Urban Sustainability In Application
Best Case Practices

by

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## Best Case Practices

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Chapter 1. Introduction

Over the past half decade, a strong consensus has grown among American political leadership that climate disruption poses an urgent threat to the environmental and economic health of our communities. Following the establishment of the Kyoto Protocol on February 16, 2005 by 141 countries, Seattle Mayor Greg Nickels created the U.S. Conference of Mayors Climate Protection Agreement with the goal of matching the international membership level. A mere five years later, over 900 mayors representing all 50 states have signed onto the initiative committing to meet Kyoto limits on greenhouse gas emissions while pushing state and federal governments to enact policies and programs to reduce emission levels. On a local level, the agreement promotes sustainability initiatives such as the incorporation of anti-sprawl land use policies, urban forest restoration programs, and expanded transit option.

The popularity of the U.S. Conference of Mayors Climate Protection Agreement exemplifies the current paradigm shift toward the prioritization of environmental stewardship and sustainability as a central criterion in the decision-making process among not only public authorities, but private businesses and the collective consumer as well. Cities are thinking far more than in the past about how they can be organized and managed and provide services in a sustainable way. In many cases, municipalities are taking unprecedented means to do so. This shift has led to the profound rethinking of priorities and the underlying issues of how cities consume resources, dispose of waste, and facilitate activities. Additionally, this new-school mindset is a growing trend within professional fields of architecture, design, engineering and planning and this cross-section of people and professions adds a richness and depth to both the process and the ultimate product. Sustainable urbanism is becoming an embedded philosophy and dominant pattern of development for the future of American cities.

Regardless of the debate over global warming being a man-made phenomenon, a natural cycle or a combination of both, the new era of environmental stewardship it has helped spur on has resulted in the creation of innovative programs and policies for managing cities and services with multi-dimensional benefits. Behind this movement, cities are effectively reducing their environmental impact, improving their economic efficiency, and enhancing their quality of life. The application of sustainability principles in urban settings is having pervasive implications upon all city systems. Infrastructure is being created in a way that adds value beyond its primary purpose. The built environment is being designed to consume less energy and create less pollution while contributing positively to the wellbeing of its adjacent surroundings. Urban form is being transformed to promote density, facilitate transit options, and protect sensitive lands. Common assets are being managed more efficiently and effectively. Urban populations are increasingly incorporating sustainable lifestyle practices into their daily activities. Perhaps most importantly, these advances are being accomplished through cost-effective, financially feasible means. In environmental, economic and social terms, cities that want to best position themselves for long-term prosperity cannot afford to overlook the programs and policies of sustainable development.
As is often the case with a progressive movement, there are obstacles to realizing these potential benefits. In terms of political barriers, economic and industrial interests must be accounted for and political inertia must be overcome. Officials are understandably reluctant to adopt new changes and measures when there are no guarantees of their results. This will change over time with evolving measurement techniques and indicators directly detailing the quantitative economic and environmental benefits of sustainable development practices. In the future, this hard data from pilot and permanent programs will be instrumental in guiding the decision making process. In terms of public concerns, the Yale Project on Climate Change identified three primary reservations: excessive government intervention, rising energy prices, and the potential costs in terms of jobs and the economy. While these are legitimate concerns, there is mounting evidence supporting the synergism of sustainability and economic growth. A concerted effort must be made among sustainability practitioners and local leaders to address these concerns through education and the sharing of information.

The question then becomes why some communities have been capable of taking advantage of these opportunities while others lag behind. The complexity of this issue is immense with contexts ranging from political will, community values, and demographics to urban form and geographical constraints. Some city characteristics are simply more conducive for sustainability practices. Because of this complexity and distinctiveness, this question is best addressed on an individual basis. However, an alternative approach to examining sustainability and cities is to analyze best-case practices that can potentially serve as models for application in other communities, regardless of their particular characteristics. Doing so also reveals common traits of successful programs.

This paper identifies innovative programs and policies that are being implemented on a local level to address issues of sustainable urbanism. These are solutions that bridge theoretical concepts to produce illustrative, real and measurable results. These models can then in turn serve as guidelines for other communities. Showcasing how some cities are meeting the sustainability agenda will allow public decision makers in others to take better advantage of the potential benefits sustainability has to offer. Furthermore, any examination of progress made towards the realization of sustainable development adds depth to the field and presents the opportunities for future programs to build upon pioneering principles. I hope that through this analysis, cities in the formative stages of sustainable development planning will be able to apply the lessons of their counterparts and fully leverage the progress that has already been made toward making cities smarter and more sustainable.
Chapter 2. Background

“The Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their needs.”
- The Brundtland Report, 1983

The Brundtland Report’s definition of sustainable development serves as a foundation for the application of the term in various contexts and on many different levels ranging from anthropological to institutional. While a majority of these uses are similar in many aspects, such as the three pillars of environmental, economic and social sustainability, the concept in detail can be a vague notion whose meanings and implications are often disputed. Because it is often an unfocused concept, people can be misguided in their response to the term. A concrete working definition is vital to avoiding the triviality of the term sustainability.

Sustainable development is best defined by its principles. In environmental terms, this implies the efficient use of renewable and nonrenewable resources and the minimization of pollution and waste. In economic terms, this entails a focus on growth through the improvement of resource productivity and the building of a restorative economy that is not extended beyond its financial means. In social terms, this reflects the equitable use of resources and access to needs, services, and opportunities. These three foundations stress a whole systems approach and an awareness of the consequences of our actions on future resources and generations. While metrics, indicators and core interests vary between these three factors, they provide the framework for a myriad of practical sustainability applications in the form of programs and policies. With this outline in place, sustainable urbanism can move beyond categorization and problematic definitions by focusing on specific strategies to become a realistic solution to improving economic efficiency, reducing environmental harm and enhancing quality of life in cities.

Before evaluating the core issues and applications of sustainable development, it is important to address secondary aspects that provide the necessary context for this analysis. Chapter 2 continues in five sections.

- Section 2.1 Historical Context
- Section 2.2 Pioneering Reform
- Section 2.3 Cities As Solutions
- Section 2.4 Organizational Form
- Section 2.5 Sustainability Metrics

2.1 Historical Context: An Ecological Foundation

With the 1798 publication of An Essay on the Principle of Population, Thomas Malthus became one of the earliest contributors to today’s environmental movement. Malthus was an economist and country pastor noted for his theory of population growth and the
dire strain it could place on agriculture and the earth’s limited natural resources. Although today, more nuanced views are taken of the Malthus Theory that look carefully at the ecosystem and examine the consequences of a society that is overly consumptive, the efficient use and allocation of limited resources is a key component to sustainable urbanism. His work is noted for its influence on the Club of Rome’s *Limits to Growth* released in 1973.

**The Conservationists - Late 1800s and Early 1900s**
The conservationist movement developed out of scientific forestry methods pioneered in Europe. During this period, Alexander von Humboldt began managing forests based on ethological ideals such as the “house-hold of nature” in order to preserve growth. As legislative and scientific knowledge of this movement developed, it spread back to England and the United States thanks to men such as Gifford Pinchot, the “father of American forestry.” In the US, it merged with America’s existing conservation movement behind the work of George Perkins Marsh and William F.V. Hayden. The formation of Yellowstone National Park was a landmark event during this period. Pinchot’s principles based on the preservation of natural resources and the protection of public interests have proven influential for many in today’s conservation movement. Many principles of Humboldt, Pinchot, Marsh and Hayden can be seen in today’s sustainability movement.

**The Preservationists - Late 1800s and Early 1900s**
While conservationists allowed for some degree of development within sustainable limits, the preservationist movement split due a philosophical belief that the environment has value in and of itself and the preservation of that value should be the primary goal. John Muir, founder of the Sierra Club, was the foremost preservationist and had a strong influence on the formation of the modern environmental movement. Muir viewed wilderness as the pristine environment. Preservationists principles advocate the setting aside of natural resources from prevent damage caused by human activities.

**The City Beautiful and Garden City Movements and Aldo Leopold - 1900 to Mid 1900s**
Behind the work of Ebenezer Howard, the garden city movement advocated the establishment of balanced self-contained urban areas with open spaces and public parks. These spaces were meant to bring together the town and the country. Similarly, the city beautiful movement also advocated for the use of beautification measures in cities. Its proponents believed that these features improve social order and the quality of life. In many ways, both movements were precursors to environmental health and the progressive era as they exposed unhealthy urban environments. Several principles of both new urbanism and smart growth find their roots in the pre-auto planning and development patterns of this period.

While different in many respects, Aldo Leopold also valued the healing capacity of nature. Leopold was an ecologist, forester, and environmentalist and is known as a founding father of the modern environmental movement. 1947’s *Sand County Almanac*, detailed his land ethic with the famous quote, “A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community…it is wrong when it tends
otherwise.” Leopold’s work was influential in extending the social conscious from people to the land.

Historic Preservation
While the field of historic preservation was growing alongside the conservation and preservation movements, it did not truly begin to flourish until the mid 1900s with the establishment of the National Trust for Historic Preservation, which was meant to link the preservation efforts of the National Park Service with the activities of the private sector. In 1966, the National Historic Preservation Act was passed establishing roles for federal, state and local levels of government in historic preservation. Over the next 20 years, membership grew from 10,700 to 185,000 with an estimate of 54,000 jobs created in the administrative aspect of preservation. While the historic preservation movement was established to protect history and culture, it plays a crucial role in today’s sustainability agenda through the promotion of stewardship of the built environment and the facilitation of the reuse of existing buildings. Along with generating economic growth, this also captures large amounts of embodied energy.

Modern Environmentalism - 1960s and 1970s
The modern environmental movement rose out of the grassroots organizations of the late 1960s and early 1970s on both a local and national level. During this period, the oil shocks of the 1970s led to the first movement toward building energy efficiency and solar power. While these efforts resulted in the increasing institutionalization of these issues, they eventually faded over the duration of the Carter administration. Despite this, overall interest in environmentalism grew sharply with books such as Rachel Carson’s *Silent Spring*, which was released in 1962, and *Design with Nature* by Ian McHarg. McHarg, a renowned landscape architect and advocate of regional planning using natural systems, pioneered the concept of ecological planning. Many of his ideas would later become the foundation of Geographic Information Systems technology. Finally, several advancements were made in the federal arena with the formation of the EPA and the National Land Use Policy Act of 1970. President Nixon’s environmentally focused legislative agenda laid the foundation for the environmental resurgence of today.

