What Works and Why?
Evaluating the Effectiveness of Cities' Sustainability Initiatives

Judith A. Layzer
Associate Professor of Environmental Policy
Department of Urban Studies & Planning
MIT
jlayzer@mit.edu
and
Stephanie B. Stern
Masters in City Planning Candidate
Department of Urban Studies
MIT

Paper prepared for the American Political Science Association Meeting, September 2-5, Washington, D.C.

ABSTRACT

This essay lays the foundation for the Urban Sustainability Assessment (USA) project, which aims to provide useful information to planners as they make decisions about which programs to pursue and how to go about designing and implementing them. After briefly laying out the rationale for urban sustainability, we describe the kinds of initiatives currently under way in U.S. cities. We then outline our approach to assessing the effectiveness of those efforts. That approach involves gathering detailed information on both program design and political factors, as well as on program outputs. We will construct logic models that link those data, and relates them to environmental outcomes. The result will be a series of focused assessments that we hope will prove valuable to program officials.

For more than a decade, and at an accelerating rate since the mid-2000s, U.S. cities have been pursuing sustainability initiatives in one form or another. Although the term urban sustainability is used loosely, the general idea behind these initiatives is to reduce cities' environmental impact while enhancing social equity and economic vitality. But what urban sustainability means in terms of actual programs adopted and actions taken varies widely from one city to the next. Even cities with similar types of programs may design and implement them very differently. In fact, in deciding how to become more sustainable, each city faces a series of decisions about which programs to undertake and how to design and implement them given their particular situation.

This paper, which lays the groundwork for a larger Urban Sustainability Assessment (USA) project, asks: How and to what extent can cities learn from one another about which sustainability programs make sense for them, and how to design and implement these program in a way that is likely to reduce the city's environmental impact.[1] We argue that an evaluation that takes into account key sources of heterogeneity among cities, as well as aspects of program design and the political factors that can impede or enhance implementation, will provide a useful supplement to the networking and informal learning that planners currently rely on. Such an evaluation—if designed and communicated with users in mind—can help cities invest scarce resources wisely and reduce the likelihood of undertaking programs that will end in failure and public disillusionment.

The essay that follows begins by briefly reviewing the concept of and rationale for urban sustainability. Next, we provide a review of what cities in the U.S. are actually doing under the rubric of sustainability. Third, we describe how cities currently learn from one another about program options. And finally, we set out a framework for evaluating the effectiveness of urban sustainability programs, with some examples from analyses that are currently under way. We conclude by reflecting on the challenges and benefits of such an assessment.

What is Urban Sustainability

Historically, cities have been the cause of serious environmental problems. Their construction disrupts biogeochemical cycles; for example, cities typically exploit local aquifers, often causing subsidence, before moving on to tap more distant sources. The removal of trees and shrubs, combined with extensive coverage with asphalt and concrete causes heat islands; thus, Tokyo's temperature has increased about 3 degrees Celsius over the last century (Dickerson 2010). Cities also

[1] This project focuses on the environmental impacts of city policies and practices; where practicable, however, we also assess the equity and other relevant impacts of cities' sustainability programs. As many scholars have pointed out, equity consistently receives the least attention from both scholars and practitioners (Agyeman 2004; Saha 2009), and this project is no exception. That said, there are serious global equity consequences to U.S. resource consumption and waste production; therefore, to the extent U.S. cities reduce their environmental impacts, there is more space for development in low-income cities and countries.

concentrate waste, which they then dump into landfills, rivers, and oceans. And they emit vast quantities of greenhouse gases.[2]

Paradoxically, cities are also critical to the pursuit of global sustainability. They have lower per-capita infrastructure (water, sewerage, and energy transmission) costs, greater prospects for reuse and recycling of materials, reduced per-capita demand for land, the potential for cogeneration and distributed generation of energy, and the potential for reducing transportation-related energy consumption (Mitlin & Satterthwaite 1994, cited in Rees & Wackernagel 1996). In wealthy countries like the U.S., urban residents generate substantially fewer greenhouse-gases per-capita than non-urban residents (Dodman 2009; Owen 2009).

Although cities offer the possibility of lower impacts, there are severe limits on what city governments can do to reduce residents' environmental impacts. Cities don't control the price or supply of fossil fuels, the rate or nature of technological development, the advertising environment, or even their own populations. But cities do control some important behavioral drivers. They write zoning rules, which can have dramatic (positive or negative) impacts on settlement patterns.[3] They also design streets, permit development projects, address stormwater runoff, establish waste-management systems, build and manage transit systems, and undertake other functions that shape how residents and local businesses operate. As a growing percentage of the world's population lives in cities, these roles will become even more important.[4]

What Are U.S. Cities Doing?

Cities around the world have adopted policies aimed at reducing their ecological footprints; at least four—Rizhao, China; Arendal, Norway; Vancouver, Canada; and Vaxjo, Sweden—have announced their intention to become carbon neutral. There is ample evidence in recent years that U.S. cities recognize their role in pursuing sustainability as well. More than 1,000 mayors have signed the Mayors' Climate

---

[2] The World Bank has attributed 80 percent of global greenhouse-gas emissions to cities, a figure that has since been repeated. As political scientist David Satterthwaite (2008) observes, however, the contribution of cities to global greenhouse-gas emissions is almost certainly overstated, given the contribution of heavy industry, power plants, and animal agriculture, which are typically outside cities. Taking those facilities into account, cities are responsible for more like 50 percent of greenhouse-gas emissions. That said, if emissions are apportioned to consumers, cities would be responsible for considerably more than 50 percent. Steven Davis and Ken Caldeira (2010) calculate that net imports to the U.S. of greenhouse gas emissions were 10.8 percent of total consumption-based emissions, which translates to 2.4 tons of CO_2 per person. However you do the analysis, wealth is the single most important factor driving greenhouse-gas emissions: unsustainable consumption, especially in the world's most affluent countries, but in general by the world's most affluent people, is the main driver of greenhouse gas-emissions (Dodman 2009).

[3] In *Zoned Out*, Jonathan Levine argues that in many localities, existing zoning rules discourage dense, compact development, so the market supplies less of it than people would like.

[4] Globally, about half the world's population lives in urban areas, and a far greater percentage of the population of the industrialized North (75 percent to 80 percent) lives in urban areas.

Action Pledge, in which they vow to meet the Kyoto-Protocol targets of reducing greenhouse-gas emissions 7 percent below 1990 levels by 2020. Some of these cities have developed more comprehensive sustainability plans, among the most widely publicized of which are New York's PlaNYC, Denver's GreenPrint, and Toward a Sustainable Seattle. But many other cities, large and small, are either in the process of or have completed a sustainability plan. According to Living Cities (2009), thirty-two of the forty largest cities in the U.S. rank sustainability among their top five priorities; as of the spring of 2009, three-quarters of the forty were creating or had completed a sustainability plan. Similarly, about 80 percent of those surveyed by the nonprofit Urban Sustainability Directors' Network (USDN)—a collection of sustainability directors from eighty-six U.S. cities in thirty-four states and eight cities in Canada—are in the process of devising a sustainability plan, have published a plan, or are already implementing one.

At the same time, the USDN survey also suggests the vulnerability of cities' sustainability initiatives. Almost half of them are located in the mayor or city manager's office, while only five have their own department (see Table 1). As Harriet Tregoning (2010), Director of the Washington, D.C. Planning Office, points out, if you have the attention of the mayor, you can have an impact, but the position waxes and wanes in importance with the priorities of the mayor. Moreover, the USDN survey reveals another source of fragility: currently, cities' sustainability initiatives are heavily reliant on funding from the Energy Efficiency and Conservation Block Grant (EECBG), which received $2.7 billion through the American Recovery and Reinvestment Act, the stimulus package passed in 2009. As cities' financial conditions worsen, sustainability initiatives are likely to be among the first to see cuts.

Table 1. Where in city government is the sustainability initiative that you head located?

City Department	Number of Responses	% Response
Mayor's or City Manager's Office	41	44%
Planning Department	12	13%
Public Works Department	11	12%
Environmental Agency	11	12%
Own Department	5	5%
Municipal Utility	2	2%
Other	11	12%

N=80 U.S. cities. Each can be in multiple categories (responses sum to 93)
Sources: USDN Associate and Core member surveys and from the Sustainable Cities Institute City Profiles

Fortunately, most cities have numerous sustainability programs in place, even if they have not formalized a sustainability plan, established a sustainability office, or appointed a lead sustainability officer. In fact, cities' overarching

sustainability initiatives typically emerge as the agglomeration of piecemeal actions already being taken to address particular goals, not as the result of a paradigm shift (Conroy & Iqbal 2009). Cities often start with low-hanging fruit, such as tree planting or parks (something they know how to do); something that has been vetted, like LEED green-building standards; or pilot projects, like the green roof on Chicago's City Hall (Conroy & Beatley 2007).[5] They may undertake sustainability programs as a way to save money by reducing energy, water use, or waste, rather than as a way to reduce their environmental impact (Hart 1992).

