

Sustainable Cities

**How Communities Can Implement Solutions to Generate
Environmental Benefits**

Prepared by



THE SHPIGLER GROUP

STRATEGY MANAGEMENT CONSULTING SERVICES

Sustainable Cities: How Communities Can Implement Solutions to Generate Environmental Benefits

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- Water
- Telecom
- Smart Cities

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Executive Summary

In his State of the City address in 2019, Los Angeles Mayor Eric Garcetti laid out a vision for the city's sustainability, including a vision that featured:

- Recycling 100% of its wastewater by 2035
- Achieving 100% renewable electricity by 2045
- Mandating that every home, store, and office be carbon-emissions-free by 2050
- Creating 300,000 clean new jobs by 2035

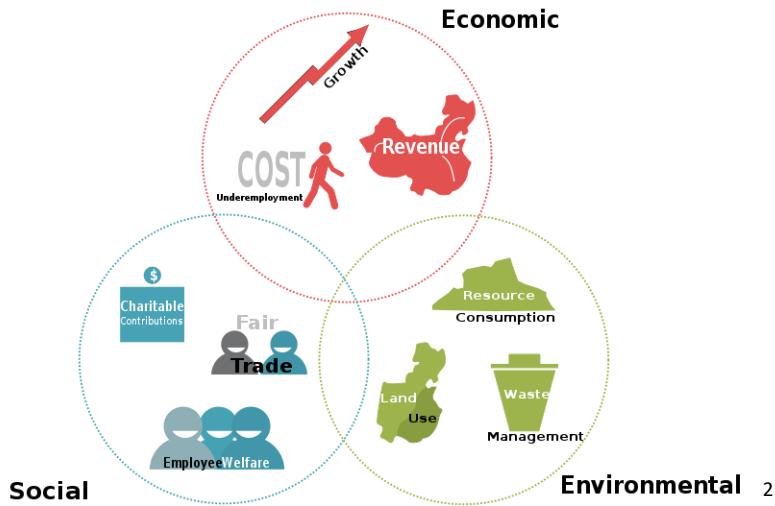
Los Angeles is certainly not alone in promoting a mission to champion sustainability. This vision aligns with many of the sustainable efforts being conducted across the United States and across the world. More than ever, cities have become the front lines for attacking the key issues of climate change, renewable energy, and pollution control.

On an ever increasing basis, cities – large and small – are deploying programs to address the issues associated with sustainability. With a variety of emerging technologies that address some of the key elements of sustainable planning, cities have more options available to them on this front than ever before.

However, questions still remain regarding the viability of sustainability efforts for many communities, especially smaller ones. Nevertheless, with careful planning, each community can develop a plan that suits its requirements and resources.

The Sustainable Framework

In 1994, business writer John Elkington coined the phrase, the “Triple Bottom Line”, to illustrate the potential for businesses to adopt a new framework, one focused on three different elements – social, environmental, and financial.¹ Rather than solely focusing on traditional economics alone, a number of businesses began to factor in the impacts associated with social and environmental effects of policies and decisions as a way to guide corporate decision making.



While the movement has had some degree of impact within the business sector, where we see an increasing amount of adoption of the concept is within the municipal sector. Today, a rapidly increasing number of cities – large and small – are running with the concept under the label of sustainability. The issue of sustainability has become more of a source of focus as environmental concerns have become heightened at the same time that global urbanization continues to climb. Today, 55% of the world is estimated to be living in urban areas and the United Nations estimates that by the year 2050, that number will rise to 68%.³ In the United States, the percentage of urban area dwellers is already at 80%.

There is no singular definition of what a sustainable city entails, but there are certain elements that tend to be looked upon as part of sustainable city initiatives:

- Minimizing required inputs of energy, water, food, waste, heat output, air pollution/CO₂, methane, and water pollution
- Sustainable reliance on the surrounding natural environment

¹ “Triple Bottom Line”. (November 17, 2009). The Economist.

² Wikimedia Commons.

³ “68% of the World Population Projected to Live in Urban Areas by 2050, Says UN”. (May 16, 2018). United Nations, Department of Economic and Social Affairs.