International Environmentalism - 1970s and 1980s
The environmental movement was also gaining significant ground abroad with 1972’s Stockholm Conference on the Human Environment, the Club of Rome’s *Limit to Growth* and the Oslo Convention. In 1973, E.F. Schumacher published *Small Is Beautiful*. In 1980, the world community again came together for the International Union for the Conservation of Nature and Natural Resources, which would lead to the *World Conservation Strategy*. The Brundtland Report of 1983 established the first definition of sustainable development in its guide *Our Common Future*. Finally, 1992 saw another monumental meeting of leaders at the First United Nations World Conference on Environment and Development where Agenda 21 was produced. The strides many European and Australian cities made over this time period laid the groundwork for their becoming leaders in today’s realm of sustainable cities. These cities are examples of the transformation that is possible over time as urban areas begin to reshape and redefine themselves.
2.2 Pioneering Reform: Challenging Old Assumptions of Urban Planning

With the onset of new technologies, informational capabilities, resources, and materials, the environmental movement reached a tipping point in the 1990s as it moved from the fringe groups of the 1960s and 1970s into mainstream society. On the global stage, the Kyoto Protocol was established and 2002 saw the World Summit on Sustainable Development, which concluded that despite advances, few environmental goals were actually being met. In the US, three movements were underway, New Urbanism, smart Growth, and the USGBC, that would challenge the old assumptions of urban planning and form the basic design tenets of today’s sustainable urbanism.

**New Urbanism**

In 1993, six architects in Virginia established the Congress of New Urbanism behind a shared vision of promoting a new form of urbanism as an antidote to sprawl. CNU went about rewriting the charter of the 1928 International Congress of Modern Architecture to reflect their urban design principles of a rational city based on compact, walkable, mixed-use neighborhoods laid out in a traditional grid network with a discernable center and edge. In many ways, New Urbanism is not new, as its urban design principles rely upon features commonly associated with old towns and villages such as narrow streets, alleys, and town greens. While many of these principles were established during the city beautiful and garden city movements of the early 1900s, in the 1970s planners and architects such as Lewis Mumford, Leon Krier, and Christopher Alexander were influential in convincing others to discourage what they called anti-urban post-war development. New Urbanism had impacts well beyond its original intentions. Through the promotion of density, it laid the foundation for transit-oriented development and form-based zoning, as it brought to light many potential conflicts with zoning and regulation laws.

**Smart Growth**

While New Urbanism’s approach is rooted in an urban design perspective, smart growth reflects more principles of urban planning and public policy. During the 1970s and 1980s many states and localities started to adopt similar principles in attempts to shape growth patterns; however, it was not until the 1990s that these efforts were grouped under the guise of “smart growth.” Due in part to its loose, decentralized formation, smart growth has several interpretations and meanings, but its core principles are the encouragement of compact development, the enhancement of transit options, the protection of natural resources and environmental quality, and the promotion of affordable housing. Proponents believe that smart growth strategies create a strong sense of place and encourage community involvement while also preserving open spaces. However, opponents argue that not all smart growth policies have met their objectives and point to the few attempts to systematically assess their effectiveness. While the application of smart growth principles may not prove universally beneficial, the core principles provide an important foundation for sustainable urban form as they emphasize the importance that the built environment has on quality of life.
**USGBC and Green Building**

The green building movement led by the United States Green Building Council, USGBC, has also been influential in sustainable development. Founded by three development industry professionals in 1993, the USGBC set about establishing green building standards with the Leadership in Energy and Environmental Design rating system. LEED has become an increasingly mainstream force that has focused the design and construction industries on more sustainable practices and an integrative approach to building. While it identifies five main performance areas of sustainable sites, water efficiency, energy efficiency, materials and indoor environmental quality, it stresses the importance of the system over the performance of individual components. Although LEED does rely on a point system and scale for classification, the USGBC has placed a strong emphasis on moving beyond this in the promotion of the concepts and philosophy behind the system. Doing so encourages education and the institutionalization of sustainable building practices. As these measures have grown in popularity, their environmental and financial benefits are becoming better documented. The quantification of financial savings is an essential contribution of LEED and the USGBC to the sustainability movement.

Of particular importance to sustainable urbanism is the USGBC’s expansion of LEED certifications to include Neighborhood Design, which aims to integrate the principles of smart growth, New Urbanism and green building. The benefits of LEED-ND include healthy living thanks to compact, walkable neighborhoods, reduced urban sprawl due to its emphasis on infill sites and redevelopment, and the protection of open spaces. LEED-ND entered a pilot phase in 2007 and the rating system is still under review. As LEED-ND increases with popularity it should aid in the institutionalization of sustainable development principles and growth patterns.

While new urbanism, smart growth and green building have their critics, they all offer valuable principles that promote smart planning and the effective and efficient use of resources. Sustainable urbanism incorporates many of the philosophies of each movement. When considered in the larger context of conservationism, preservationism and environmentalism, many applications of sustainability commonly seen throughout cities today, find their roots in ideas of their predecessors. It is now up today’s sustainability movement to lay the foundation for improving cities for decades to come.

### 2.3 Cities As Solutions

“The unsustainable use of energy is not an inevitable aspect of urbanization and economic growth. Cities can advance the prosperity of their inhabitants while achieving equitable social outcomes and fostering the sustainable use of resources.”

- Ban Ki-moon, UN Secretary-General, 2008

The United Nations estimates that by 2025, 60 percent of the world population will live in cities. Urban areas are the centers for industrial production and are commonly known for their extensive use of resources and production of waste. Additionally, they
generate a disproportionate share of a nation’s GDP, energy consumption and greenhouse
gases emissions. Given this importance and the rapid rate of urbanization, it is essential to
recognize the role that cities play in the sustainability effort. Strides must be made to
address the negative environmental implications of urbanization. Urban growth must be
properly managed to ensure the minimization of energy use and material inputs and the
maximization of recycling, energy efficiency, and water conservation. Well-planned,
well-governed cities can increasingly provide a high quality of life without requiring high
consumption levels and greenhouse gas emissions. Given the magnitude of the role that
the urban environment has to play, it is essential that cities continually strive to become
the solution and not the source of environmental problems.

There are several key reasons why cities are an appropriate focus of study for sustainable
urbanism. Cities have the potential to act as the catalyst for change and city government
provides the necessary platform for leadership. Political will is instrumental to local
sustainability efforts. While citizen or businesses led initiatives might provide the driving
force behind a shift in policy, city leadership ultimately has the authority to establish a
sustainability agenda and institutionalize energy, water, and wastewater efficiency
programs and services. Public officials provide vision and their actions and leadership
has the ability to galvanize the efforts of others throughout the community. Furthermore,
many cities are leading by example through setting municipal guidelines for building and
fleet efficiency standards. As large property owners, cities are in a unique position to
demonstrate the benefits of sustainable building principles. Ultimately, public officials
are the decision makers in the determination of how a city is managed, how services are
provided, and how grow will occur. Perhaps most importantly, cities have the ability to
reshape themselves over time and create an urban form that is more conducive to building
an environmentally, economically, and socially healthy community.

Along with leadership and decision-making, city leaders have the ability to control
behavior through incentivizing and regulating behaviors through the exercise of legal
authority. Examples include greenhouse gas emissions thresholds and the provision of
green building incentives. Local officials have the capacity to eliminate political and
legal barriers to sustainable development. Often times this relates to outdated policies,
codes and regulations that are prohibiting the application of new sustainability related
techniques and technologies. While citizen and business led initiatives are beneficial,
leadership from city government sets the stage for the types of wholesale changes a
community needs to address the challenges of sustainability. Through the proper
utilization of city systems, policies and behaviors, cities have the opportunity to set the
future course of a region.

Cities possess the necessary capacity to take on the role of educator. Citizens must be
aware of the opportunities and programs that exist and the benefits that stand to be
gained. Many cities have instituted public information campaigns that have significantly
impacted citizen behavior. On the other hand, city leaders should also be learning from
their citizens who can serve the role of subject matter experts. Education and awareness
are crucial to the success of sustainability efforts. Finally, many of the negative
environmental externalities and their associated costs that sustainability initiatives
attempt to address are passed on to governments in the long run. It is more effective to limit these costs through preemptive measures.

While leadership and political will can be instrumental for a community by providing vision and building support, there are problems inherent with this reliance. First, economic and industrial interest can present political barriers to sustainability initiatives. Few elected officials are willing to oppose major business forces in a community when they know the potential impact it could have on their career. It is sometimes easier to sacrifice potential future benefits for short-term security. Overcoming harmful habits and political inertia can prove problematic, especially when sustainability programs are only beginning to produce guaranteed results. As more efforts are made to document both the environmental and economic benefits of programs, such as energy efficiency thresholds and recycling requirements, political inertia will become less of an obstacle.

In the discussion of cities and sustainability, it is important to note distinctiveness. Each community presents unique opportunities and challenges. The first step towards sustainability is assessing your situation and figuring out where resources could be used most efficiently. All of these factors play a crucial role in the formulation of a sustainability plan and its translation into action. While there are no cookie cutter solutions for sustainability the following case studies provide ideas for the facilitation of sustainable development strategies.