Cities' substantive sustainability programs generally fit into one of eight broad categories: transportation/accessibility, land-use planning, pollution reduction, green infrastructure, energy, water, waste, and food (see Figure 1).[6]

Figure 1. Urban Sustainability Program Areas

Within each broad category are several program areas; for example, transportation/accessibility includes a variety of programs that facilitate bicycling and pedestrian access, from bike-lane painting to public education to bike share; programs that explicitly aim to discourage car use, such as parking restrictions and fees, congestion charges, and traffic calming; and mass-transit programs. The

[5] LEED refers to Leadership in Energy and Environmental Design; it is a certification system developed by the U.S. Green Building Council that gives points for incorporating environmentally friendly materials and practices into a building's design and construction.

[6] These do not include planning endeavors, indicators project, or other attempts to gather or synthesize information.

broad goal of these programs is the same: to get residents and visitors out of their cars, and in doing so to reduce congestion, local air pollution, and greenhouse-gas emissions while enhancing residents' health.[7] But cities adopt different combinations of programs and take different approaches within each program area, often building on their existing strengths.

Nearly all USDN members are working to increase walking and bicycling in their cities (see Table 2). This preoccupation coincides with a surge of interest in many academic disciplines in non-motorized transportation (Forsyth, Krizek, & Rodriguez 2009). To enhance biking, planners can choose from among a menu of approaches that involve engineering, education, encouragement, enforcement, or evaluation and planning—the five Es (Steele & Altmaier 2010). Among the engineering program options are building bikeways, installing bicycle racks in prime locations around the city, and enabling transit connections by adding bike racks to trains and buses. Some cities in the U.S. have even begun experimenting with bike-share programs, which were initially adopted in France and are now widespread in European cities. In 2008, Washington, D.C.'s Department of Transportation—in conjunction with Clear Channel Outdoor—launched the nation's first bike-share program, a pilot project with 100 bikes at ten stations. Two years later, in the spring of 2010, the city announced it would install the nation's largest bike-share system, with more than 1,000 bikes and 114 stations spanning D.C. and Arlington, Virginia.[8] Following D.C.'s lead, on Earth Day 2010, Denver launched its own bike-share program, B-cycle, which has about 500 bicycles at fifty rental stations around the city. And during the summer of 2010, Minneapolis rolled out the nation's third bike-share program, with 1,000 bikes at eighty stations.

Table 2: Please describe your city's status in the areas of sustainability practices listed below.

Status	Renewable electricity generation		Transit Oriented Development		Increased walking and bicycling mode share		Zero-waste policy		Tree planting		Green infrastructure for storm water management		Locally grown food system	
No Plan	16	21%	11	14%	2	3%	39	51%	5	7%	8	10%	27	34%
Plan Underway	23	31%	18	23%	19	24%	12	16%	8	11%	23	29%	27	34%
Plan Published	8	11%	11	14%	9	12%	5	6%	11	14%	12	15%	4	5%
Plan Embedded in City Plans	3	4%	15	19%	15	19%	6	8%	10	13%	10	13%	8	10%
Plan Being Implemented	7	9%	14	18%	17	22%	3	4%	24	32%	17	22%	3	4%
Results Are Evident	9	12%	7	9%	13	17%	3	4%	16	21%	6	8%	4	5%
N/A	9	12%	3	4%	3	4%	9	12%	2	3%	3	4%	6	8%

N=82, including seven Canadian cities
Source: USDN core and associate member surveys

[7] Transportation programs directed at cars often also seek to raise money and to reduce traffic fatalities.

[8] At that point, the city dropped Clear Channel, opting instead for a nonprofit operator that would focus more on expanding system usage and less on advertising.

These programs have common features, such as nominal annual membership fees ($80 in D.C., $65 in Denver) and the option of paying a small fee for a 24-hour period; there is also an additional usage fee that rises sharply because the goal of the program is to encourage short rides that would be too far to walk but are too close to drive (L. Kaiser 2010). (One aim of the D.C. bike-share program is to expand access to the region's mass-transit system by making it accessible to people in a wider geographic area through strategically placed bike kiosks.)

To encourage walking, many cities are revisiting the idea of pedestrian malls, a concept that was widely disparaged in the 1980s and 1990s. Between 2008 and 2010, New York City's Department of Transportation temporarily created nine pedestrian plazas in four of the city's five boroughs; they were so successful that the city is installing more permanent barriers to cars in several locations, including Times Square and Herald Square (Baker 2010). Seattle and San Francisco are also experimenting with pedestrian-only zones, which can alleviate air and noise pollution and mitigate heat-island effects. In addition to reserving pedestrian-only streets, San Francisco has been converting parking spaces into pocket parks by installing temporary wooden platforms. Likewise, Seattle is converting some of its urban alleys into walkways.

A second area where cities have been extremely active is tree planting. Augmenting green space in cities is a key strategy for combating the heat-island effect: trees lower temperatures by directly shading surfaces and by absorbing radiation; as a result, vegetated spaces can be measurably cooler than their surroundings. Trees also mitigate urban air pollution, filter stormwater, and absorb CO_2. Nearly every major city has declared its intention to plant one million new trees—or some other symbolic number. Million Trees LA, for example, is working with federal and state agencies to prepare a science-based tree-canopy analysis. Public-private partnerships are responsible for planting the trees, with particular attention to under-served communities. MillionTreesNYC keeps a running tally of the number of trees planted on its website (www.milliontreesnyc.org).

A third area that most cities are working on is energy efficiency—in part because the EECBG has provided an infusion of cash, but also because of the recent focus on climate change and the prospect of saving money. Within this area, cities can choose from an array of programs, including municipal building and street-lighting retrofits, voluntary residential and/or commercial audit and direct-install programs, and city energy-conservation ordinances (see Table 3). According to the sustainability directors in the USDN, among cities' most tangible accomplishments in 2009 was performing energy-efficiency retrofits in government buildings. But a growing number of cities are pursuing energy efficiency in commercial and residential buildings as well. San Francisco Mayor Gavin Newsom recently proposed a bill that would require large commercial buildings to publicly display whether they meet energy-efficiency standards. Buildings would have to have audits every five years, along with annual updates on upgrades made, and the information would be available on a public database. Several California cities have similar policies, as does Boulder, Colorado. Denver has taken an even

more direct approach: in October 2008, it began a door-to-door outreach program; workers have since canvassed more than 10,000 households, fully weatherized more than 300, and referred another 700 to the city's energy-assistance program.

Table 3. City Energy-Efficiency Programs

Type of Mechanism	Programs
Municipal Programs	Building Retrofits
	Street Lighting Upgrades
	Employee Behavior Modification
Voluntary Programs	Rebates
	Audits and Direct Install
	Loans and Financial Assistance
	Competitions/Challenges
	Education and Information
	CFL Giveaway
City Ordinances	Energy-Conservation Ordinances (Residential or Commercial)
	Energy-Disclosure Ordinances

By contrast, relatively few cities have zero-waste policies or initiatives that aim to promote locally grown food—although two-thirds of the sustainability directors surveyed by the USDN say that promoting locally grown food is a priority, and nearly half express interest in working on zero-waste policies (see Table 2). San Francisco has led the way on waste reduction with a host of zero-waste initiatives to enable it to meet its goal of 100 percent diversion of waste from landfills by 2020. Some cities are experimenting with waste-to-energy technologies: for instance, Boston is investigating the possibility of siting a biogas digester that can convert rotting organic waste into methane-based biogas; Oakland and Los Angeles have already begun pilot projects to collect food waste and deliver them to bioreactors. In 2008, the San Antonio Water system contracted with the energy company Ameresco for 900,000 cubic feet o methane-based natural gas per day from the city's sewage-treatment facility (Flisram 2010). Cities are also reducing their construction waste, which constitutes more than one-quarter of the waste stream by weight. Philadelphia and Detroit, for example, are working with local nonprofits and technical colleges to dismantle houses and recycle their components, rather than simply demolishing them. In doing so, they are averting the requirement for enormous amounts of landfill space: the debris from the more than 4,100 homes demolished in the Detroit metro area in 2008 would have taken up 290,000 cubic yards of landfill space (Flisram 2010).

Also growing in popularity are composting programs: a survey by *BioCycle* magazine in 2009 found that more than ninety communities nationwide offer some sort of food-waste collection service, more than double the number involved in such initiatives a year earlier (Pittman 2010). San Francisco has led the way in this regard as well. It launched a mandatory curbside compost pickup program in

2000, and the program has become more popular over time: in 2009, the city's contractor, Recology, collected up to 400 tons per day; by the spring of 2010 it was collecting up to 525 tons per day. Portland Metro, which struggled for almost a decade to implement composting, has finally managed to get its program—Fork it Over!—running smoothly; it now sends 5,000 tons of food each year to local food banks and another 8,000 tons to composting facilities (Pittman 2010).