- Increased adoption of renewable energy resources
- Enabling a smaller ecological footprint
- Supporting a decrease in the risk of climate change
- Supportive of a community that is equitable, diverse, connected, democratic, and provides a good quality of life
- Able to meet the needs of the present without sacrificing the ability of future generations

The drive to support sustainability among cities continues to grow. As municipal entities struggle with how to address competing demands among poverty, hunger, resource consumption, and biodiversity loss, hard decisions need to be made. For many communities, the decision centers on the choice to champion sustainability.

Case Studies

As communities consider how to develop sustainability efforts of their own, there exist opportunities to leverage lessons learned from cities that have already started on the path. Below are some examples of cities with notable sustainability initiatives:

San Francisco, CA

San Francisco, along with the surrounding Bay Area, embodies the concept of high-tech. Serving as the home to some of the world's most innovative companies in the world (e.g. Google, Salesforce, Airbnb, Uber, Twitter), the region certainly provides a fertile ground for sustainability. Already, the city has positioned itself as a leader in sustainability and clean energy through adoption of new technologies in facilitating building energy efficiency and transportation. The city has adopted a city-wide fleet of hybrid-electric buses and over half of the buses and light rails are zero emission.

In addition, San Francisco and the entire Bay Area have achieved significant gains in water conservation. Given the drought conditions for much of California, San Francisco residents have reduced average daily water intake to 49 gallons per day, nearly half of the national average. In addition, the city has adopted a variety of conservation tactics, including advances in sustainable food, recycling, and composting. The city has established legislation to achieve a goal of zero waste to landfills; the current level of waste diversion is already at 80%. Two innovative programs in particular aid in this endeavor⁴:

- RecycleWhere is a collaboration among local governmental agencies (San Francisco, Palo Alto, San Jose, Contra Costa, and Alameda) to reduce waste by using open source software and an open data model to provide localized and accurate results
- San Francisco residents can make their own compost, recycling, and landfill signs for their home or business with the Zero Waste Signmaker

San Francisco has also drastically reduced greenhouse gas emissions by powering 41% of its requirements through the use of renewable energy. This has been facilitated by a wide range of programs:

- SF Energy Map is a tool that tracks the solar and wind installations across the city, enabling any resident or business to go to the website to see solar potential for their own roof and access existing rebates
- Energy Use Challenge is used to enhance programs and policies that promote energy efficiency

⁴ "Designing a Smarter, More Sustainable San Francisco". SF Environment.

- Honest Buildings is an online portal that informs property owners, managers, and tenants about their building's performance and provides the most effective energy-efficiency strategies to help them reduce utility costs
- The San Francisco Municipal Transportation Agency (SFMTA) established SFpark to use new technologies and policies to improve parking in San Francisco by collecting and distributing real-time information about where parking is available so drivers can quickly find open spaces
- San Francisco currently has 110 public EV charging stations, the highest per capita rate of any city, at 13.5 chargers per 100,000 people

Vancouver, BC

In 2016, Vancouver was identified as the highest ranking city in North America in sustainability.⁵ The city was ranked as the best in air pollution in the world and featured the lowest carbon footprint of any major city in North America. A significant part of that achievement stems directly from the development of the “Greenest City Action Plan” that established ten specific goal areas to achieve the ultimate vision of zero carbon, zero waste, and a healthy ecosystem⁶:

- Climate and renewables – targeting building energy use, transportation fuel use, and waste generated
- Green buildings – improving the environmental performance of buildings throughout the city
- Green transportation – improving quality of life by making Vancouver a city where moving on foot or by bike is safe, convenient, and enjoyable and providing for fast, frequent, reliable, and accessible transit
- Zero waste – diverting waste from landfills
- Access to nature – improving access to green spaces
- Clean water – helping residents and businesses use less water to combat the effects of population growth and climate change
- Local food – enabling a stronger local food system to reduce the environmental impact of food production and transportation
- Clear air – working in partnership with businesses, residents, and other levels of government to achieve clean air targets
- Green economy – developing a green economy to support a healthy and sustainable future
- Lighter footprint – limiting the amount of resources consumed

⁵ Sustainable Cities Index 2016. Arcadis.

⁶ “Greenest City Action Plan”. City of Vancouver.

Vancouver continues to develop new ways to achieve sustainability. As part of its Renewable City Action Plan, the city has committed to getting 100% of its energy from renewable resources by 2050, including all elements of energy within the city.