2.4 Organizational Form

The institutionalization of sustainability programs reflects a serious commitment to change on behalf of a municipality and is essential in the coordination of the transition toward a more sustainable environment. While any increased interest in sustainability is a positive, it is necessary that these ideas and values reach a launching point for implementation. Changes in the way of thinking must correspond with changes in actions in order to ensure that sustainability is not just a slogan. Establishment of an operational form is an essential part of this process. First, it provides leadership and a publicly recognizable individual or group of individuals for promoting sustainability. Taking this first step signifies the importance of sustainability to the public. Secondly, it creates an expert source for information gathering, organizing and disseminating. Having a local expertise is vital to evaluating the merit of potential sustainability programs and policies and can be critical in providing useful information to decision makers and managers. Because intergovernmental and private-public cooperation play such a crucial role in the development of sustainability programs, having a thorough understanding of existing conditions and relations is essential. Additionally, it creates a venue for the collaborative exploration of ideas, identification of key issues, establishment of an action plan and the declaration of initiatives. After problems are graded and assigned a level of priority to ensure that resources are allocated in an efficient manner, a blueprint for achieving goals must be established. Having a responsible party ensures that progress will be effectively monitored and adjustments will be made as necessary. While any efforts are better than none, organizational form of some sort is key to maximizing efforts. The optimal type of form is dependent upon the individual city.
There are five common organizational forms for addressing sustainability in city governments. Many of the most proactive cities such as Portland, Seattle, Chicago and New York City have created an Office of Sustainability. They are responsible for the collaboration with other city agencies, business groups, nonprofit organizations and other parties. Many other cities are following their example with the creation of offices. Secondly, many municipalities rely upon an interdepartmental team with representatives in each area responsible for working on issues. Either of these first two organizational forms may or may not feature an appointed Director of Sustainability. Conversely, smaller municipalities or those with limited resources may only have an appointed director to lead efforts. The fourth organizational form is a citizen task force or volunteer committee often headed by a city employee, such as a planner. These scenarios rely heavily upon the involvement of community subject matter experts in the formation of goals and an action plan and can thus be beneficial in establishing public-private partnerships. Finally, sustainability measures and principles can simply be incorporated into existing programs and policies without the establishment of an official director, office or task force to oversee the efforts. Of course, these organizational forms are not exclusive of one another.

Regardless of the approach taken, what is important is that adequate resources are committed to addressing the issue of sustainability and that these discussions are not merely lip service. As one would expect, the amount of resources devoted to an issue directly correlates with the achievements in the implementation of policies and programs. Most sustainability development frameworks are in the formative stages and are still evolving. Additional research into the effectiveness of organizational form will be accumulated over time.

2.5 Sustainability Metrics

Sustainability metrics are quantitative measures that can be applied in the assessment of program. Examples include cost savings, emission levels, energy consumption, or any other figure that can be measured to gauge progress. They allow for assessing conditions and trends, comparing across places, situations, and time, providing early warning information and anticipating future conditions and needs. Quantitative data is an invaluable instrument for gaining support and demonstrating the benefits of a program in a measurable way. For example, cost savings are easily understood and can serve as strong political tools. Different disciplines take different approaches to sustainability metrics and indicators. Planners should recognize the linkages and relationship between approaches and use the one with the most utility in the given situation.

Environmental metrics deal primarily with greenhouse gas emissions, and a carbon or ecological footprint. Greenhouse gas emissions are gases that trap heat in the atmosphere. The monitoring of greenhouse gas emissions from various activities allows for the creation of inventories, which are used to track trends, develop strategies for lowering levels, and monitor progress. For example, the U.S Conference of Mayor’s Climate Protection Agreement goals are based on the reduction of greenhouse gas
emissions. The most common man-caused greenhouse gases are carbon dioxide, methane, nitrous oxide and fluorinated gases.xvii

An ecological footprint is a science-based resource accounting system that documents the area of land required to produce the renewable resources needed to support a population. It compares people’s use of resources to nature’s ability to regenerate resources. A large carbon footprint is typically associated with higher energy consumption and more carbon-intensive behaviors. There are a number of resources available to a city for calculating an ecological footprint. Both greenhouse gas emissions and carbon footprint measures allow people to quantify the environmental consequences of their daily actions and lifestyle choices.

Greenhouse gas and ecological footprint inventories do little to account for the economic or social elements of sustainability. Economic metrics are simply financial savings or costs associated with sustainability efforts. The difficulty is in measuring these benefits, which vary according to the specific instance. For example, in order to monitor cost savings for energy efficient buildings you first need to know previous levels of operating expenses and energy costs to use as a basis. Then, it requires the necessary equipment to properly monitor expenses. While this is more or less straightforward for buildings, measurements get complicated when considering the cost savings of investments in other systems, such as infrastructure. In many instances, the application of new technologies or more cost-effective technologies are allowing for more detailed system monitoring. Finally, social metrics are the hardest of the three to measure quantitatively as they deal primarily with access to services, health conditions, and other concerns that require extensive research.

There are a myriad of sustainability reporting systems that attempt to merge the measurement of all three environmental, economic and social factors into one index. Examples include the Global Reporting Initiative – GRI, the Sustainable Enterprises Approach, and the Environmental Sustainability Index – ESI.xviii With any emerging methodology, the key for planners is the ability to differentiate which information matters in a given context and which is secondary. ICLEI, Local Governments for Sustainability, is a great resource for learning more about indicators, the measuring of a cities ecological footprint, and strategies that can be put in place to address the situation.

**Additional Resources:** ICLEI, U.S. Mayor’s Climate Protection Center, EPA Sustainability Program, International Institute for Sustainable Development, C40 Cities Climate Leadership Group, Clinton Climate Initiative, Climate Leaders US
Chapter 3. Sustainability In Application

While sustainability practices present the opportunity to make cities smarter through addressing unhealthy environments and unstable production and consumption patterns, broad conceptions tend to marginalize the value that sustainable development has to offer. The examination of existing programs and policies allows for moving beyond a theoretical approach in the application of sustainability in cities. Sustainable development can be effectively framed through city systems and areas of sustainable practices. The six main systems identified in this study are infrastructure and urban form, the built environment, transportation management, energy management, waste management, and water management. While this categorization is not wholly inclusive, it accounts for the majority of urban sustainable development programs. A final section is included to address urban forestry and the greening of cities. For each of these sections, areas of sustainable practices are identified and analyzed individually.

While this structure allows for a systematic approach to examining sustainability and cities, it does not imply that decision should be made on a system-by-system basis. In many ways, urban environments function as a natural organism and decisions made in one arena often have consequences in another. Similarly, the implications of inefficiencies are cumulative as well. Both problems and solutions must be approached in a comprehensive manner with an emphasis on holistic decision-making and not narrowly defined responsibilities. The layering of program and policy objectives is key to producing positive impacts across systems.

Chapter 3 is continued in seven main sections. Each section provides a brief categorical overview before defining key sustainable development principles and goals and identifying best-case practices from municipal programs and policies.

- Section 3.1 Infrastructure and Urban Form
- Section 3.2 The Built Environment
- Section 3.3 Transportation Management
- Section 3.4 Energy Management
- Section 3.5 Waste Management
- Section 3.6 Water Management
- Section 3.7 Urban Forestry and the Greening of Cities

3.1 Infrastructure and Urban Form

Infrastructure and urban form are central to the overall sustainability of a city. Their structure affects every facet of sustainable urbanism. A special emphasis should be placed on these issues during the long-term planning process and growth management. Urban infrastructure has long-term impacts and infrastructure investment influence resource needs well into the future. Because decisions on its formation can make or break a city’s future, provisions should be made in an integrative manner.
Infrastructure investments in transportation and basic city service systems will significantly shape urban form and growth. Sustainable development values urban form that is compact and dense with balanced centers and corridors. According to architect Norman Foster, a city only twice as dense uses \(1/10\)th of the energy.\textsuperscript{xx} The lower the density of a city, the higher its emissions from the transportation sector and the more costly it is to provide basic services. Through establishing compact neighborhoods with a mix of dwelling types and commercial uses, needs and services can be met with fewer vehicle miles traveled. Along with establishing a goal of seven to eight dwellings per acre, LEED Neighborhood Development emphasizes the importance of floor area ratios necessary to support transit.\textsuperscript{xx} In terms of transit, the feasibility of increased frequency and types of services is directly correlated with the market of people who have access to these services.

Another strategy cities can take to create healthy urban form is the promotion of infill and increased density through brownfields development programs. Along with the cleaning up of contaminated sites, the use of brownfields reduces pressure to develop open spaces and capitalizes upon existing infrastructure. However, regulatory, financing and liability factors provide obstacles for brownfields redevelopment. The EPA’s brownfields program empowers communities and other economic stakeholders to work together to sustainably reuse brownfields. Additionally, the American Planning Association is in the process of developing the Community-Based Brownfields Redevelopment Strategies workbook and training programs, which should be a vital resource for communities interested in promoting brownfields redevelopment.

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**Baltimore, Maryland – Baltimore Brownfields Initiative**

**Urban Form - Brownfields Program**

Since 1996, the City of Baltimore has facilitated over 30 brownfields projects under the direction of the Baltimore Development Corporation, BDC. The program has resulted in a cleaner urban environment, a larger tax base and the preservation of open space.

**How It Works:** BDC is a city created NPO that staffs the Baltimore Brownfields Initiative. BDC staff are advised by the Baltimore Brownfields Council, a panel of local businessmen, government stakeholders, and professional experts. BDC has created a Brownfields Property Tax Credit program for the purchase of designated brownfields properties. Along with allowing for tax credits on 50 to 70 percent of the increase in property taxes attributed to site improvements, the BPTC also allows for tax abatements for past taxes. Additional financing sources are provided by the Baltimore Brownfields Financing Fund in three forms: the EPA Brownfields Revolving Loan Fund, City Bond Funds, and the Maryland Clean Water Revolving Loan Fund.

**Results:** Since 1996, the City of Baltimore has completed over 30 Brownfields projects, producing more than 3,000 new jobs and $300 million in new investments.

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**Also See:** Chicago Brownfields Program,

**Source:** http://www.baltimoredevelopment.com/initiatives/brownfields.aspx
3.2 The Built Environment

Buildings account for 40 percent of total energy consumption, 68 percent of electricity consumption, and 38 percent of greenhouse gas emissions in the U.S. Additionally, the built environment represents an enormous amount of embodied energy as investments in buildings, roads and other structures have long-term implications. Effective building design is critical in the establishment of a healthy urban ecosystem and decisions made today must be made with their long-term implications in mind. Sustainable development offers an opportunity to reshape a new generation of urban development in a way that has the potential to require less energy input, improve air quality and human health, and protect the natural habitat. In terms of the built environment, sustainable development entails three primary objectives: promote green building standards, encourage smart growth projects and increased density, and support the preservation of existing buildings.