Historically, food has been primarily the province of nonprofits, with cities playing a minimal, supporting role. But in 2008, the Seattle City Council passed the Local Food Action Initiative, which aims to support a citywide effort to cultivate fresh food. The city has taken several steps to implement its action plan, from opening a downtown farmers market to passing a resolution that supports a transfer-of-development-rights program to support King County farmland; the city also repealed a Department of Transportation regulation that required residents to obtain a permit before converting a planting strip in front of their house into a garden plot (Knudsen 2009). In July 2009, San Francisco also began promoting local food by issuing the city's first comprehensive food policy. The plan, based on the recommendations of a committee that included urban and rural representatives, seeks to give all of the city's residents access to food produced in the Northern California region. Among the elements of the plan are efforts to promote farmers markets by centralizing information about fees and rules, updating the Administrative Code, creating a public directory of city agencies and fee schedules for establishing a new farmers market, and establishing an annual meeting of farmers-market managers. The city will also encourage urban agriculture by addressing two main barriers: access to land and educational and technical support. The city is conducting a land audit to identify potential city-owned plots; it is also augmenting and coordinating the educational and technical-support efforts of the city's many food-related nonprofits.

Perhaps the most audacious recent action by a city was Salt Lake City's decision to overhaul its land-use regime in one fell swoop. Drawing on the Sustainable Community Development code devised by Chris Duerksen and his colleagues at the Rocky Mountain Land Use Institute, Mayor Ralph Becker spent two years refining thirty to forty policy changes that, taken together, dramatically change the city's approach to land-use planning. Many of the reforms involve removing unnecessary or counterproductive restrictions and cleaning up confusing codes; other seek to promote recycling and transit use (Jensen 2010). Among the particular revisions are: lifting restrictions on granny flats to facilitate multi-generational housing, allowing for non-profit community gardens, instituting a new water-conserving landscape ordinance, requiring permeable concrete along main boulevards, and enhancing recycling to reduce landfill deposits 50 percent by 2015. Whether the city council will embrace the changes remains to be seen. But Mayor Becker has formed focus groups and is meeting with community councils in hopes of building support for the reforms.

How Do Cities Learn From One Another

Currently, city officials make ad hoc decisions about which programs to adopt and how to design them, or are driven by political mandates such as a climate-change, clean-energy, or zero-waste goal set by the mayor. They tend to be opportunistic, building on what they have already done successfully in hopes of keeping the momentum going (Tregoning 2010). With limited time and resources for research, when embarking on new programs planners look to online sources and colleagues in other cities for information about what has worked. Most planners prefer informal contacts and networking; they like one-on-one interactions in which they can learn from officials in other cities and hear about the motivation behind programmatic decisions (Gray 2010; Strommen 2010). Colleagues can also help provide information to justify a decision; for example, when Washington, D.C. was considering eliminating parking minimums, the planning director solicited letters from parking directors elsewhere that described the impact on their city of such a measure—letters that helped convince the zoning commission to support the move (Tregoning 2010). As organized networks and regional cooperation grow, city officials have more and more contact with their counterparts in other cities, to the point where some cities are now overwhelmed with requests for information. Ann Arbor, for example, receives so many requests for information on its LED street-lighting program that the city's Environmental Coordinator wrote a white paper to respond to frequently asked questions (Naud 2010).

Planners also rely on case studies and best practices, many of them published online or disseminated through established networks. Although valuable for inspiration, case studies typically fail to give planners the details they need to determine whether another city's program would work for them. They also tend to downplay obstacles. And since they are sprinkled throughout the literature or presented at conferences, they can be hard to find; some of the planners we interviewed appealed for greater coordination, expressing the desire for a central website to house information on cities' sustainability programs (Naud 2010; Prest 2010).

A small but growing cadre of organizations have sought to meet the needs of planners for both peer advice and case studies. The oldest and most established is ICLEI-Local Governments for Sustainability (ICLEI). Created in 1990, ICLEI counts more than 600 U.S. cities, towns, and counties (and hundreds more local governments around the world) among its members. ICLEI USA was launched in 1995 to promote climate-change mitigation and adaptation and sustainable development among cities in the U.S. In addition to providing members with planning tools, ICLEI is working on its STAR Community Development Index, which aims to build a consensus around frameworks for evaluation that will facilitate comparison among programs and learning from others. ICLEI also holds an annual "local action summit," at which members can share their experiences. A host of other organizations and forums have sprung up in recent years, including the following:

- Launched in 2009, the Urban Sustainability Directors Network (USDN) seeks to help city leaders learn from each other and accelerate the adoption of city sustainability initiatives. With 71 core and 21 associate members, the USDN seeks to provide a confidential space where practitioners can engage with peers without political pressure or media attention (Parzen 2010). (In the public realm, there is enormous pressure to publicize successes and avoid discussion of challenges and obstacles.)

- The Lincoln Institute for Land Policy has long funded research, sponsored the development of planning tools, and hosted workshops for planners. For the past decade, with the backing of the American Planning Association and Harvard's Graduate School of Design, Lincoln has convened thirty big-city planners annually on a variety of sustainability topics, from smart growth to water and energy management to the future of metropolitan regions. In addition to its formal sessions, the Big City Planning Directors Institute provides informal opportunities for members to share their experiences.

- The Home Depot Foundation's Sustainable Cities Institute has constructed an online toolbox that seeks to provide information and guidance to planners and other sustainability officials. In 2010, the foundation launched a city program, in which a panel of experts will serve as a resource to help cities develop and implement sustainable community-development plans.

- The U.S. Conference of Mayors provides a vehicle for political officials to discuss priorities and ongoing challenges. The organization produces a booklet with brief descriptions of some "best practices"—innovative programs that aim to reduce a city's greenhouse-gas emissions.

- Living Cities, formed in the early 1990s, is a consortium of funders who aim to promote more vital and sustainable urban development. Living Cities focuses on improving the lives of low-income urban residents, so its sustainability agenda emphasizes equitable environmental practices.

- The annual meeting of the American Planning Association (APA) regularly includes panels that focus on urban sustainability, as well as its component elements. There, planning scholars and practitioners can interact to generate new insights about sustainability.

- The International City/County Management Association (ICMA) advances professional government worldwide. Among its priorities is promoting sustainable communities; like ICLEI, it serves as a research, outreach, and technical assistance hub for local governments engaged in sustainability programs.

- The Architects Institute of America (AIA) began its Sustainable Design Assessment Team (SDAT) program in 2005. AIA assembles a team of experts to develop recommendations for a community after it has submitted an application that describes its economic, environmental, and social-equity challenges.

- Finally, a variety of organizations focus on individual program areas. For instance, the Alliance for Biking & Walking synthesizes data from various sources on the prevalence and efficacy of programs that foster biking and walking (Steele & Altmaier 2010).

Designing an Evaluation to Facilitate Learning

There is no shortage of design principles—minimize car use, create abundant green spaces, reduce energy consumption, generate zero waste—related to making a city more environmentally sustainable (Beatley 2000; Farr 2008; Kenworthy 2006; Kenworthy & Newman 1999; Newman & Jennings 2008; Register 2006; White 2002). There are also a growing number of opportunities for sustainability planners to network with colleagues from other cities—although those forums are often aimed at a high level and so may not reach programmatic officials. But officials still need systematic information on the effectiveness of different programs and, as important, the reasons for variation in programs' effectiveness. The aim of this project is not to develop a prescriptive menu of programs that each city should adopt; cities are too heterogeneous for that. Rather, city officials typically want two kinds of advice. First, in any given program area, what kinds of programs make sense in what combination? And second, how should those programs be designed and implemented?

Therefore, the USA project is proceeding at two levels. At the first level, for each program area (e.g., energy efficiency, transportation, food, or waste) we match cities on a host of analytically relevant dimensions—such as size, region, fiscal capacity, population density, and wealth—and ask them about which programs they have adopted and why. The aim of this part is to develop insights that might help a city official think about its own choice of programs. At the second level, we assemble a diverse set of cities that have adopted a particular program (such as household energy efficiency, bike share, urban agriculture zoning, or composting) and collect information, through in-depth interviews and document review, about (1) the design of the city's program; (2) the political and social factors that may have affected implementation; (3) how program officials overcame design, political, or social obstacles (if they did), or why those obstacles rendered the program inoperable; and (4) to the extent possible, the program's actual operation (e.g., its outputs). The aim of the second level of analysis is to generate/construct a logic model that can help city officials think through the advantages and pitfalls associated with different approaches.

Attributes of Cities

A small number of attributes render comparisons among cities challenging, and which attributes matter most depends on the type of program. Evaluators will begin with hypotheses about which city attributes are relevant considerations for a given program and group cities to facilitate appropriate comparisons.

Observers routinely assume that a city's *political culture* make some programs and approaches more or less viable. In particular, a city's environmental ethic is thought to be of paramount importance in determining whether or not it can adopt aggressive sustainability measures; according to some, this is why San Francisco, Seattle, Portland, Austin, Boulder, and Minneapolis so often take the lead in adopting sustainability policies.[9] Other harder-to-measure attributes of a city's political culture—such as its propensity to accept or resist rules—may influence the form of a city's programs.[10] Thus, in Fort Worth, environmental programs generally take the form of incentives or education rather than mandates, in deference to a larger debate within the city about the role of the city government (Gray 2010). At the same time, as D.C. Planning Director Harriet Tregoning points out that effective programs can change norms in a city. So a city's culture may have more impact on the rationale for a program than on the city's ability to adopt it.

