, and compare benefits of various greenspace scenarios in Downtown LA.

2. Data Collection
2.1 Establish Framework and Goals for Data Collection
a. Literature review to identify impacts of similar greenspace projects in other cities and understand the net effects of small scale greenspace: economic, aesthetic, community, environmental
b. Interviews with Harlem Place business owners and developers:
      1. Determine what are the obstacles to integrating greenspace?
      2. What prevents developers from providing park space in lieu of fees?
- What do stakeholders know about greenspace?
  - Environmental impacts?
  - Positive and negative perceptions?
- What do developers want?
  - Emphasis on rent prices, or also an awareness of the aesthetic benefits of an attractive green area adjacent to their property?
- Determine which blocks of Harlem Place have a higher number of stakeholders who are receptive to greening the alley: this will likely be the best place to break ground.
  - Do they have strong opinions on the kind of greenspace they want/any preferences?

c. Determine which studies are appropriate to transfer to Harlem Place site.
      How do other studies quantify impact? (build upon lessons/inputs from CITYgreen4.0 Program and others)
      Software CITYgreen4 calculates economic values of greenspace in urban settings (Longcore 2004). This software is able to assess the impacts of landscape features like trees, stormwater runoff, air pollution, and carbon sequestration. Longcore uses CITYgreen in a densely populated urban area, within 146 acres of land in a Los Angeles holding residential, commercial, and institutional use.

<u>How to transfer other study data to serve Harlem Place analysis</u>? (comparable soils, climate, density and use?)

d. Develop metric for ecosystem service and greenspace analysis
<u>water infiltration and stormwater reduction</u> (gallons/year)
- LA study utilizing CITYgreen determined benefits of $275 per cubic foot of stormwater reduction
<u>heat island reduction</u> (albedo change/tree shade impact on surface temperature/area)
<u>energy use reduction</u> (kwh/tree shade; kwh/albedo change)
<u>particulate capture</u> (pounds/tree or shrub)

2.2 Site Data Collection: Acquire Necessary Ecological Models, constraint and biophysical data for Harlem Place.
a. Acquire UCSB Geography Department data to determine site soils.
b. Harlem Place specific data from volunteer professionals:
1. Daylight analysis to optimize vegetation selection and siting so vegetated areas receive appropriate solar exposure
2. Soil Analysis: to determine soil characteristics to quantify net stormwater infiltration capacity
3. Subsurface Infrastructure Analysis: to determine subsurface constraints including basement footprints, piping etc.
4. AutoCAD Modeling: for baselayer model
c. Community Services: input from local community members about desired ecosystem services/needs
d. Analysis of current public transit and building uses and information gathering from Neighborhood Council determine pedestrian activity around/through site to maximize Harlem Place's ability to serve as a useful, well-used pedestrian corridor.
e. Determine most needed and feasible ecosystem services and social impacts

3. Modeling

a. Transfer and quantify impacts to Harlem Place
b. Compare site selection, design scenarios, and environmental and social impact of Harlem Place
c. Design scenarios to investigate for infiltration:
-Build upon different design approaches such as the Chicago Green Alley Program (Fiegel 2009).
-Parameters to consider include: vegetation type, vegetation density and siting, surface albedo, surface infiltration, service road to greenspace ratio, pedestrian and dog walkway design, feature placement (dumpsters, benches, etc)
d. Assess the net effects of implementing greenspace in Harlem Place.
e. Utilize GIS to estimate and determine the potential for more greenspace implementation in Downtown LA.
1. GIS data maps can display net impervious surface data as well as infrastructure in LA. Using this data, GreenLA can determine where other alleys and underutilized impervious surfaces exist to demonstrate the capacity of widespread greenspace implementation.
2. Transfer the quantified impacts from the analysis of Harlem Place (3.d.) to inform estimation of the impacts of redeveloping the potential areas determined from 3.e.1.
f. Determine the cumulative impacts/benefits of implementing greenspace in all available areas in Downtown LA