**Sustainable Building**

Sustainable building principles increase the efficiency with which buildings use energy, water, and materials, while also reducing impacts on human health and the environment through the complete building life-cycle: sitting, design, construction, operation, maintenance, and removal. Internally, green building principles relate to a thermally efficient exoskeleton that reduces heating loads, renewable energy technologies, efficient water and wastewater systems, economical HVAC system operations, low VOC chemicals for interior finishes and installation methods, and other energy efficient systems such as occupancy sensor, CFL or LED lighting. Externally, sustainable building standards upon to building orientation and daylighting strategies to reduce cooling loads, minimize landscaping requirements, and provide features to encourage forms of alternative transportation. While some of these features come at an upfront cost premium, in the long-term, sustainable buildings offer financial savings. Experts believe that as green building spreads, market competition will spur the development of better and more efficient systems to overcome cultural resistance and bottom line economics.

As of August 2008, USGBC records show 98 cities, 25 towns, and 29 counties have officially adopted a type of green building standard. LEED, Energy Star, and other green building standards provide a basic framework for the green building industry. They have been pivotal in the institutionalization of green building practices as they have gained wide acceptance among architects, builders, and building owners. LEED is recognizable and provides instant associations for those with limited exposure to sustainable building. For others, it provides an easy outline of the necessary steps to take to allow a building to realize the benefits of sustainability. Perhaps most importantly, while LEED addresses strategies on an individual basis, it does a good job of promoting an integrated whole-systems approach to maximizing building performance and return on investment. Finally, LEED serves as an excellent indicator for authorities to use in the establishment and promotion of green building standards.

While experts believe that green building will one day be just how things are done, gaps still exist between the market and sustainable buildings. These gaps primarily relate to high initial investment cost and cost misconceptions, information and technology
availability, uneven utility incentives, and formal barriers posed by building codes and regulations. Fragmented and uncoordinated municipal support for green building often fails to address these issues. There is a strong correlation between cities that have developed green building policies and address these issues and those with thriving green building markets. With the potential benefits that cities stand to gain, public leaders should in facilitating the institutionalization of green building standards. There has been an unprecedented level of municipalities making this transition over the past several years. The following examples address how leading cities have been able to accomplish this feat.

**Voluntary Green Building Programs**

The building industry has become increasingly proactive in the adoption of innovative green building principles. Similarly, the past several years have seen an increasing number of municipalities adopt green building policies and programs to facilitate this transition. In general, these programs attempt to change building practices through the provision of incentives, financial assistance, and educational programs. Behind the Austin Energy Green Building Program, the City of Austin, Texas has achieved measurable results from a program that combines educational resources and an official green building rating system with loans, rebates, and other financial resources. It should be noted that as of 2006, the Austin Energy Green Building Program was made mandatory for larger commercial and industrial facilities and certain building zones. This is a prime example of how a phased voluntary to mandatory transition can smooth the process by demonstrating significant results without at first requiring compliance.

<table>
<thead>
<tr>
<th>Austin, Texas – Austin Energy Green Building Program</th>
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<tr>
<td><strong>Green Building Program</strong></td>
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<td>Austin’s efforts to promote green building date back to 1991 when Austin Energy Green Building, AE/GB, adopted the first ever city-wide tool for evaluating the sustainability of buildings in the U.S. AE/GB provides technical support to homeowners, architects, designers and builders. The Green Building Program is made up of four different sections: Residential, Commercial, Multi-Family and Manage It Green. Manage It Green is a consulting firm for utilities and government agencies. Since its inception, the program has rated over 7,000 homes, 60 commercial buildings, and 57 multi-family developments. The ratings are a great marketing tool for building owners.</td>
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<tr>
<td>AE/GB also created an initiative for municipal buildings in 2000 requiring that they meet LEED Silver certification. AE/GB also offers a Green Building Guidebook, a Sustainable Building Sourcebook, a green building professional finder, green workshops, a green map of Austin, and a myriad of other resource.</td>
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</tbody>
</table>
How It Works: Beyond the educational components, AE/GB assist professional teams in establishing green building goals for the construction of a building, review plans and specifications, make recommendations for improvements, and rate the final product on its impact to the environment and community. Ratings are based on a sustainability rating specification along with LEED and Green Global tools. Additionally, AE/GB coordinates loans and rebates for a wide range of energy efficiency features including HVAC units, solar photovoltaic systems, and solar water heaters. The rebate is dependent upon completion of the project and realized energy savings to the utility.

Results: Annual CO2 Reductions – 15,927 tons, Annual Financial Savings - $2.2 Million, Initial Investment - $1.2 Million Annual Budget.

Application: The AE/GB program would be most effective in municipalities that own an electric utility or can establish a positive working relationship with one.

Awards: National Association of Homebuilders Green Building Program of the Year, USGBC Public Sector Leadership Award, United Nations Local Government Honours Programme Finalist

Also See: Seattle Sustainable Building Action Plan for Multi-Family Projects, Albuquerque Green Path Energy Conservation Program

Sources:
http://www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/index.htm
http://www.c40cities.org/bestpractices/buildings/austin_standards.jsp

Municipal Green Building Standards
Many cities are requiring municipal buildings over a certain size to meet LEED standards. Given the large size of the building stock for many municipalities, these measures can have significant impacts on overall community health and energy use. Furthermore, these projects can be great resources for demonstrating the benefits of sustainable building techniques to the local community. Additionally, mandatory green building standards for municipal buildings have paved the way for city-wide mandatory standards. The City of Seattle, Washington has been a pioneer in the field of green building with the third most LEED certified buildings in the U.S. and a sustainable building industry worth $671 million. They have been able to achieve this level of success through a concentrated program with a broad range of measures to encourage green building in the residential, commercial, and multi-family sectors. The greening of Seattle’s city facilities and city-funded projects has played a key role in their progress.
Municipal Green Building Standards

Since 2000, Seattle has adopted a number of successful regulatory standards, measures, and incentives in support of the green building industry. The Sustainable Building Policy requiring all municipal buildings over 5,000 square feet to meet a minimum of LEED silver has played a key role in Seattle’s program. They currently have 10 LEED certified buildings with an additional 28 projects planned or in development. Program leaders believe that this demonstration of success has fueled private sector interest in green building practices. To assist these efforts, City Green Building also conducted a City LEED Incentive Program from 2000 to 2005 and implemented a Density Bonus Program starting in 2005.

Along with the Seattle Justice Center, the Seattle Central Library is the showcase Seattle’s highly successful green building program, as it outperforms the Seattle Energy Code by 10 percent. The building features an advanced daylighting and glazing system, a unique air distribution system, a rainwater collection system for landscaping, and innovative materials. Additionally, the facility has developed an education program that will teach visitors about the sustainable design features of the building.

How it Works: City Green Building is funded through interdepartmental resources and relies upon strong relationships with the City’s water and energy utilities and their incentive programs. The Seattle Central Library was funded by a 1998 “Libraries for All Bond.”

Results: The Seattle Central Library demonstrates electricity savings of 4.5 million kWh/yr and reduced CO2 emissions of 181 tons annually.

Mandatory Green Building Programs

In 2007, Washington DC became the first city to require all privately funded new construction projects to be LEED certified. Just one year later, Annapolis, Los Angeles, Portland, San Francisco, and Seattle all adopted mandatory green building programs as well. Due to concerns over the effectiveness of voluntary programs, many cities turned to mandatory requirements. While requiring mandatory standards can be problematic due to the opposition from those who are wary of additional upfront costs and increased governmental oversight, it is an effective means for significantly improving energy performance and reducing CO2 emissions on a large scale. Berkley, California was another one of first mandatory programs in the U.S.
Berkley, California – Residential Energy Conservation Ordinance

Mandatory Green Building Standards

In 1991, the City of Berkley adopted the Residential Energy Conservation Ordinance, RECO, requiring all homes, apartment buildings and mixed-use buildings to meet building standards. Energy efficiency requirements are based on California’s Title 24 Energy Codes. Over 600 buildings are transferred or remodeled annually under RECO.

How It Works: RECO is applied when homes are sold, transferred or renovated exceeding a total permit value of $50,000. The building owner must take responsibility for RECO and has one year from DOP to complete requirements. If the energy inspection report does not meet standards, the maximum owner expenditure is 0.75 percent of sale price. Responsibility can be transferred to the buyer. Berkley does offer limited assistance on more costly improvements such as attic insulation.

Results: RECO has reduced residential energy consumption by over 13 percent, annual CO2 emission by over 5,000 tons and allowed households to save up to $450 on their annual energy bills.

Also See: Annapolis, Atlanta, Boston, Chicago, Dallas, LA, New York, Portland, San Francisco, Seattle and Washington

http://www.c40cities.org/docs/casestudies/buildings/berkeley_standards.pdf

Incentive Programs

In order to facilitate the incorporation of green building techniques in the private sector, many municipalities have established incentive programs ranging from non-financial incentives such as expedited processing and the modification of codes and regulations to rebate plan and loan programs. Of the varied types of incentives available, tax incentives, density bonuses, and expedited permitting are the strongest methods compared to grants, loans, award programs, technical assistance, fee reductions, and discounts on Energy Star appliances. For examples of financial incentive programs, see Seattle, Baltimore County, and Cincinnati, Ohio.

Chicago, Illinois – Green Building Permit Program

Green Building Incentive Program

Run by the Chicago Department of Construction and Permits, DCAP, the Green Building Permit Program is one of several successful Chicago initiatives supporting green building. It expedites the permit process for projects that incorporate innovative green building strategies, thus saving time and money. Accepted projects receive permits in between 15 to 30 business days as opposed to the typical 3 to 6 months. The number of days is based upon the amount of sustainable building elements included in the plan with the more elements translating to shorter time. Reduced pre-construction
time is valuable for developers as it lowers construction loan payments and ultimately reduces the cost of doing business. The program also includes an opportunity to have consultant code review fees waived for extraordinary programs. About 10 percent of participants had fees waived.

**How It Works:** Applicants submit a listing of green building components along with construction documents which are reviewed by the DCAP Green Permit Program. Acceptance into the program is based upon specific guidelines and requirements. Commercial projects must earn LEED certification. Smaller residential projects must receive a two-star rating under the Chicago Green Homes program. The owner may be asked to include additional features from a menu of items such as green roofs, renewable energy features, and on-site power generation.

**Results:** In 2007, the program processed more than 200 projects representing 60 percent of new development and 40 percent of existing building retrofits. Depending on the level of green building standards adopted, it is estimated that participants achieve 25 to 45 percent energy reduction over a typical project.