Seattle, WA

Seattle has long been considered one of the greenest cities in the country, for a variety of reasons:

- The city has long been recognized as having consistently excellent air quality, led by efforts by the Puget Sound Clean Air Agency
- The City of Seattle was awarded the Leading Public Fleet award for their work in government fleet demonstrating leadership in the procurement and deployment of alternative fuels and advanced vehicle technology
- Seattle has been aiming to extend its green spaces, with a target of 30% canopy cover by 2037 and plans to restore 2,500 acres of forest parklands by 2025
- Seattle City Light became the first utility in the nation to become carbon neutral
- The city has added electric forms of public transportation, including two lines of streetcars and light rail
- 700 million gallons of stormwater will be managed by Seattle with green infrastructure by 2025
- Seattle has been experimenting with motivating green construction through various incentive programs
- Seattle recycles and composts nearly 60% of its waste

Seattle has conducted a series of campaigns that collectively promote parallel smart city efforts that include smart economy, smart government, and sustainability. With a rigorous set of programs across the region, Seattle has shown the way to achieve adoption of a wide variety of smart city implementation. Overall, the city has demonstrated significant gains in sustainable site development, water savings, energy efficiency, and enhanced materials selection and environmental quality.

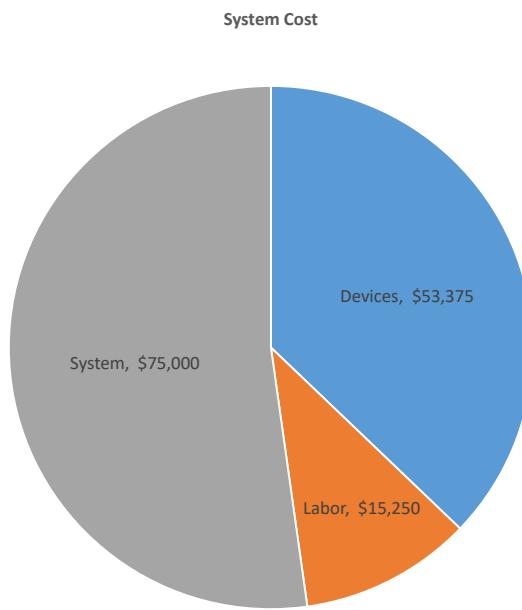
Making the Case for Sustainability

The value proposition for cities is clear – according to a major study by the World Health Organization, the cost of ignoring environmental issues in urban areas has become too costly already⁷:

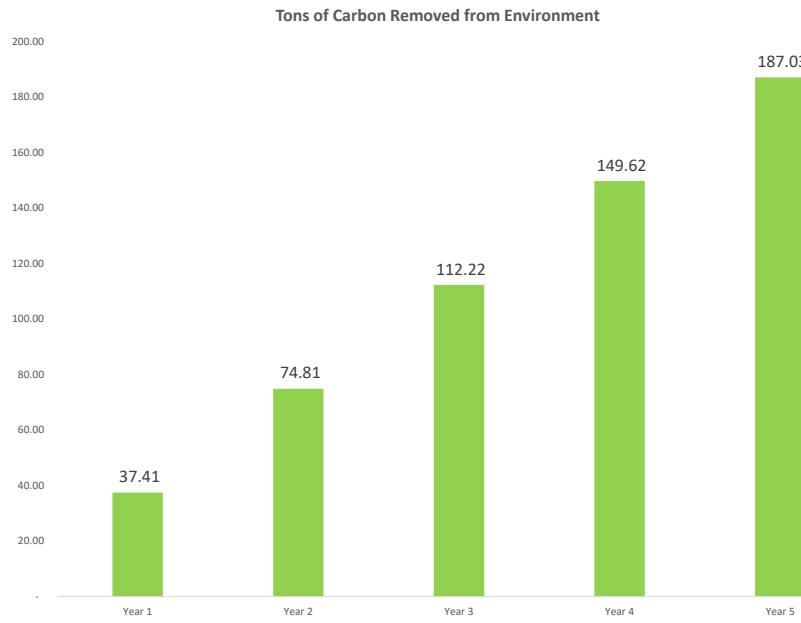
- The air pollution in major cities may reduce life expectancy by up to 22 months
- More than 80% of urban areas reach air pollution levels well above acceptable levels
- Seven million people die every year from the effects of exposure to fine particles in polluted air

However, for many cities, the question is not whether there are benefits associated with pursuing sustainability efforts, but rather how to proceed in a cost constrained environment. With Internet of Things (IoT) capabilities, more and more cities are realizing that the cost of implementing an environmental monitoring system is far less costly – and far more impactful – than in prior years.