4. Communication of Results to Stakeholders

a. Create visuals of greenspace scenarios for Harlem Place
b. Create visuals depicting the potential siting of greenspace implementation throughout Downtown.
c. Synthesize the final analysis of greenspace impacts in a manner that is relevant to various local stakeholders
d. Community stakeholder presentations (utilize PowerPoint and other visuals). Key community stakeholder groups include the Downtown LA Neighborhood Council and its Committees, the City of Los Angeles Planning Department, as well as Business Improvement Districts (BIDS)

5. Constraints
Our project has both technical and ideological constraints. Outside of our scope, there may be many barriers to actual implementation of greenspace, depending on whether lots are under public or private ownership and their current designated uses. Although Bren funding and software accommodations should allow us to stay within our allocated budget, the volunteer status of the professionals working with the Neighborhood Council may limit their availability to provide guidance and feedback.

MANAGEMENT PLAN
Meeting Management:
> Meeting Organizer/Corporate time manager: Leanne Veldhuis
> Agenda Setting: Rebecca Tannebring
> Agenda Recording/minutes: Theresa Morgan
> Deadlines: Katie Riley

Logistics Management:
> Financial Manager: Theresa Morgan (TM) - Responsible for managing financials: track and document project spending
> Web Manager: Katie Riley, Leanne Veldhuis (KR, LV) - Responsible for Web Design and managing web site.
> Data Manager: Rebecca Tannebring (RT) - Responsible for determining data labeling and compiling system.
> Client Relations: Katie Riley

Expectations of Student Group Members
All group members will fully contribute to GreenLA's success throughout the duration of the project. All work will be high quality and will culminate in a final product worthy of a master's thesis level publication. These expectations include, but are not limited to:
- Completing assigned work and submitting assignments by set internal and external deadlines.
- Providing documents to advisor and client for review at least one full work week prior to deadlines.
- Keeping schedules current on Corporate Time and updating the internal GreenLA calendar with personal vacation times so group is aware of conflicts in schedule as early as possible.
- Alerting group members and advisors, when necessary, to conflicts, uncertainties and inability to meet deadlines as planned.

Expectations of Faculty Advisor
-Attend weekly meetings with group members and notify group members via email to greenla@bren.ucsb.edu at least 24 hours in advance if a meeting must be rescheduled.
- Attend some additional meetings with clients and/or other key stakeholders

- Provide logistical and technical advice when appropriate
- Mediate inter- and intra- group conflicts if needed

Expectations of Client
- Assist group with facilitating contact with other stakeholders and volunteer professionals assisting the Harlem Place redevelopment
- Provide group with data and relevant information as needed
- Provide feedback on work products
- Attend meetings as needed

Conflict Resolution
- Any conflicts will be first confronted and mediated within the group, and more specifically within the relevant persons within the group in a private manner. Following the discussion, a resolution plan will be created to remedy the issue that is satisfactory to persons involved.
- Should a conflict not be resolved via the above method, our faculty advisor will be asked to help mediate.
- Conflicts between group members and the faculty advisor will be openly addressed in a neutral setting. If a conflict cannot be resolved, an external mediator within the Bren School will be called in for consultation.

DELIVERABLES

GreenLA will provide the Sustainability Committee with analysis of small-scale urban greenspace projects through the Harlem Place case study. In addition to a final report and oral presentation, the following deliverables will be produced:

Literature review to identify impacts of similar greenspace projects in other cities and gain a better understanding of the net effects of small scale greenspace: economic, aesthetic, community, self-perpetuating.

Research methods and data requirements to quantify, analyze and compare benefits of various *greenspace scenarios* in Downtown LA.

Transfer benefits to a specific project (Harlem Place) to show impact of potential greenspace on Downtown LA.

Provide information to client to assess the net effects of implementing greenspace projects, such as Harlem Place, that they will use as part of their *Toolkit*, which provides all stakeholders with access to information regarding a greening strategy for Downtown LA.

Organize our research findings and recommend a scenario for Harlem Place; we will create *visual displays* to use in public stakeholder presentations and in future Sustainability Committee projects.