**Also See:** San Francisco Green Priority Permitting Program, King County, WA Green Building Incentives and Grants, Austin, TX Energy’s Green Building Program, Arlington, VA Green Building Incentive Program

**Source:** DCAP Green Permit Program Brochure - http://csba.foresightdesign.org/documents/GreenPermitBrochure1.pdf

**Smart Growth**

The promotion of dense, clustered, mixed-use development has environmental, economic and social benefits. It minimizes the impact of development, improves transit options, and enhances community health while also reducing pressure on the development of open land. A variety of planning techniques are available to foster more compact development patterns. In general, these codes, regulations and policies apply flexibility for the accommodation of principles of smart growth, mixed-use development, Traditional Neighborhood Development, and Transit-Oriented Development. While many objectives are best addressed through long range planning and the comprehensive planning process, authorities must ensure that local codes do not inhibit dense, mixed-use development in the short term as well. Specific examples of steps taken to accomplish this include the establishment of form-based codes that support mixed use neighborhoods, nodal development provisions like those in Eugene, Oregon, density zoning and special use permit programs like Berkeley’s Live/Work program.

Live/Work zones were first popularized in the 1980s when manufacturers started moving out of large industrial buildings and warehouses in downtown areas. In order to accommodate city dwellers that wished to live and work in these abandoned spaces, building and zoning regulations had to be adopted. The adaptive reuse of these buildings would prove an integral part of many cities urban revitalization programs as small businesses, restaurants, entrepreneurs, and creative professionals began to occupy the
spaces. Another significant benefit of the live/work setup is the potential elimination of commutes and the alleviation of traffic congestion.

### Portland, Oregon – New Columbia, Housing Authority of Portland

**Smart Growth**

Located on the site of the former Columbia Villa public housing community, New Columbia is an 82-acre public housing development created by the Housing Authority of Portland, HAP, along with public and private partners. New Columbia creates a diverse mix of housing types with new parks, public facilities and recreational facilities. All residents are within a five-minute walk of public transportation. Additionally, extensive efforts were made to reintegrate the site into the existing neighborhood and improve the environmental performance of the development. The neighborhood school received LEED Gold certification and 98 percent of stormwater is processed on site thanks to a green street system with vegetated pocket swales.

**How It Works:** HAP is serving as the master developer with a range of partners including government, financial and community stakeholders. Joint planning efforts took place over a two-year period with a strong emphasis on community economic development.

**Awards:** 2007 National Award for Overall Excellence in Smart Growth from the EPA.

**Also See:** Seattle Housing Authority Built Projects, The Borough of Manhattan Equitable Development

**Source:** [http://www.hapdx.org/newcolumbia/](http://www.hapdx.org/newcolumbia/)

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**Historic Preservation**

Historic preservation should also play an important role in sustainable development efforts. The reuse and recycling of buildings is an environmentally responsible practice that reduces pollution and promotes the conservation of nature. The reuse of building infrastructure provides significant energy savings in the form of embodied energy in materials and assemblies, minimized energy costs associated with demolition and waste transfer, and alleviated demand for new materials. Due to central locations many historic preservation projects ease municipal infrastructure pressures and preserve open spaces through the utilization of previously developed land. Additionally, in many cases, the traditional character of the buildings allows for energy efficiency through the use of good ventilation and durable materials.

Historic preservation, which takes the form of conservation, rehabilitation, restoration and reconstruction, results in economic benefits for local construction, real estate and tourism industries. In general, the restoration of buildings is labor intensive and requires specialized professionals, thus offering local employment opportunities. The renovation of old buildings also creates value, which results in increased property tax values for both the subject building and surrounding properties. These property tax benefits provide additional revenue for municipalities. Finally, preservation tourism can be a vital
economic strategy for municipal governments as it encourages the inflow of dollars into a region.

While historic preservation policies and programs are addressed primarily on the Federal and State levels through the Historic Tax Credit Programs and national organizations such as the National Trust for Historic Preservation, local authorities still have a crucial role to play in the preservation of buildings. Preservation objectives should be incorporated into the municipal planning process as much as possible. The four primary roles local decision makers can play in the support of historic preservation are reforming building codes to encourage the rehabilitation of historic buildings, actively participating in advocacy and preservation efforts, providing educational and technical support for local residents and businesses, and promoting preservation tourism.

3.3 Transportation Management

The development of a healthy transportation system represents a major challenge to the realization of sustainable development. Transportation accounts for a large amount of energy use and measures must be made to ensure that that energy is being used efficiently. Furthermore, land use is a primary determinant of a city’s sustainability and land use patterns co-evolve with transit. Sustainable transportation planning must encourage healthy land use patterns and vice versa. Transportation habits also have significant implications on community health. Auto-oriented systems encourage sedentary lifestyles and compromise the environment and human wellbeing. Addressing transportation is an underlying issue to improving energy efficiency, land use, community health and the creation of a sustainable urban environment.

Many of our cities transportation infrastructures are strained to a state of limited functionality. Auto-centric urban transportation systems with overbuilt roadways have proven unsustainable, as they use excessive energy and often provide declining levels of service with increasing investments. Sustainable transportation policies and programs are now attempting to rectify these problems and the examples of cities that have successfully done so have been well documented. On an international level, these include cities ranging from Stockholm and Hong Kong to Curitiba and Vancouver. In Western Europe, non-motorized transportation actually accounts for 50 percent of urban trips. While the US remains an auto-oriented nation, Boulder, Portland, and Boston have been successful in shifting transportation patterns away from the automobile. Typical signs of reversal include a reduction in annual vehicle miles traveled and increased demand for various modes of alternative transportation. One challenge in this process is that it takes longer for changes to be reflected in statistics. There is a significant lag time between a shift in transportation planning and investment patterns and the signs of reversal. Public decision makers must have a long-term approach to sustainable transportation. Again, it must be an integrative approach that recognizes both the direct and indirect effects of transportation planning decisions.

Beyond correcting unsustainable transportation systems, a second challenge relates to pricing efficiency. Current transportation and land use markets do not efficiently
compensate consumers for reducing the transportation costs that they impose on a society. For example, the indirect costs of roadway expansion are often not given appropriate weight during the decision making process. Alternative transportation options have been undervalued, especially in terms of funding and management strategy. Sustainable transportation policies at the city level are capable of correcting these market gaps.

Four key components of a sustainable transportation system are the promotion of transportation patterns that have positive implications on urban form, the expansion of alternative transit programs to reduce automobile dependence, the support of innovative vehicle and fuel technologies, and sustainable transportation infrastructure. The benefits that stand to be gained from these objectives are numerous. Environmentally, they address air, water and noise pollution, habitat loss, and the depletion of non-renewable resources. The economic benefits relate to traffic congestion, facility costs, and consumer costs. Socially, sustainable transportation objectives result in improved mobility for the disadvantaged, health impacts, and community livability. It is important that these benefits are recognized and appropriately weighted in the transportation planning decision-making process.

**Transit and Land Use**
Compact, dense urban form lends itself to sustainable transportation patterns. Mixed-use concentrated developments reduce travel demands by providing basic commercial needs and services in close proximity to one another and to housing, thus reducing the length and number of required trips. Secondly, they facilitate public transportation efforts by establishing a large concentrated market in a specific location. The larger and more concentrated a population is in a given area, the more public transportation it can support. Also, in terms of connectivity, it is easier to string together significant destinations and nodes of concentrated development. Finally, many of these dense mixed-use centers accommodate non-motorized transportation such as walking and biking. These developments are commonly referred to as gmart growth or Transit-Oriented Developments, TOD.

Transportation and urban form are most appropriately addressed through policy and planning. Local authorities should shift infrastructure priorities to address underlying land use issues. Zoning, codes and regulations should facilitate the development of concentrated mixed-use centers and sustainable corridors that lend themselves to healthy transportation patterns. Cities that are able to do so will position themselves well for establishing a healthy long-term transportation outlook.

**Alternative Transportation**
With or without proper urban form in place, cities must move beyond traditional auto-centric thinking to embrace the benefits that a balanced multi-modal transportation system has to offer. This network should emphasize public transit, pedestrian activity, bicycling, and rideshare programs in giving people more choices as to how they meet their transit needs. These complementary options to automobiles must be reliable, safe, and secure and provide a high overall level of service. Programs that reduce automobile
demand should be considered equally with those that increase capacity. Accomplishing an increase in alternative transportation usage is a joint effort between public and private authorities requiring serious investments and commitment to public transit and alternative transportation programs. Well-coordinated efforts with public-private cooperation are vital to the creation of an accessible, multi-modal transit system.

### Boulder, Colorado – Go Boulder

**Alternative Transit – Multi Modal System**

GO Boulder has been working to create an innovative and balanced transportation system that allows for no long-term growth in auto traffic since 1989. Their goal is to reduce single-occupancy vehicle trips from 44 percent to 25 percent by the year 2025 and they have put a range of programs in place for doing so. They have seven high frequency transit routes that are smaller and run along popular routes. Each route features buses and bus stops with a unique identity and look. Over 300 miles of bicycle and pedestrian paths enhance the overall system. Bike-to-transit is encouraged through bike racks and storage areas on buses. Next, GO Boulder created Eco Passes, which allows users to ride any transit system throughout the region at no additional charge. Business, neighborhoods, and student passes are available. GO Boulder also reaches out to the business communities through promoting the benefits of innovative flextime and telecommuting.

**How It Works:** GO Boulder is funded by the Regional Transportation District. The system was built from the bottom up through the community-based model that values citizen input.

**Results:** More than a quarter of the population is riding on a bus on any given day. During peak months, GO Boulder carries over 24,000 passengers per day.

**Awards:** Bicycle Friendly Community Gold Level Award from the League of American Cyclists

**Also See:** GRTC - Richmond, MITS – Muncie, RTD – Denver,

**Sources:**

http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=8774&Itemid=2973

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**Marketing and Education**

Along with working with the community, marketing and education also play a pivotal role in increasing ridership. Users must be made aware of possible services and measures must be made to facilitate their use. Doing so will improve community health, reduce emission levels from single occupancy vehicles, and improve mobility for the disadvantaged.
### Portland, Oregon – SmartTrips

**Alternative Transportation – Communication and Marketing**

SmartTrips is an extensive approach to reduce drive-alone trips and increase biking, walking and the use of public transit in the City of Portland. It incorporates targeted marketing strategies featuring maps, organized activities, and informational packets to increase public awareness and communication.