A city's *climate and geography* may affect the kind of energy programs that make sense: whereas Boston has access to ample wind resources, Tucson is more likely to rely heavily on solar.[11] San Francisco, located in the middle of the country's most productive agricultural land, may be better situated to enact regional food policies than, say, Dallas. The city of Austin regards its climate as a limitation on how much it can mimic the practices of Portland, Seattle, San Francisco, and other sustainability leaders located in more temperate areas (Matthews 2010). Climate and geography may matter less than people assume for some kinds of programs. Minneapolis is a leader in bicycle programs, despite its snowy winters; its bike-share program simply removes stations during the winter months. (Montreal, which is both hilly and snowy, also has a very successful bike-share program.)

The *Income/education of a city's population*—as measured by Census data on socioeconomic status and/or the proportion of businesses that are professional and scientific, education, managerial, health, and social services—may also influence its receptivity to sustainability programming (Lubell, Feiock, & Handy 2009). A related variable, a city's *fiscal capacity*, is also likely to matter: thriving cities, which typically have more productive revenue sources, have greater flexibility than declining or stagnant cities. (Cities rely on a combination of transfer

[9] Census data on the percent of voters in the city who are registered as Democrats is (unfortunately) a reasonable proxy for its environmentalism in the U.S.

[10] We will glean these attributes from interviews and secondary sources.

[11] We will glean information on climate and geography from the National Atmospheric and Oceanic Administration (NOAA) and the U.S. Geological Survey (USGS).

payments from state government and local income, sales, and/or property taxes. They also can impose fees for services, such as parking, garbage collection, and car ownership.) Gil Kelley, former Director of the Portland Bureau of Planning, cautions against assuming that fiscal capacity or socioeconomic status are determinative, however. He notes that when Portland's transformation began, in the late 1960s and early 1970s, the city was not wealthy, nor did it host a single high-profile university.

Differences in *size, population density*, and *existing urban layout* matter a great deal when cities are trying to assemble a mass-transit plan. A subway system makes sense in densely populated New York City; by contrast, light-rail or bus-rapid transit systems make more sense in the spread-out cities of the West. Austin, which is a sustainability leader in many areas, has had difficulty developing a viable public-transit system because of the city's layout and relatively low density, coupled with its hot climate (Matthews 2010). Density and urban layout also shape cities' ability to undertake green-infrastructure retrofits, zone for urban agriculture, or find sites for composting or waste-to-energy facilities.

Finally, idiosyncratic factors affect particular program areas; for example, whether or not a city owns its own water or energy utility strongly influences its ability to promote energy- or water-conservation policies.

Policy Design

A program's effectiveness is partly a function of its design. In assembling a program, cities have at their disposal a host of policy tools, each of which embeds a theory of action. These mechanisms, which are often used in combination, may be more or less well designed to bring about the desired outcome. As Deborah Stone (1988/2002) makes clear, ultimately the effectiveness of a policy tool depends on a skillful assessment of the concerns and perceptions of both the implementing entity and the target(s).

One straightforward approach a city can take is *direct government action*. A city can simply implement a program itself, as many do with their tree-planting initiatives; it can hire contractors, as is typically done with recycling; it can establish or capitalize on a city-owned enterprise. One powerful instance of a city moving sustainability forward by taking direct action is Austin's Pecan Street Project. In an effort to create an entirely different business model for energy delivery, the city's utility, Austin Energy—working with the University of Texas, the Environmental Defense Fund, and the Austin Chamber of Commerce—is seeking 1,000 residential and seventy-five commercial volunteers to try out a range of clean-energy and water-conservation pilot programs (Behr 2010). Another city-run program, one that explicitly incorporates equity and environmental considerations, is Boston's $63-million project to renovate 4,300 apartments in thirteen Boston Housing Authority developments to save electricity and water—the largest energy- and water-use efficiency overhaul of public housing in the nation's history (Ryan 2010). (Chicago has recently completed a $43-million project to modernize its public-housing units.)

Alternatively, a municipal government can use its investment or procurement powers. For example, a city can mandate that all food procurement by public entities rely on local vendors. Green-procurement programs, which are on the rise, date back to Massachusetts' decision in the 1980s to buy products with recycled content (Worrel & Nijaki 2010). The city of Pittsburgh has since committed to buying products and services that reduce toxicity, include a large percentage of post-consumer content, and conserve natural resources. Santa Monica's sustainable-procurement program, instituted in 1994, focuses on reducing toxic chemicals, decreasing fleet emissions, and buying recycled products.

When a city's goal is to change the behavior of targets, either businesses or residents, it may employ mechanisms that range from more coercive to less so, more expensive to less so, and more flexible to less so. Among the most direct, least flexible, and least costly (for the city) mechanisms are *rules*, in the form of ordinances, such as "take back" laws for products, plastic-bag bans, energy-conservation building codes, or environmentally friendly zoning. To be effective, rules must be perceived as legitimate; if not clearly communicated and widely enforced, they are likely to be widely flouted. In 2009, for example, New York City instituted a rule prohibiting retail establishments that are running air conditioning to prop their doors open on hot days. After their first warning, stores are fined $200 for a second infraction, and up to $400 for additional citations. By July 2010, the city had fined nine stores and issued twenty-six warnings, and compliance was on the rise (Boryga 2010). Washington, D.C. has one of the nation's most stringent green-building codes. To mitigate resistance, the city devised the code in collaboration with developers; it also began with municipal buildings and phased in private development, so the public sector absorbed the high initial costs of finding appropriate materials and training laborers to with them (Tregoning 2010).

More flexible, less coercive, but relatively expensive (for the city) are *financial incentives*, such as pricing, taxes/charges, tax incentives/subsidies, grants/loans, rebates/rewards, surety bonds, or vouchers. For instance, New York City has instituted a tax-abatement scheme to promote solar panels on rooftops. Philadelphia, Chicago, and Washington, D.C. all offer financial incentives for building owners to install green roofs on existing buildings. Portland's Clean Energy Works program provides long-term loans to homeowners for residential weatherization. Interest rates are lower for more ambitious weatherization projects, and the city has teamed up with local utilities so loans are repaid through electric-bill savings.

The very least coercive (but also typically least effective) mechanisms cities can deploy are *voluntary instruments*, including information/persuasion, cooperation with nongovernmental organizations, and technical assistance. For example, in August 2010, San Francisco unveiled SFApproved.org, a website that residents can use to research more than 1,000 environmentally friendly products, from cleaners and light bulbs to antifreeze and garden hoses. San Francisco also

ran a Power Savers program from 2002 to 2003 to help small business owners update their lighting, saving over 20 million kWh for participating businesses. Some cities have used competitions to spur energy-efficiency projects. Boulder, for example, collaborated with two companies to develop the "10 for Change" challenge, a program to encourage businesses to reduce their energy use by 10 percent. According to the city's website, the 55 participating businesses have reduced their energy use by well over one million kWh.

Nearly every program a city undertakes encounters funding problems, so integrating clever *financing mechanisms* can be critical to its longevity and effectiveness. Because of its innovative financing model, Berkeley's FIRST program is being closely watched: in 2008, the Berkeley City Council adopted this program to give city-backed loans to property owners who install rooftop solar-power systems. The loans are paid off as part of an owner's property-tax bills—the first time a special-tax district has been created to help retrofit homes and businesses for alternative energy. In Austin, Texas, habitat conservation relied on development fees until planners came up with the idea of tax-increment financing. Using this mechanism, Travis County can collect the increment in taxes on land whose value has increased once a habitat conservation plan is in place. (A habitat conservation plan makes some formerly off-limits land available for development.) Unfortunately, sustainability programs often rely on revenues from environmentally damaging activities: the revenues from Washington, D.C.'s five-cent plastic-bag tax go toward cleaning up the Anacostia River; because plastic-bag use has decreased seven-fold in the city since the tax was instituted, however, the revenue-raising potential of the tax is limited (Figueroa 2010).

Designing a program that will change business purchases or practices can be tricky. New York City Mayor Michael Bloomberg's 2007 mandate that all taxis put into service starting in October 2009 had to get at least 30 miles per gallon immediately encountered problems: in response to an appeal from taxi drivers, a federal judge blocked the rule. The city responded with a set of financial incentives for fleet owners to purchase hybrid cars: in March 2009, the city allowed fleet owners to raise their lease rates to drivers by $3 per shift for hybrids and other high-mileage vehicles, but forced them to drop their rates to $12 per shift for the ubiquitous Crown Victorias, which get twelve to fourteen miles per gallon. The board of trade promptly sued, arguing that the $15 differential was a *de facto* mandate, which is preempted by the federal Energy Policy and Conservation Act and the Clean Air Act. The board of trade prevailed, and the Second Circuit Court of Appeals upheld the ruling (A. Newman 2010).

Bloomberg's e-waste recycling program was also held up in court: the program required manufacturers to collect and recycle electronic goods sold in the city and was slated to begin in June 2009. But the Consumer Electronics Industry and the Information Technology Industry Council argued the city had overstepped its authority by trying to regulate commerce beyond its borders (Gronewald 2010a). Although other cities and states have take-back laws, producers said New York's rule was problematic because it included no cost-sharing for retailers, consumers,

or government. (Denver, by contrast, works with Best Buy to offer an e-cycle coupon program that allows consumers to drop off electronics at a reduced rate at several locations around the city.)