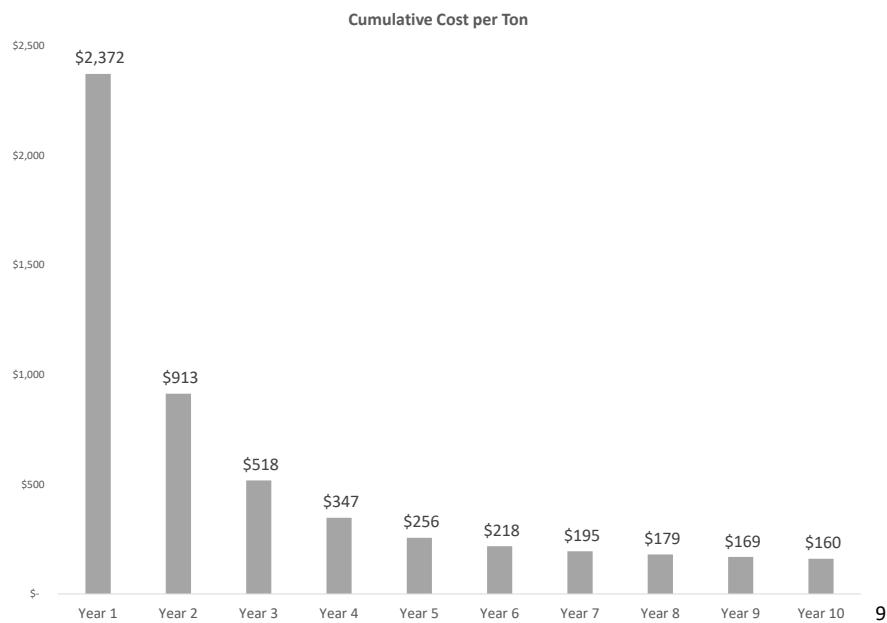
To illustrate this point, consider a city with a population of 100,000 and a legacy industrial base that presents a myriad of environmental concerns. System modeling reveals that proper placement of 305 networked sensors could cover the entire city's footprint. Given current system costs, likely carbon impacts, and financial benefits, the city would experience the following system characteristics over a five-year system deployment:



⁷ "Exposure to Ambient Air Pollution from Particulate Matter for 2016". World Health Organization.



Based on this city's proposed deployment, there exists a potential to deliver a solution to remove 561 tons of carbon from the environment over the five-year deployment period. Assuming the system was carried out for a ten-year forecast and assuming the cost of maintaining the system was set at 15% per year, the total cost of carbon remediation would be lowered to \$160 per ton, well within the range of direct air capture methods that typically cost \$94 - \$232 per ton.⁸



⁸ Mulligan, J., Ellison, G., Levin, K., Lebling, K., Rudee, A. "6 Ways to Remove Carbon Pollution from the Sky". (June 9, 2020). World Resources Institute.

⁹ The Shpigler Group analysis.

Summary

Developing a plan to support sustainability requires a combination of elements – innovation, community buy-in, resourcefulness, and funding. None of these issues are ever in abundant supply everywhere, so careful planning is required. With the right degree of planning, however, cities can in fact create plans that support the needs of the community in a prudent and effective manner.

As the concept of the “Triple Bottom Line” was championed more than a quarter-century ago, cities can now consider how to design programs that effectively combine the elements of economic development, social progress, and environmental responsibility:



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The nature of sustainability in cities continues to evolve, as emerging technologies like autonomous vehicles, solar-integrated roofing materials, and smart transportation systems challenge the definition of sustainability in the future. Nevertheless, with careful planning, cities developing plans today can aid tremendously in achieving their own objectives in a prudent and cost-effective manner.

¹⁰ Waldrop, M. M. “The Quest for the Sustainable City”. (August 27, 2019). Proceedings of the National Academy of Sciences of the United States of America.