**How It Works:** SmartTrips is administered by the Transportation Options Division of the Office of Transportation. Residents within a targeted area are contacted and given an option of requesting informational packets. The resident then chooses options that are of the most interest to them individually. The information packets are then delivered to the resident. The program is funded through a combination of the city’s gas taxes and transportation revenues combined with energy tax credits from private businesses.

**Results:** SmartTrips projects have resulted in a reduction of 9 to 13 percent of drive-alone car trips by residents in targeted areas.

**Also See:** TriMet

**Sources:** [http://www.portlandonline.com/transportation/index.cfm?c=43801](http://www.portlandonline.com/transportation/index.cfm?c=43801)

### Incentive Programs

Incentive programs can also be valuable tools for increasing transit ridership. Serious backing from local businesses can significantly increase ridership numbers and incentive programs are one way of getting businesses more involved. By encouraging employees to use alternative transportation, businesses will save money by reducing the demand on parking facilities and having a healthier workforce. For employees, incentive programs allow for savings on transportation costs through parking cash out and other similar programs. In many of these cases, public-private cooperation is vital to program success.

### Palo Alto, California – Employee Commute Program

**Alternative Transportation – Incentive Program**

The City of Palo Alto Employee Commute Program offers employees Commuter Checks to encourage their use of alternative modes of transportation. The incentives are $40 for public transit, $30 for carpooling, and $20 for walking or biking. To receive the incentive, employees must use the chosen mode for 60 percent of their workdays. Additionally, Palo Alto has four vanpool services whose riders receive a $60 per month stipend.

**Awards:** EPA Commuter Choice Leadership Initiative Certificate of Recognition

**Rideshare Programs**

From carpools and vanpools to flexcar programs, there are many types of rideshare programs. Both employer based and municipal based rideshare programs minimize single occupancy vehicle travel and reduce rush hour traffic congestion. Many municipalities encourage carpooling through the provision of designated highway lanes. Carsharing programs such as ZipCar are becoming increasingly popular in many cities. Because program operators cover costs of maintenance, repair, and insurance, these programs offer significantly cheaper means of transportation.

<table>
<thead>
<tr>
<th>Los Angeles – Los Angeles World Airport Rideshare Program</th>
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<tr>
<td><strong>Alternative Transportation – Rideshare Program</strong></td>
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<tr>
<td>The Los Angeles World Airport Rideshare Program, LAWA, takes a multi-faceted approach to alternative transportation by providing assistance with vanpool, transit, carpool, bike, and regional services. Transit costs for employees are subsidized up to $110 per month. Additionally, the program host contest and giveaways for carpool and vanpool participants. Incentives for regional transit include gift cards to stores like Target and Starbucks.</td>
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<tr>
<td><strong>Results:</strong> The LAWA vanpool program saves over 25 tons of emissions annually.</td>
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<tr>
<td><strong>Award:</strong> EPA’s Best Workplace for Commuters Charter Member, 2002 Diamond Award for Comprehensive Marketing</td>
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<tr>
<td><strong>Source:</strong> <a href="http://www.lawa.org/rideshare.cfm">http://www.lawa.org/rideshare.cfm</a></td>
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**Cleaner Fuels and Vehicles**

Along with striving for a reduction in automobile dependence, cities must also focus on building a green fleet through energy efficient vehicles and alternative fuels. Today’s efforts in auto related energy efficiency center upon electric and hybrid vehicles and alternative fuels. These new technologies result in more fuel efficient and cleaner vehicles that reduce the demand on oil and other natural resources while also improving air quality through the emission of fewer greenhouse gases. While fuel-efficient cars and the use of biofuels have gained significant ground in the private market, cities are in a prime position to encourage this shift in consumer behavior. Incentive programs can be established to encourage the purchase of fuel-efficient vehicles. Progressive standards can be set for low carbon fuels and transportation related emissions goals. Road lanes can be dedicated to fuel-efficient vehicles. Infrastructure can be built that tends to the needs of hybrid vehicles. Finally, city fleets can be converted to run on biodiesel or some other alternative fuel to demonstrate the benefits to citizens first hand. Cities must do their part in addressing this issue.
San Francisco, California – Clean Air Vehicle Program

Green Fleets - Low Emissions Transport System
The Clean Air Vehicle program is a commitment from municipal agencies of San Francisco to reduce carbon emissions according to the San Francisco Environmental Code, which requires that vehicles purchased must be clean air vehicles when feasible. Program fleet goals include 70 percent alternative fuel vehicles and 90 percent alternative fuels or high efficiency vehicles. Half of the Municipal Railway fleet is comprised of zero-emission vehicles with more than 700 cleaner air natural gas, hybrid, electric, and biofuels vehicles. Additionally, vehicles that use diesel are being converted to run on B20 biodiesel.

How It Works: The program relies on grant funding from the Bay Area Air Quality Management District to help the city departments offset incremental cost increases associated with vehicle purchases.

Results: The Clean Air Vehicle program has achieved an annual CO2 reduction of 5,345 tons and estimates an annual financial savings of $150,000 annually on fuel and maintenance costs.


Local authorities should also ensure that their communities are aware of programs, such as Clean Cities, that facilitate the use of alternative fuels and advanced vehicles. Clean Cities is a government-industry partnership under the U.S. Department of Energy with local coalitions in over 90 communities. Each of these coalitions are responsible for developing public/private partnerships to promote alternative fuels, fuel blends, fuel economy, hybrid vehicles, and other similar measures.

Sustainable Transportation Infrastructure
The market for sustainable construction is expanding and many disciplines have realized the benefits of sustainability. The next step in transportation infrastructure is the advancement of green roadways, parking facilities and system elements. Sustainable transportation infrastructure utilizes modern construction techniques, recycled materials, stormwater management practices, and pervious pavement technologies to minimize energy inputs and improve operational efficiency in the construction, maintenance and operation. Materials play a crucial role in the creation of a more sustainable transportation infrastructure. Innovative materials are being used that incorporate less diminishing natural resources and Recycled Material Components, RMCs. RCMs are derived from industrial byproducts and their use both diverts waste from the landfill while also reducing demand for asphalt and cement. While not currently cost effective in many cases, pervious pavement is also a promising new material for green roadways. Material use is just one example of many types of advancements in sustainable transportation infrastructure.
While new infrastructure and inputs are important, improvements to existing infrastructure are also vital in the creation of sustainable transportation infrastructure. Efforts should be made to improve the efficiency of operations in existing systems, which offers a more cost effective and immediate alternative to new transportation infrastructure investments. The optimization of traffic signals for maximum vehicle flow can result in a significantly reduction in waste fuel by cars sitting in congestion. On a larger scale, programs like the Chicago’s Green Alleys initiative have the potential to drastically improve existing transportation infrastructure through the application of new environmentally friendly strategies.

### Chicago – Chicago Green Alleys

#### Transportation Infrastructure

Chicago is using innovative techniques to green its extensive alley network of nearly 2,000 miles. Due to problems from flooding and stormwater runoff, Chicago has decided to retrofit its alleys with permeable pavements and infiltration basins. The new pavements will also reflect heat helping the area around it to stay cool during the summer and be made out of recycled materials.

**How It Works:** Green Alleys is part of CDOTs green infrastructure initiative. The higher costs for construction are offset by savings on maintenance and sewer improvements.

**Results:** Since the program began as a pilot in 2006, more than 80 Green Alleys have been installed.

**See Also:** Portland Traffic Signal Optimization Project, Chattanooga Recycled Asphalt In Pavement, Indianapolis Recycled Tires in Pavement


### Additional Resources

- Center for Transportation Excellence
- Transportation for America
- American Public Transportation Association

#### 3.4 Energy Management

Energy management is perhaps the most identifiable issue of sustainable development. The continuous excessive and inefficient use of energy has severe negative impacts on our environment, both seen and unseen. When energy related problems do arise, they directly affect the services and comforts of city residents and the course of day-to-day activity. While these problems on the surface take the form of skyrocketing fuel costs and rolling blackouts, they have far reaching underlying implications. The unseen component of energy management is the use of a limited supply of non-renewable resources, American dependence on foreign oil, and climate change. With these issues
continually coming to the forefront of the political and social arena, the development of sustainable energy efforts have increased at an unprecedented case over the past decade. Energy related sustainable development goals include reduced consumption and the conservation of resources, exploration of alternative energy sources, the advancement of energy efficient technologies, and a shift in energy policies to facilitate these advancements. These efforts have far reaching environmental, economic and social implications.

While sustainable energy markets have been largely driven by the private sector, local governments and cities have a crucial role to play in this process. Many municipalities operate or work closely with utility companies that provide energy and they can have an influence over what type of energy is provided and how it is provided. Local leaders must encourage businesses and residents to make energy related decisions with a long-term focus. In cases where this is unlikely, measures should be taken to incentive clean energy or regulate less favorable options. Until private markets start addressing these issues through cap-and-trade structures or other similar programs, local authorities should use policy as a tool for leveling the playing field for energy sources.

“The problem with energy technology is that you’re always competing against an existing cheap alternative. Those lights are already there. If you don’t have the government stepping in to level the field by making the dirty light more expensive and the cleaner one cheaper, it’s going to take a very long time to actually make that transition.”

- Thomas Friedman, November 11, 2008

Just as the urban form of today can be directly traced to planning and growth policies of the previous decades, the energy infrastructure of tomorrow is dependent upon decisions made today. These decision should be made in a manner that best positions cities and regions to provide cheaper, cleaner and more sustainable energy in an efficient manner. Policy must be used as a tool to facilitate this transition from existing technologies to new, innovative, cutting edge programs and practices. As Thomas Friedman suggests, one of the primary roles of the government in relation to sustainable energy is to level the playing field. The issue of sustainable energy in an urban setting can be subdivided into three main divisions: alternative energy sources and fuels, energy efficient, and energy policy and financial systems.