Figuring out how to design a program that will prompt individuals and households to make resource-conserving investments can be even trickier than trying to change the practices of business, even in environmentally oriented cities. For instance, in Boulder, Colorado, a program of financial incentives combined with intense publicity campaigns was not enough to spur most homeowners to weatherize their homes (Simon 2010).[12] Since 2006, Boulder has subsidized about 750 home energy audits. The audits still cost homeowners about $200, so only the most committed sign up. Nevertheless, follow-up surveys found that half of those who had audits did not implement even the simplest recommendations, despite incentives, such as discounts on energy-efficient bulbs and rebates for attic insulation.[13] The obstacle is *not* that residents don't believe that climate change is a problem, or that energy conservation is not important. Rather, officials suspect that either the expense or sheer inertia are to blame. So, in an effort to bring about more widespread change, Boulder is using $370,000 in federal stimulus money to hire contractors who will do basic upgrades for free: as many as fifteen energy-efficiency teams will go door-to-door and offer to caulk windows, change lightbulbs, and install low-flow showerheads and programmable thermostats.

Crafting a rule that will get residents to change their behavior can be particularly challenging. A 2009 ordinance passed by the city of Los Angeles that limited lawn and garden watering with sprinklers to two days per week reduced water consumption by 20 percent. But a year later, the city was considering a change in the ordinance after several high-profile water-main breaks.[14] To ease the stress on the water infrastructure, the L.A. Department of Water and Power (DWP) proposed spreading out the lawn-watering days, with half the city watering on Monday and Thursday and the other half watering on Tuesday and Friday. The City Council countered with a proposal to allow each half of the city three days of watering per week, while shortening the watering time permitted from thirty minutes to twenty-four. Critics pointed out, however, that the proposal would only save water if people complied with the timing requirement, which was highly

---

[12] Boulder, a city of 100,000, is considered one of the nation's most environmentally oriented. It was one of the first cities to levy a tax with proceeds to be used to protect open space. Residents bike to work at twenty times the national average. In 2006, Boulder approved the nation's first carbon tax, now $21 per year per household; the revenues fund energy-conservation programs. Yet Boulder's carbon emissions fell less than 1 percent from 2006 to 2008; by the end of 2008, the city's emissions were 27 percent higher than 1990 levels—a worse showing than the U.S. as a whole, where emissions rose 15 percent during that period (Simon 2010).

[13] About seventy-five businesses also got free audits; they made so few changes that they collectively saved just one-fifth the energy auditors estimated they were wasting.

[14] Opponents of the new lawn-water regime argued that the fluctuations in water pressure stressed the system and caused the breaks, although the Department of Water and Power's own records showed the break were part of a normal pattern.

unlikely. By contrast, says Emily Green (2010), the original proposal was "perfectly tailored to the collective honor system. With such a narrow window for water, violators were conspicuous."

Political Factors

Political factors may also impede or enhance a program's effectiveness. Implementation scholars have long warned of the pitfalls of ignoring the impact of political variables on programs' ability to achieve their stated goals (Mazmanian & Sabatier 1989; Werner 2004). As Jeffrey Pressman & Aaron Wildavsky (1979) observed decades ago, even well-designed programs can fail during implementation: every policy involves a series of decisions, most of them mundane; the more transactions that must occur for a program to work, the greater the likelihood that it will get stuck at some point along the way. Michael Lipsky (1980) illuminated the many ways that those responsible from carrying out a policy may alter the goals established by legislators and top-level administrators. Although much implementation research focuses on state or federal policies, many of its insights are relevant in a municipal setting.

For programs that aim to change the behavior or priorities of city employees, such as tree-planting or municipal energy-efficiency programs, the political challenges may include a lack of political or administrative leadership or conflict with existing organizational or professional norms. *Political leadership* is often critical to getting a new program off the ground. Mayor Greg Nickels of Seattle was particularly credible and persuasive in promoting that city's extensive light-rail system because of his longstanding leadership in sustainable transportation and land use (Nickels 2010). Philadelphia Mayor Michael Nutter's commitment was one of the catalysts for Philadelphia's new $1.6-billion green stormwater infrastructure plan (Madden 2010). By the same token, a lack of political leadership can result in the failure to address a critical issue. For example, Mayor Daley—who has made sustainability a cornerstone of his governance strategy—has declined to challenge two coal-producing power plants that operate within Chicago's city limits and contribute to the city's worst-in-the-nation rating among metropolitan areas for nitrogen-oxide pollution (Guarino 2010b). Moreover, a shift in political leadership can jeopardize a program if planners have not anticipated ways to insulate it or made a succession plan (Tregonin 2010). For example, in Baltimore, each new mayor has tweaked the city's sustainability plan in hopes of putting his or her own mark on it (Strommen 2010).

Administrative leadership is often overlooked but can be essential to a program's success. Barry Rabe (2004) has written eloquently about the importance of bureaucratic policy entrepreneurs in forging state-level climate-change policies; similarly, planners and policy directors at the municipal-level play a central role in determining whether a program is adopted, what form it takes, the resources allocated to it, and the extent to which it garners political support.

A sustainability initiative's mandate may fall short of expectations if it conflicts with the *organizational or professional culture* of the department that must

implement it. An investigation of barriers to green-stormwater infrastructure (GSI) revealed that concerns about liability, uncertainty about the technology's effectiveness, and aversion to change impeded the implementation of GSI in Portland, Seattle, and Minneapolis. The engineers and designers who sign off on plans for managing stormwater are culpable for their performance; "they don't really get excited about going out on a limb and trying something new," said one official. "They want to know what they are backing is tested, vetted, and is going to work" (quoted in Hammitt 2010). Alternatively, agency staff may simply lack adequate expertise or training to implement a sustainability program. Older and younger engineers may have very different capabilities in terms of incorporating GSI into stormwater-management plans; new models pose a particular challenge for "seasoned" engineers. A similar problem has arisen when cities have tried to adopt green-procurement policies but have found that staff are unable to discern genuinely green products.

For programs aimed at changing residents' behavior, many scholars contend that a process that aims to engage citizens in developing and implementing the program—serious *public engagement*, often through a collaborative or other type of participatory process—is essential to ensuring implementation (Healey 1993; Innes & Booher 1999; Susskind & Cruikshank 1987; Wondollek & Yaffee 2000). Proponents argue that when stakholders participate in formulating a program, they "own" it and so are more likely to ensure it is implemented; citizens' local knowledge can also help ensure the program is designed in ways that make it more likely to work. So, for example, local neighborhood groups have been critical to the success of an urban stream restoration program in Portland, Oregon, because they fill in the gaps between what public institutions can provide and what the community needs (Shandas & Messer 2008). Conversely, the argument goes, a sustainability program can be weakened by a lack of well-managed public engagement. Urban tree planting can fail because residents do not water new trees or vandalize them. In addition, arborists may encounter resistance to planting a diverse mix of trees, rather than a monoculture that looks "neater" but is far more susceptible to disease. Arborists, who know the benefits of diversity, must be able to hear residents' concerns and communicate the importance of diversity to residents. Minneapolis has developed a program that offers residents a choice of species when a local tree is cut down, so the neighborhood ends up with a greater variety of trees (Mazullo 2010).

Relatedly, *partnerships with nonprofits and universities* in the design and implementation of a program may enhance its prospects (Portney & Cuttler 2010). Nonprofits can not only bring expertise and mobilize support for a program, they can also facilitate the implementation process by taking on some tasks for which they are particularly well suited. In the realm of food, for example, the non-profit network is well-established in many cities and is a crucial resource for municipal officials trying to intervene to promote local food. New York City is trying to boost solar-power generation in the city by converting tens of thousands of square feet of empty rooftop space in Brooklyn, Queens, and Staten Island into a photovoltaic

power plant. The neighborhoods were chosen through a solar-mapping initiative led by Hunter College of the City University of New York (CUNY), and the program is being run in partnership with CUNY, the New York State Energy Research and Development Authority, and Consolidated Edison, the city utility (Gronewold 2010c). Similarly, planners contend that successful pedestrian plazas feature a partnership with a local nonprofit or business-improvement district, which can share the management and maintenance and ensure that the areas respect the local context. On the other hand, as many cities discovered during the recent recession, public-private partnerships can go sour, leaving cities with responsibility but no capital (McElroy 2009).

By the same token, a *mobilized and well-funded opposit*ion can thwart sustainability initiatives. Business opposition can be particularly devastating if the affected businesses are mobile and can threaten to leave the city. Moreover, business leaders have ready access to city officials, who worry about maintaining the city's economic vitality. Even businesses that can't threaten to leave—such as building owners or taxi drivers—have leverage: they can form coalitions and publicize their grievances; they can also sue. For example, in early December 2009, New York Mayor Michael Bloomberg dropped his plan to call for owners of buildings of 50,000 square feet or more to undergo energy audits and then pay for many of the changes identified—the most far-reaching initiative of his plan for reducing the city's greenhouse-gas emissions—after fierce opposition from building owners.[15] The mayor responded by retaining the audit requirement but make any changes voluntary. The main issue was cost: the legislation would have required about $2.5 billion in building improvements, and the city only had $16 million of federal stimulus money available for loans; moreover, under some leases owners would not be able to pass the costs of the improvements along to tenants, who would benefit from lower energy bills (Navarro 2009). Critics took the mayor to task for trying to institute the program during a recession; Steven Spinola, president of the Real Estate Board of New York, added that owners doubted the financial benefits to be gained from investing in retrofits.