MILESTONES

SPRING 2009	
Task	*Deadline*
Final Proposal Draft Submitted	18-May-09
Final Proposal Submitted	26-May-09
Final Proposal Review Meeting	2-Jun-09
Summary of Proposal Review Meeting Completed	12-Jun-09
Website Operational	12-Jun-09
Self-Peer Evaluations Submitted	12-Jun-09
Inform Client about Summer Needs from Volunteer Professionals (Daylight Analysis, Soil and Subsurface Infrastructure Analysis, and AutoCAD Modeling of Harlem Place; Input from Local Community Members About Desired Ecosystem/Community Services)	12-Jun-09

SUMMER 2009	
Task	*Deadline*
Expand Literature Review on Assigned Topic	Sep-09
Research Potential Models and Methods	Sep-09
Check in on Volunteer Professional Progress	once per Month

FALL 2009	
Task	*Deadline*
Determine Most Needed and Feasible Ecosystem Services and Social Impacts	Oct-09
Develop Metric for Ecosystem Service and Greenspace Analysis	Oct-09
Acquire Necessary Ecological Models/GIS/Constraint and Biophysical Data for Harlem Place	Nov-09
Progress Reviews Completed	13-Nov-09
Written Progress Report	4-Dec-09
Quarterly Peer Evaluations	4-Dec-09
Site Selection, Design Scenarios, and Environmental and Social Impact of Harlem Place	10-Dec-09
Initiate BID Presentation Scheduling	10-Dec-09

WINTER 2010	
Task	*Deadline*
BID Presentations	Jan-10
Create Visuals of Greenspace Scenarios for Harlem Place	Jan-10
Compile Final Analysis of Greenspace Impacts	Jan-10

Choose Optimal Design Scenario for Harlem Place	Jan-10
Project Defense	Feb-10
Draft of Final Report to Advisor	15-Feb-10
Title, Abstract, and Acknowledgements	10-Mar-10
Final Report Signed by Advisor and Submitted	19-Mar-10
Project Brief Submitted	19-Mar-10
Self/Peer Evaluations Submitted	19-Mar-10
Advisor Evaluation Submitted	19-Mar-10

SPRING 2010 **Final Presentation (FP)**	
Task	*Deadline*
Group Photo Taken	1 week prior to FP
PowerPoint Presentation Submitted to Advisor	1 week prior to FP
Poster Submitted to Printer	1 week prior to FP
Practice Videotaping of Presentation if Necessary	1-4 days prior to FP
Public Final Project Presentation	Mar-10
Final Project Poster Submitted to Bren	1 week after FP

BUDGET

Travel	$300
Business cards	$40
Office supplies	$50
Client parking	$24
Telephone calls	$15
Printing	$150
Final poster/brief	$300
BID Displays	$20
Library copy card	$50
Total Cost	**$924**

Budget Justification

The Bren School of Environmental Science and Management will provide $1300 to cover project costs, with an additional $200 for printing costs. This budget is a forecast of Green LA's expected costs over the next 10 months. Adjustments will be made to the budget as necessary. All changes to the budget will be discussed as a group and finalized through the project Financial Manager.

Travel:
We anticipate traveling to our project site in LA approximately once a month between the months of September and March. We have estimated the total cost, including gas and parking, to be $300.

Business Cards:
Green LA plans to create business cards for all group members. We anticipate the cost to be approximately $40.

Office Supplies:
We plan to buy basic office supplies for proper organization and presentation. We estimate the cost to be $50 for initial purchases of supplies, such as hanging folders, binders, highlighters, business envelopes, and Thank You cards.

Client Parking:
We estimate that our client will visit the Bren School approximately 3 times over the course of the project. We plan to cover the costs of parking, which totals $24.

Telephone:
The telephone set-up fee is $10, with an additional $1/month for 12 months, plus calls. Conference calls our client or potential external advisor will be necessary from time to time. We estimate no more than 2 hours of conference call time each month since we will be traveling to LA frequently and communicating via email with our client and advisors.

Printing:
We plan to divide the $200 allocated for printing costs among each of the four group members. This money will be used for day-to-day printing of literature and document drafts. We have budgeted a total $300 for the final printing of our project poster and briefs.

BID displays:
We will provide visual displays for the BID displays in Downtown LA as part of our deliverables. The visual displays will be primarily PowerPoint slides, and we estimate the cost to be $20.

Library Copy Card:
We plan to purchase a group library copy card that will be used for routine copying of literature, maps, and graphical illustrations. Our initial budget for the copy card will be $50.

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