**Alternative Energy Sources**
Alternative energy source and fuels offer the potential to reduce pollutant emissions and fuel consumption. Solar, wind, biomass, tidal, and geothermal energy sources provide cleaner, alternative energy than traditional fossil fuels sources. Each option offers advantages and disadvantages and the technologies must be addressed in terms of a life-cycle assessment. Solar power involves the conversion of sunlight to heat using photovoltaic technology to convert sunlight into electricity. Along with being a renewable energy source, solar power releases no water or air pollution. However, solar panels require high initial costs. Similarly, wind power does not produce air or water pollution. Common disadvantages cited with wind farms are noise pollution and that it is
a variable source of energy in that it is dependent upon the wind, which may or may not be blowing.

Biomass and biofuels involve the use of garbage and other renewable resources in the generation of electricity. The two main advantages of biomass are that it is abundant and most production methods cause little effect on the environment. On the other hand, the direct combustion of carbon-based fuel leads to air pollution similar to that from fossil fuels. Secondly, biomass energy produced from corn or other vegetation leads to competition of land use for food and water use. Tidal energy is another source of clean and renewable sustainable energy. Its primary advantages are that it is reliable, cheap to maintain, and produces no waste or pollution. In terms of disadvantages it impacts the habitat along the coastline, it traps dirt or pollution along the coast for longer periods of time than under natural conditions, and it needs a large area of sea to be cost effective. Finally, geothermal power offers the advantages of taking up less land than other alternative energy sources and requiring very little energy to run after building the station. The large drawbacks with geothermal power are that the locations where stations can be built are limited due to required conditions and sites may sometimes “run out of steam” perhaps for long periods of time.\textsuperscript{xxv}

Just as transportation management cannot be focused solely on automobiles, energy production cannot be focused completely on fossil fuels. While not perfect, alternative energy sources have positive long-term impacts. They should be used in integration with one another to maximize these benefits. This should be done in terms of both distributor and supply side management. The difficulty is in determining how to best mix and match sources and fuels. Three examples of cities successfully utilizing renewable energy operations include Chicago’s city boilers and natural gas program, Los Angeles’s Green Power for a Green LA, and San Francisco’s solar power facility at the Moscone Center.

### San Francisco, California – Solar Power System

#### Renewable Energy
San Francisco’s Monoscone Center features the largest municipal owned solar power system in the U.S. at 60,000 square feet. It’s 5,400 solar panels provides 826,000 kWh annually, which is equivalent to powering 184 homes for a year, removing 7,000 cars from the road, or foregoing 88 million vehicle miles traveled. To complement the solar power, other energy efficiency measures were also made including lighting upgrades,

#### How It Works: The project was funded by the Mayor’s Energy Conservation Account, which was established in 2001. It also received rebates from the California Public Utilities Commission and the California Energy Commission. The project required an initial $8 million investment.

#### Results: Since completion in 2004, the solar power system has generated a $600,000 annual savings in energy and a CO2 reduction of 1,000 annual tons.

Also See: Chicago City Boilers and Natural Gas, LA Renewables, Austin National Renewable Energy
Energy Efficiency - Retrofits
In the discussions of energy efficiency, substantial focus must be placed on the existing building stock to encourage owners to invest in retrofitting. Given that buildings account for 40 percent of greenhouse gas emissions in the U.S., doing so can be the difference in a municipality reaching targeted emission reduction levels or lagging behind. Additionally, it allows for buildings to save money and energy. In most cases, incentives must be used to encourage building owners who are not sure how long they will be located in a building to take on more debt and invest in the property. On the other hand, programs encouraging smaller investments in energy efficiency appliances can also be beneficial in reducing energy use. Additionally, building commissioning can identify significant saving opportunities. There are many programs such as the Energy Efficiency Retrofit Program under the Clinton Climate Initiative that offers support for cities seeking to encourage energy conservation in their community.

Houston, Texas – Energy Retrofitting Program

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<td>In operation since 2006, Houston’s retrofitting program has significantly reduced energy consumption in over 640 poorer communities. The program offers free simple solutions such as weather stripping windows and doors, insulating attics and hot water pipes, and caulking windows.</td>
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<th>How It Works:</th>
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<td>The city partnered with CenterPoint, the local electricity provider, and the Houston Advanced Research Center to implement the program. CenterPoint paid for the retrofits and expected a two year payback period.</td>
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<td>The program has cut CO2 emissions by 1,100 tons annually and produced average savings on energy bills of $870 a year. Energy consumption has been reduced 48.6 percent.</td>
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<td>Sacramento Municipal Utilite District Cool Roofs Program, Portland General Electric Commissioning Program</td>
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<td><a href="http://www.c40cities.org/bestpractices/energy/houston_weather.jsp">http://www.c40cities.org/bestpractices/energy/houston_weather.jsp</a></td>
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Energy Efficiency – Lighting Systems
Energy efficient lighting programs are beneficial in reducing energy costs and improving efficiency. While energy efficient lighting is beneficial at the individual building level, when taken to a larger municipal scale, the benefits can be significant. For example, street and signal lights account for 40 percent of the Minneapolis electricity budget. Many cities including Ann Arbor, Chicago and Portland have by up to 85 percent by
replacing traffic lights and streetlights with LED lights. According to the Energy Savings Trust, LED lights use 10 percent of the power of a standard incandescent light bulb.xxvii

### Ann Arbor, Michigan – LED Lighting

**Energy Efficiency - Lighting**

In 2005, a citywide LED initiative became an integral component of Ann Arbor’s Energy Fund. Along with using less energy, LED lighting lasts significantly longer than traditional bulbs. The City currently has converted 1,640 fixtures.

**How It Works:** The city is working closely with local utility owners and operators to determine how to best cover the higher up front costs. Two potential options are the Municipal Energy Fund and a street lighting tariff from the Michigan Public Service Commission.

**Results:** The City estimates an energy savings of 50-80 percent with annual financial savings of $160,000 from its traffic and streetlight LED program.

**Also See:** Portland, Chicago, Lexington, Syracuse, Raleigh, Seattle’s City Light’s Energy Smart Services

**Sources:** [http://www.c40cities.org/bestpractices/energy/annarbor_fund.jsp](http://www.c40cities.org/bestpractices/energy/annarbor_fund.jsp), [http://www.nycclimatesummit.com/casestudies/lighting/lighting_annArbor.html](http://www.nycclimatesummit.com/casestudies/lighting/lighting_annArbor.html)

### Policy and Financial Incentives

There are other examples of local governments relying on policy and financial incentives to facilitate energy efficiency. In terms of energy generation, Renewables portfolio standards, RPS, provide an example of policy-oriented approach to addressing energy efficiency. RPSs require that a certain percentage of a utilities energy sales or new generating capacity be derived from renewable resources. Cities with their own authority over electric utilities can adopt their own RPS policies. In other cases, city governments should encourage RPS adoption by the state.

### Austin, Texas – Austin Energy 2003 10-year Strategic Plan

**Renewable Energy Policy**

Behind efforts dating back to 1999, Austin continued its shift toward renewable energy in 2003 by establishing a targeted renewable portfolio standard of 20 percent by the year 2020 with a specific commitment to 100 MW of solar. Following the adoption of the Mayor’s Climate Protection Plan in 2007, a resolution increased the target to 30 percent and set a green power purchasing procurement of 100 percent for municipal facilities by 2012.

**Results:** According to Austin Energy, in 2007, 5.8 percent of its retail electricity sales were from renewables with solar generation totals of 1.6 MW.
Financial incentives include direct incentives, low-interest programs, income and investment taxes credits, property tax financing, property tax incentives and expedited permitting and fee waivers. Financial incentives should be used as a tool for addressing the issue of individual costs and shared benefits. For example, it is estimated that photovoltaic solar energy can supply 30 percent of the necessary energy for a household that would otherwise be provided by the power plants. While the individual takes on the costs of the investment, the benefits are shared among the utility and the community.

### Albuquerque, New Mexico – Energy Conservation Code

**Energy Financial Incentives**

Albuquerque’s Energy Conservation Code came about from the Albuquerque Green program started in 2007. The codes were established working closely with multiple community stakeholders and are designed to reduce greenhouse gas emissions by requiring buildings to be more energy efficient. Among the provisions, commercial and multi-family development must be 30% more energy efficient than in the past, while single-family dwellings are required to use more efficient HVAC and lighting systems. The goal is to achieve carbon neutrality for all Albuquerque buildings by the year 2030.

**Sources:** [http://www.cabq.gov/albuquerquegreen/pdf/volumeI.pdf](http://www.cabq.gov/albuquerquegreen/pdf/volumeI.pdf)

### Additional Resources: Sustainable Solar City DOE Report, ACEE.

### 3.5 Waste Management

“In 2006, Americans recycled 32.5 percent of municipal solid waste, which prevented the release of 52 million metric tons of carbon equivalent – the same as taking 41.2 million cars off the road.”

- EPA, Local Government Recycling Program

The amount of waste produced in a city is considerable and its proper disposal is one of the most pressing problems a city has to handle. In general, this problem has been magnified over time as waste generation has increased while available landfill space in proximity to urban areas has decreased. Most solid waste systems are designed to suck waste into landfills. However, landfills pose hazards to air and water quality as biodegradable materials break down into CH₄ and CO₂. They also have negative affects on real estate values and renders landfill sites non productive for other uses. Waste incineration also poses serious environmental risks from greenhouse gas emissions and other air quality concerns. Additionally, waste disposal carries significant costs in terms
of collection and transportation. In many situations, waste transportation is extremely problematic, as municipalities are having to ship waste long distances to available landfills. The situation necessitates change through both new methods to treat waste and new practices to not generate as much. Furthermore, innovative programs and technologies are allowing for the conversion of garbage and other waste materials into usable energy. Waste is being converted from an economic and environmental bad into a commodity.

Sustainable development promotes the recycling, composting and reuse of waste. Not only should waste be diverted from landfills, but also it should be utilized as a source of value. Innovative municipal efforts and joint public-private ventures offer excellent ways to increase recycling, capitalize upon emerging conversion technologies, and find new sources of funding to address waste management. The future of sustainable urbanism and waste management are zero waste programs that contribute beyond their primary purpose.