Cities' efforts to staunch the tide of plastic bags also illustrate the challenge of instituting rules over the opposition of organized business interests. San Francisco was the first U.S. city to ban plastic shopping bags, about 90 billion of which are distributed each year nationwide. Other California cities soon began to devise their own programs aimed at curbing plastic-bag use. But the plastics and grocery industries quickly mobilized to stop plastic-bag bans. The Save the Plastic Bag Coalition formed to dispel the "myths" about the harms associated with plastic bags; they posted studies purporting to show that producing and distributing paper bags release three times the greenhouse gases of plastic bags (Saillant 2010). In Oakland, the Coalition to Support Plastic Bag Recycling (an industry group) argued

[15] The mayor's concept was critical because although many cities are now requiring that new buildings meet LEED standards, existing buildings make up much of the stock, particularly in the nation's older cities.

that the city's ban was illegal because it had not studied the environmental impact of increased paper-bag use. A judge agreed and overturned the ban (Chartrand 2010). Similarly, a judge in Manhattan Beach overturned that city's 2008 ordinance banning plastic bags because the city did not do an environmental-impact study. Hoping to avoid a lawsuit, San Jose decided to conduct a comprehensive life-cycle review of both kinds of bags.[16] (All of these initiatives may be preempted if the state of California follows through on its plan to enact plastic-bag restrictions—a move that is motivated partly by businesses seeking to avoid a patchwork of local rules.)

Less widely commented on, but often important, is an *effective public rationale* for the program. A compelling public rationale—one that is not always environmental—is seen as necessary to combat low public interest, which—according to Edward Jepson (2004), is a major stumbling block for many sustainability initiatives. For example, energy-efficiency programs are touted as providing "green jobs," a rationale that helps build support by bringing labor unions and progressives into the mix. Mayor Bloomberg promoted the mandatory-retrofit program as part of a package of measures that would not just reduce emissions but also would create 17,000 jobs. Tom Leppert, the current mayor of Dallas, included greening the city as part of his election platform, and he has capitalized on the new LEED-certified convention center to attract hospitality business (Sweckard 2010). An economic-development rationale can also help sell sustainability in cities that would ordinarily be hostile. For instance, in Fort Worth, sustainability efforts are driven by economic concerns and the desire to attract new and growing businesses (Gray 2010). Ethan Kent, president of the Project for Public Spaces, suggests that contemporary pedestrian plazas are successful because they are justified as being about loving the city, whereas previous efforts were antiurban (Baker 2010). (Equally plausible is that cities themselves are simply more popular now than they were in the 1970s, when many pedestrian plazas failed.)

The existence of a *state mandate or incentive* may also facilitate or obstruct a city program. State renewable energy standards (RESs) provide cities with leverage over utilities that might otherwise resist incorporating alternative-energy sources. California's statewide green-building code, CalGreen, mandates water-use reductions, construction-waste recycling, the use of low-pollutant paints, carpets, and floors, and inspections of HVAC systems to make sure they are working efficiently. The state mandate will prompt an increase in the number of green-building professionals, making it easier for cities to impose their own requirements

[16] U.S. cities were inspired by Ireland's successful program to cut plastic-bag use. In 2002, Ireland imposed a 33-cent tax on plastic bags and simultaneously ran a public-awareness campaign. Within weeks of the program's inception, plastic-bag use dropped 94 percent (Rosenthal 2008). (The Irish government eventually had to raise the tax after consumption started to rise slightly—a common effect.) There were no plastic-bag makers in Ireland, and grocers were accustomed to collecting a sales tax, so little resistance developed. Washington, D.C. subsequently adopted a plastic-bag tax. In other U.S. cities, however, the opposition has managed to quash proposals to impose such a tax; in fact, San Francisco failed to institute a tax but did succeed in imposing a ban.

on new and existing buildings. The state of California is also using its climate-change law, AB 32, to force cities to modify their transportation and land-use practices. For example, in 2008, Stockton signed a pact with Attorney General Jerry Brown that committed the city to adopting smart-growth measures, stronger water-conservation measures, and green-building ordinances for commercial buildings (Sullivan 2008). States may also act as enablers: Minnesota's GreenStep Cities supports the implementation of best practices in the areas of buildings, land use, transportation, environmental management, and economic and community development. A city that implements a minimum of best practices in each category is recognized as a GreenStep city and gets technical assistance with implementation strategies (Herman 2010). Similarly, under Massachusetts' Green Communities Act, cities can get technical and financial assistance for energy-efficiency and renewable-energy programs. State mandates are not a guarantee of success. For example, the state of New York enacted a $100,000 tax credit for installing a green roof. The program has had little impact in New York City, however; two years after its passage green roofs remain rare, and most energy-conscious building owners are opting for simpler, cheaper solutions, such as painting their roofs white (Gronewold 2010b). (The city also sponsors a Cool Roof program that encourages white roofs.) What's more, states can actually impede municipal sustainability efforts; for instance, Ann Arbor is preempted by the state of Michigan from establishing its own green-building code.

Monitoring data may also prove indispensable for a program's long-term viability; conversely, an inability to demonstrate results may undermine a city's ability to maintain support for the program. Indicators projects have become central pillars of some cities' sustainability initiatives. Many cities are tracking their greenhouse-gas emissions through ICLEI. But tracing the linkage between a particular program and its outputs and outcomes is much less common. In an effort to supply information on the environmental benefits of retrofitting buildings, Deutsche Bank Americas Foundation is financing the creation of a public database of several hundred retrofitting buildings in New York City and the savings from such moves. The foundation hopes that making the data available will help convince building owners to retrofit their properties and will increase underwriters' willingness to finance those projects (Satow 2010). Although the government has subsidized programs to retrofit buildings since the 1970s, there is no national database that documents the results. Utilities across the country run Energy Star programs, but no one aggregates the results of their efforts either.

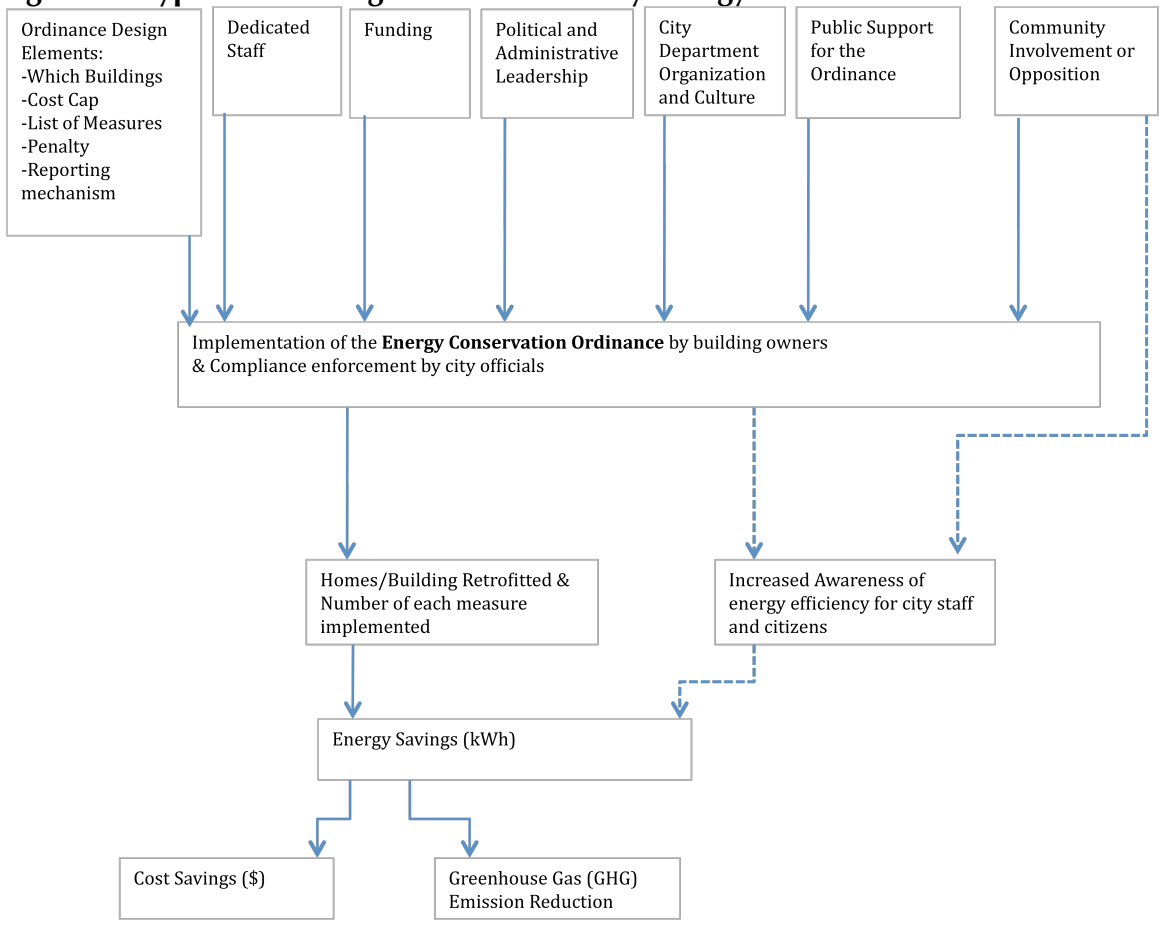
Finally, the *availability and reliability of funding* is essential to effective implementation of almost every initiative. Despite its aggressive claims to be the country's greenest city, Chicago has struggled to implement a recycling program. A blue-bag program launched in 1995 was abandoned in 2008 after it was widely criticized as ineffective in actually recycling most of the collected waste (Guarino 2010a). A new every-other-week curbside recycling program was announced, but has yet to be fully implemented because of budget constraints. (According to the Illinois Environmental Protection Agency, in 2008 the average Chicagoan produced