Recycling
While many communities face the challenge of making recycling cost-effective, there are strategies that can be taken to improve efficiency and have the programs make economic sense. Fostering communication and public awareness through the exchange of information regarding available programs and opportunities to participate in those programs for households, businesses, and other organizations is a crucial step toward building a strong recycling program. Beyond marketing, have a thorough understanding of generation amounts by source so that resources can be allocated appropriately. Also, innovative programs such as pay-as-you throw incentives can boost interest and recycling rates. Programs should also make an effort to work with schools and businesses. Some common programs to boost recycling figures include curbside recycling, garbage fee collection, sorting stations at landfills, enforcing a cradle-to-cradle policy, and refusing to pick up certain items such as tires, batteries, and paints. Additionally, some communities such as San Francisco, Los Angeles and New York City have decided to ban items that prove problematic when it comes to recycling including plastic bags. Other cities like Boston and Ann Arbor are imposing an extra tax on items such as bottled water. Along with the strong environmental benefits of recycling, these programs are also valuable for job creation.

Composting and the diversion of food waste and natural materials also play a critical role in waste management. The EPA estimates that 24 percent of solid waste in the U.S. is made up of yard trimmings and food waste. Recycling programs that fail to address composting a significant portion of waste that could be diverted from landfills. Educational programs must instruct citizens what types of composting materials will be accepted and if they will be collected through a pickup program or at a drop off location. After processing, composting can then be sold to enrich soils, control erosion, or for landscaping purposes.

Conversion Technologies
Anaerobic digesters, methane recovery, and biomass gasification are just several of the examples of various methods being used to convert waste into fuel. In many cases these methods make financial and practical sense. They mitigate landfill pollution, reduce greenhouse gas emissions, and lower energy costs. In economic terms, they have the potential to minimize waste transportation costs, generate income from the energy processed, and extend the life of the landfill.

**King County, Washington – Digester Gas Fuel Cell Project**

**Waste-to-Fuel Conversion Technologies**

Launched in 2004, King County, which is near Seattle, successfully became the first project demonstrating the generation of 1 MW of electricity from a fuel cell power plant run on digester gas, a byproduct of anaerobic digestion of wastewater solids. During the second year of operation, a heat recovery unit was added to recycle waste heat generated by the plant. The two sources generate almost zero emissions. The pilot project is being monitored to record more accurate data on digester gas fuel cell technology. As costs for technologies like this continue to decrease and efficiency in fuel cell technologies increase, similar plants could be pivotal in providing renewable energy with minimal environmental externalities.

**How It Works:** The project was a partnership between King County, the EPA and FuelCell Energy, Inc.

**Also See:** Toronto Keele Valley Landfill Methane Capture

**Source:** [http://www.c40cities.org/bestpractices/waste/kings_gas.jsp](http://www.c40cities.org/bestpractices/waste/kings_gas.jsp)

**Zero Waste Programs**

The latest goal in waste reduction is to become a zero waste community. San Francisco and Austin are two cities leading the way in this pursuit. San Francisco currently recovers 70 percent of waste. Its goal for 2010 is to reach 75 percent, which would put it on its way to reaching zero waste by 2020. City officials are implementing a plan to encourage cooperation from manufacturers and distributors who would have to adjust their products and processes in order to allow the community as a whole to reach the goal. Austin’s Zero Waste by 2040 campaign established a goal of reducing the amount of waste sent to landfills by 90 percent by 2040 through facility improvements and public outreach efforts.

**Additional Resources:** National Recycling Coalition, Recycle America

**3.6 Water Management**

The sustainable management of water through conservation measures and efficiency improvements can better position a community to provide for future demands. Given current problems of aging infrastructure, increasing levels of water pollution from stormwater runoff and other chemicals, and watershed impairment from development, it
is important for city officials to plan for quality and quantity controls. Sustainable development attempts to reduce demands on water through improving water efficiency of infrastructure and treatment facilities, reduce potable water use through conservation programs and blackwater and greywater systems, and control water quality by managing stormwater runoff and other pollution causing processes.

BMPs and Low-Impact Development are two strategies for minimizing the effects of development on water quality and stormwater runoff. They promote the use of tools such as green roofs, detention basins, bioswells, and other systems that allow for increased infiltration or the reclamation of water for non-potable uses like landscaping and the flushing of toilets. Furthermore, they promote the minimization of impervious surfaces, which decreases the amount of pollutants carried by stormwater into streams and the water treatment system. Minimizing these pollutants lowers the cost of water treatment for municipalities.

### Austin, Texas – Water Efficiency Program

**Water Efficiency**

Austin’s water efficiency initiatives dates back to 1983. Today’s program includes a wide variety of services including the Free Toilet Program, the Toilet Rebate Program, the WashWise Rebate Program, free irrigation system audits, rainwater harvesting system rebates, commercial process improvement rebates, a tiered rate structure, and many marketing and educational programs. Additionally, the city has a Water Use Management ordinance with three stages of restrictions.

**Results:** While Austin’s water efficiency program has been very successful, in 2006 the City Council recognized the need for even further conservation and targeted additional increases of one percent per year for the until 2016. The current total annual financial savings of the program is $31.7 million with CO2 reductions of 8,230 tons.

**Application:** Based on Austin’s program, changes in water rates and plumbing and development codes have produced the most water savings with least investment of resources.

**Source:** [http://www.c40cities.org/bestpractices/water/austin_conservation.jsp](http://www.c40cities.org/bestpractices/water/austin_conservation.jsp)

### 3.7 Urban Forestry and the Greening of Cities

Urban forestry and the greening of cities offer many environmental benefits. Along with obvious aesthetic benefits, they improve air quality through carbon sequestration, protect natural water systems, save energy and improve economic sustainability. Additionally, urban trees extend the life of paved surfaces, increase traffic safety, and enhance real estate values. Many of these benefits go unnoticed due to the difficulty of putting a value on landscaping. Others have been demonstrated, but are not well known. For example, through the proper placement of trees, homeowners can realize savings of
up to 58 percent on their daytime air conditioning. In terms of improving economic sustainability, studies have shown that trees attract businesses and tourists, people linger longer at shops along tree-lined streets and apartments, and offices near wooded areas rent more quickly and have higher occupancy rates. Urban forestry and the greening of cities is an essential component of a healthy and vibrant urban ecosystem.

Many urban forestry programs receive national and regional assistance, but given the range of benefits that the greening of urban settings has to offer, planners and local authorities must still ensure the promotion of urban forestry and the greening of public infrastructure. The primary means for doing so is through inclusion in municipal policy agendas.

**Ithaca, New York**

**Urban Forestry**

Ithaca, Tree City USA, utilizes innovative techniques and partnerships with Cornell University and citizen groups to most effectively operate its urban forestry program. Programs include a progressive tree and shrub ordinance, a master plan and inventory, a citizen pruners group, an award winning volunteer based bare-root tree planting cooperative, and several initiatives to protect endangered areas.

**Also See:** Kansas City Regional Policies for Green Infrastructure, Baltimore County MD
Chapter 4. Conclusion

The application of sustainable development has the potential to reshape our cities into more environmentally friendly, economically sound, and socially equitable places. Sustainability is no longer a fringe issue. Sustainable development is undergoing a transformation from rough concepts and languages to a plethora of practical applications in urban context. These applications promote the efficient use of limited resources. They allow for the more effective management of common assets and do so in a financially sound, restorative way. Their results are quantifiable. They aim to improve quality of life through the rethinking of city management and service provision. These innovative local strategies are what ultimately define a sustainable city.

Given the current expansion of innovative programs and policies in municipalities across the U.S., showcasing how some cities are meeting the sustainability agenda can provide valuable models for others to use as well. These models display demonstrated benefits, with measurable economic and environmental savings. Furthermore, many are self-sustaining programs and create their own budget out of the money saved through their programs. Given the continually demonstrated benefits of these programs, cities that want to best position themselves for long-term prosperity cannot afford to overlook the opportunities of sustainable development.

4.1 Characteristics of Successful Programs

While generic solutions are not always befitting for every situation due to the complexity of city systems, an examination of best-case practices provides valuable insight revealing shared characteristics among the most successful sustainability related programs and policies. When addressing problems and weighing potential solutions, it is essential to take a whole systems, integrated approach. Not only will policy and program decisions have implications across city systems, but in many cases, they can be significantly improved through interdepartmental coordination. Cooperation between city departments, other levels of government and quasi-judicial organizations adds depth to a program in terms of resources, information, and financing options and can significantly expand its reach in a community. Forging strong working relationships with local energy and water utilities presents many options for instituting efficiency incentive programs and funding opportunities for energy efficient equipment. Being aware of and taking advantage of regional, state and federal programs can be a great source for funding and operational support. Many grant sources, loan programs, and other financial resources are administered through state and federal programs.

Along with utilizing other local governmental organizations, it is essential to reach out to public citizens and the business community for input and support. Along with gaining the expertise of local subject matter experts, citizen involvement is essential in developing a shared vision for programs and policies. Giving local residents a stake in the planning process significantly improves awareness and participation levels. Another
key to success is the creation of communication and marketing campaigns to ensure that communities are educated regarding issues impacting their quality of life and the programs that are being put in place to address them. Leveraging relationships within the business community is also key in increasing participation in programs. This is especially the case with recycling and alternative transportation programs where employers can offer incentives to encourage beneficial behaviors.

Strong relationships should be balanced with strong and directed leadership. It is essential that sustainability leaders establish clear and attainable goals with a set of measures necessary to achieve them. Finally, all successful programs require strong political will. Politically and economically, we like to find something that works and use it forever. In many cases, it takes strong leadership or an emergency to overcome this political and social inertia. Public officials must be proactive and address issues before they reach a point of disaster. Sustainable urbanism presents proven opportunities for addressing problems relating to energy, air quality, water quality, mobility, and waste before they reach a tipping point.

4.2 Next Step

Improvements must continue to be made in monitoring and the measurement of sustainability. The ability to put an exact figure on savings in financial, environmental and social terms is instrumental in promoting the increasing implementation of sustainability practices in cities.

Additional research into the role that city and regional characteristics play in the development of sustainable urbanism could provide valuable context for local level programs. City size, stage of development, economy, consumption patterns, political leadership, public health, and other characteristics all have large implications on the need for and outcome of programs and policies. Furthermore, regional differences in issues such as climate can significantly impact regulations, codes and standards. Understanding the inferences of these differences will play an important role in successfully implementing models of sustainable development.
Appendix

i http://www.usmayors.org/climateprotection/2007summit.htm
ii http://www.climatechangecommunication.org/images/files/Climate_Change_in_the_American_Mind.pdf
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