56 percent more trash per day by weight than the average Illinois resident [Guarino 2010a].) Portland's Gil Kelley notes that most sustainability programs rely on incremental or one-off financing, which is inherently insecure. He suggests that the more a city is willing to permanently redirect ongoing revenues and core investments in sustainability programs, the more likely those programs are to succeed.

Outputs, Outcomes, and Analysis

The evaluation of each program will begin with a hypothesized logic model and conclude with a more detailed model that has been modified based on the data collected and the analysis conducted (see Figure 2). We will include in that analysis cities that have tried and failed, not just "successful" cities. We will gauge program effectiveness (outcomes) in different ways depending on the program; rather than trying to reduce everything to a common metric, such as greenhouse-gas emissions, we instead intend to capture the multiple benefits of programs. For example, a walk/bike program has health, air-quality, and other benefits in addition to greenhouse-gas reduction benefits; a green-roof program has habitat, air-quality, stormwater, and health benefits.

Figure 2. Hypothesized Logic Model for a City Energy-Conservation Ordinance



Beyond measuring inputs and outputs, one of the main challenges will be to demonstrate the relationship between outputs and outcomes. Environmental outcomes are notoriously difficult to measure. Although a growing number are tracking their greenhouse-gas emissions, few cities are measuring their environmental conditions more comprehensively. Indicators projects attempt to solve the problem of outcome measures, but they are often symbolic and underfunded, so do not involve sophisticated data collection. Connecting a particular program's outputs to environmental outcomes is even trickier: given the number of potentially confounding variables, attributing outcomes to a single program is challenging. Given the paucity of high-quality information, this analysis will have to rely heavily on extrapolating from what is known about the environmental impact of particular practices (e.g., the environmental benefits of green roofs, changing lightbulbs, or reducing vehicle-miles traveled). To the extent possible, we will supplement such theoretical material with actual evidence of program effectiveness.

Finally, as part of the data-collection process, we are consulting with city officials to make sure the assessments are presented in an accessible way and provide information in a form that city officials can use both to choose and design programs and to make a persuasive case for those programs. Each assessment report needs to be tailored to the type of program being evaluated. Moreover, it should be adaptive; programs and practices are changing rapidly, and to the extent possible, we need to be able to adjust in real time.

Conclusions

There is a consensus within the planning literature that more evaluation of cities' performance in the realm of sustainability is needed. Such assessments pose daunting challenges, however, which may explain why they are so rarely done. The USA project aims to fill this gap in a pragmatic way, using the tools of evaluation and implementation research to generate useful information to planners. Of course, in their efforts to become more sustainable, cities face myriad obstacles beyond getting systematic information about what has worked elsewhere and why. Many are facing severe budget cuts that jeopardize programs regarded as far more central to their mission.

Despite these impediments, there are many reasons to expect that sustainability will become a core function of cities. After decades of decline, U.S. cities are revitalizing. According to the EPA (Thomas 2009), in twenty-six of the nation's fifty largest metropolitan areas, the share of residential construction taking place in central cities more than doubled between 2000 and 2007. The effect was strongest in metro areas with the strictest land-use policies, such as Portland, but even metropolitan areas known for sprawl, including Chicago and Atlanta, also saw increases in redevelopment of the urban core. With the Obama administration's Partnership for Sustainable Communities—a joint project of the EPA, Department of Transportation, and Housing and Urban Development—

reinforcing efforts to make cities more dense, compact, and livable, cities can expect to see a growing appetite for sustainability initiatives.

That said, there is always a danger of elite-driven environmentalism in the urban-sustainability movement (Lee 2006), particularly since, as Harvey Molotch (1976) argues, a city's growth machine—comprising its real-estate brokers, bankers, developers, and contractors—is likely to resist any policies that significantly curb development. Green initiatives have become a source of "branding" for cities, a way to attract and retain high-value residents—that is, residents that generate high tax revenues but few demands on services (Peterson 1981). If not carefully crafted, such initiatives can undermine the social-justice aims that are intrinsic to the concept of sustainability.

At the same time, cities' sustainability initiatives may fail to deliver genuine environmental benefits. As Dodman (2009, 199) points out: "Although well-planned, energy efficiency cities with good public transportation systems may appear to be winning the battle to reduce emissions if these are accounted for on a 'production' basis, these apparent gains will be undercut unless the consumption patterns of these cities' inhabitants—who purchase imported manufactured goods, consume energy-intensive diets and travel extensively around the world—are not changed as well." The genuine pursuit of sustainability would entail not just improving environmental quality within cities but also reducing the transfer of environmental costs to others (Rees 1997; Satterthwaite 1997). (Not surprisingly, the latter has been far less of a focus.) According to civil engineer Chris Kennedy and his colleagues (2007), the notion of a sustainable city suggests "an urban region for which the inflow of materials and energy and the disposal of wastes do not exceed the capacity of its hinterlands"—a more regionally based view.

Although changing the way a city operates cannot by itself yield sustainability, it can go some way toward reducing the level of resource consumption in the developed world—thereby making space for those in lower-income countries. Moreover, transforming cities into places where people primarily consume experiences rather than goods may facilitate a larger-than-city-scale economic transformation by providing the tangible evidence that an experience-driven life is more satisfying than one driven by a preoccupation with consumption and growth (Hess 2009). Such evidence can, in turn, provide the basis for political action on behavior of more aggressive state and federal policies, and more effective international treaties.

REFERENCES

Baker, Linda. 2010. "Walking Wins Out," *Planning*, May/June 2010.

Beatley, Timothy. 2000. *Green Urbanism: Learning from European Cities* (Washington, D.C.: Island Press).

Behr, Peter. 2010. "Austin Seeks a New Blueprint for Power Utilities," *ClimateWire*, April 7.

Boryga, Andrew. 2010. "9 Stores Fined for Propping Doors Open," *New York Times*, July 8.

Chartrand, Sabra. 2010. "Paper Bags or Plastic Bags? New Proposals Like Neither," *New York Times*, May 21, 21A.

Conroy, Maria Manta and Timothy Beatley. 2007. "Getting It Done: An Exploration of Sustainability Efforts in Practice," *Journal of Planning Practice and Research* 22,1: 25-40.

Conroy, Maria Manta and Al-Azad Iqbal. 2009. "Adoption of Sustainability Initiatives in Indiana, Kentucky, and Ohio," *Local Environment* 14,2: 109-125.

Davis, Steven J. and Ken Caldeira. 2010. "Consumption-Based Accounting of CO2 Emissions," *Proceedings of the National Academy of Sciences*, available at http://www.aetf.net.au/downloads/referencepapers/PNAS-2010-Davis-0906974107.pdf.

Dickerson, Marla. 2010. "Tokyo's Goal: Be the Greenest," *Los Angeles Times*, April 23, B1.

Dodman, David. 2009. "Blaming Cities for Climate Change? An Analysis of Urban Greenhouse Gas Emissions Inventories," *Environment and Urbanization* 21,1: 185-201.

Farr, Douglas. 2008. *Sustainable Urbanism: Urban Design With Nature* (New York: John Wiley & Sons, Inc.)

Figueroa, Alissa. 2010. "Plastic Bags: Untapped Tax Gold Mine?" *Christian Science Monitor,* July 1.

Flisram, Greg. 2010. "Favorably Disposed: Putting Waste to Good Use," *Planning*, August/September, 30-34.

Forsyth, Ann, Kevin J. Krizek, and Daniel A. Rodriguez. 2009. "Non-Motorized Travel Research and Contemporary Planning Initiatives," *Progress in Planning* 71: 170-183.

Gray, Allison. 2010. Sustainability Specialist, Planning and Development Department, Fort Worth, Texas. Personal communication, August. (Also contributing to the interview were Brian Boerner, Sam Steele, and Michah Reed.)

Green, Emily. 2010. "L.A.'s Political 'Turf' War," *Los Angeles Times*, July 27, 11.

Gronewald, Nathanial. 2010a. "Court Showdown Looms For NYC Electronics Law," *Greenwire*, January 5, 2010.

--------. 2010b. "NYC Ecologists Shrug as Much-Hyped Rooftop Plantings Fail to Take Root," *Greenwire*, May 21.

--------. 2010c. "Bid to Boost NYC Solar Focuses on 3 'Empowerment Zones,'" *Greenwire*, June 8.

Guarino, Mark. 2010a. "Mayor Daley: Chicago Shouldn't' Bear Full Cost of Asian Carp," *Christian Science Monitor*, March 6.

--------. 2010b. "Chicago: First US City to Regulate Coal Plant Air Pollution?" *Christian Science Monitor*, April 19.

Hart, John. 1992. *Saving Cities Money: Environmental Strategies That Work* (Sausalito, CA: Resources Renewal Institute).

Healey, Patsy. 1993. "Planning Through Debate: The Communicative Turn in Planning Theory," in Frank Fischer and John Forester, eds., *The Argumentative Turn in Policy Analysis and Planning* (Durham, NC: Duke University Press), 233-253.

Herman, Benjamin A. 2010. "Embracing Sustainability in Community Plans," *Planning*, April.

Hess, David J. 2009. *Localist Movements in a Global Economy: Sustainability, Justice, and Urban Development in the United States* (Cambridge: MIT Press).

Innes, Judith E. and David Booher. 1999. "Consensus Building and Copmlex, Adaptive Systems: A Framework for Evaluating Collaborative Planning," *Journal of the American Planning Association* 65,4: 412-423.

Jensen, Derek P. 2010. "Becker's Quiet Goal: Making SLC the Greenest City," *Salt Lake Tribune*, July 12.

Jepson, Edward J. 2004. "The Adoption of Sustainable Development Policies and Techniques in U.S. Cities: How Wide, How Deep, and What Role for Planners?" *Journal of Planning Education and Research* 23: 229-241.

Kaiser, Libby Sky. 2010. "Denver Launches Bike Sharing," *Planning*, July, 3.

Kelley, Gil. 2010. Former Director of the Portland Bureau of Planning, Portland, Oregon. Personal communication. August.

Kennedy, Christopher, John Cuddihy, and Joshua Engel-Yan. 2007. "The Changing Metabolism of Cities," *Journal of Industrial Ecology* 11,2: 43-59.

Kenworthy, Jeffrey R. 2006. "The Eco-City: Ten Key Transport and Planning Dimensions for Sustainable City Development," *Environment and Urbanization* 18,1: 67-85.

Kenworthy, Jeffrey R. and Peter Newman. 1999. *Sustainability and Cities: Overcoming Automobile Dependence* (Washington, D.C.: Island Press).

Knudsen, Emily. 2009. "Integrating Urban Agriculture Into Seattle's Land Use Planning," *Urban Farm Hub*, August 28. Available at www.urbanfarmhub.org/2009/08/integrating-urban-agriculture-into-seattles-land-use-planning/.

Levine, Jonathan. 2006. *Zoned Out: Regulations, Markets, and Choices in Transportation and Metropolitan Land Use* (Washington, D.C.: Resources for the Future).

Lipsky, Michael. 1980. *Street Level Bureaucracy: Dilemmas of the Individual in Public Services* (New York: Russell Sage Foundation).

Madden, Sarah. 2010. "Making Big Plans: Adopting a Green Infrastructure Approach in Philadelphia." Unpublished masters thesis, Department of Urban Studies & Planning, MIT.

Matthews, Ester. 2010. Climate Protection Program Director for Austin Energy, Austin, Texas. Personal communication, August.

Mazmanian, Daniel A. and Paul A. Sabatier. 1989. *Implementation and Public Policy* (New York: University Press of America).

Mazullo, Jill. 2010. "Diversifying the Urban Forest," *Planning*, February.

McElroy, Joseph. 2010. "When Bad Things Happen to Good Plans," *Planning*, November.

Molotch, Harvey. 1976. "The City as Growth Machine: Toward a Political Economy of Place," *The American Journal of Sociology* 82,2: 309-332.

Naud, Matt. 2010. Environmental Coordinator, Anne Arbor, Michigan. Personal communication, August.

Navarro, Mireya. 2009. "Mayor Drops Key Initiative to Cut Energy Use by Buildings," *New York Times*, December 5.

Newman, Andy. 2010. "Appeals Court Rejects Effort to Create Hybrid Taxi Fleet," *New York Times*, July 27.

Newman, Peter and Isabelle Jennings. 2008. *Cities as Sustainable Ecosystems: Principles and Practices* (Washington, D.C.: Island Press).

Nickels, Greg. 2010. Former Mayor of Seattle. Personal communication, April.

Owen, David. 2009. *Green Metropolis: Why Living Smaller, Living Closer, and Driving Less are the Keys to Sustainability* (New York: Riverhead Books).

Parzen, Julia. 2010. Coordinator, Urban Sustainability Directors Network. Personal communication, August.

Peterson, Paul. 1981. *City Limits* (Chicago: University of Chicago Press).

Pittman, Craig. 2010. "Portion Control," *Planning*, August/September, 22-24.

Portney, Kent E. and Zachary Cuttler. 2010. "The Local Nonprofit Sector and the Pursuit of Sustainability in American Cities: A Preliminary Exploration," *Local Environment* 15,4: 323-339.

Pressman, Jeffrey and Aaron Wildavsky. 1973/1984. *Implementation: How Great Expectations in Washington are Dashed in Oakland*, 3rd ed. (Berkeley: University of California Press).

Prest, Gayle. 2010. Sustainability Coordinator, Minneapolis, Minnesota. Personal communication, July.

Rabe, Barry. 2004. *Statehouse and Greenhouse: The Emerging Politics of American Climate Change Policy* (Washington, D.C.: Brookings Institution Press).

Rees, William E. 1997. "Is 'Sustainable City' and Oxymoron?" *Local Environment* 2,3: 303-310.

Rees, William and Mathis Wackernagel. 1996. "Urban Ecological Footprints: Why Cities Cannot Be Sustainable—And Why They Are a Key to Sustainability," *Environmental Impact Assessment Review* 16: 223-248.

Register, Richard. 2006. *Ecocities: Rebuilding Cities in Balance With Nature*, rev. ed. (British Columbia: New Society Publishers).

Rosenthal, Elisabeth. 2008. "Motivated by a Tax, Irish Spurn Plastic Bags," *New York Times*, February 2.

Ryan, Andrew. 2010. "A $63m Push to Retrofit Housing," *Boston Globe*, March 18.

Saillant, Catherine. 2010. "Plastic Bag Ban Slow to Catch On," *Los Angeles Times*, May 31, 1.

Satow, Julie. 2010. "Showing the Benefits of 'Green' Retrofits," *New Yorker*, June 2.

Satterthwaite, David. 1997. "Sustainable Cities or Cities That Contribute to Sustainable Development?" *Urban Studies* 34,10: 1667-1691.

Shandas, Vivek and W. Barry Messer. 2008. "Fostering Green Communities Through Civic Engagement," *Journal of the American Planning Association* 74,4: 408-418.

Simon, Stephanie. 2010. "Even Boulder Finds It Isn't Easy Going Green," *Wall Street Journal*, February 13, A1.

Steele, Kristen and Monica Altmaier. 2010. *Bicycling and Walking in the United States: 2010 Benchmarking Report* (Washington, D.C.: Alliance for Biking & Walking).

Stone, Deborah. 1988/2002. *Policy Paradox: The Art of Political Decision Making*, rev. ed (New York: W.W. Norton).

Strommen, Beth. 2010. Director of the City Office of Sustainability, Department of Planning, Baltimore, Maryland. Personal communication, August.

Sullivan, Colin. 2008. "Booming Calif. City Agrees to Growth Measures Aimed at Cutting GHGs," *Greenwire,* September 10.

Susskind, Lawrence and Jeffrey Cruikshank. 1987. *Breaking the Impasse: Consensual Approaches to Resolving Public Disputes* (New York: Basic Books).

Sweckard, Kris. 2010. Managing Director, Management Services, Office of Environmental Quality and Efficiency Team, Dallas, Texas. Personal communication, August.

Thomas, John V. 2009. "Residential Construction Trends in America's Metropolitan Regions" (Washington, D.C.: U.S. Environmental Protection Agency). Available at www.epa.gov/smartgrowth/pdf/metro_res_const_trends_09.pdf.

Tregoning, Harriet. 2010. Director, Washington, D.C. Office Planning. Personal communication, August.

Werner, Alan. 2004. *A Guide to Implementation Research* (Washington, D.C.: Urban Institute Press).

White, Rodney R. 2002. *Building the Ecological City* (New York: CRC Press).

Wondollek, Julia M. and Steven L. Yaffee. 2000. *Making Collaboration Work: Lessons From Innovation in Natural Resource Management* (Washington, D.C.: Island Press).

Worrel, Gabriela and Laurie Kaye Nijaki. 2010. "Buying Green," *Planning*, August/September, 36.