WHITE PAPER

Building Sustainable, Resilient and Greener Cities

By Aaron Christensen

The world's population is growing, and drastic climate changes are happening in urban and rural areas alike. To safeguard the environment and provide better living conditions, municipalities and organizations should explore green infrastructure solutions.

In today's rapidly changing world, economic development is critically dependent on sustainable and resilient infrastructure for sectors such as energy, water and transportation. The quality of the transportation system enhances trade of goods and services, and lives of the residents; water supply systems are a driver for sustainable growth; and low-carbon energy systems contribute to better well-being for humans as well as other species by emitting fewer pollutants. All these factors enhance the safety, health and quality of life of the residents.

Technology and innovation have enabled the development of sustainable and environmentally friendly infrastructure. Adoption of new technologies creates new jobs and stimulates economic efficiency. However, balancing economic development with tackling environmental issues is a big challenge faced by municipalities across the U.S.

City and Regional Planning

City and regional planning provides shape and structure to cities, towns and large metropolitan regions. The speed at which population is growing in big cities and metropolitan areas — and the threats of natural disasters and climate changes — calls for extraordinary measures to provide a better, greener and more sustainable world. City and regional planning, also called urban planning, is concerned with the development of communities, and is rooted in public health and wellness. Additionally, it works toward the preservation of natural and environmental surroundings. Several factors play a vital role in the design of the city's infrastructure and safeguarding the community's interest:

- **Electrification:** City planners must concern themselves with more than just providing electricity to residences and industries. They must look for ways to provide a continuous

supply of electricity through greener and renewable sources of energy. Switching to natural gas for heating and cooking allows for a faster transition to 100% renewable and decarbonized energy sources. Planners increasingly must also consider how to support additional loads as transportation transitions to battery electric vehicles, with unique charging patterns among passenger vehicles and medium- to heavy-duty vehicles.

- **Agriculture and secure food supply:** Having access to healthy food is crucial for communities. Expanding agriculture in urban areas or their surroundings would help maintain ready supplies of essential foods, reducing the expense of and emissions related to transporting foods from remote areas to urban cores and suburban communities.
- **Locally sourced water:** Providing access to clean drinking water by installing or upgrading hydration stations at municipal facilities and designing programs to aid on-premise plumbing issues is particularly important as the privatization of water and quality of potable water sources for residents.
- **Green jobs:** These are jobs that help in preserving and improving the environment and natural surroundings. Developing curriculum and adding courses in high schools, colleges, universities and workforce development programs to promote the importance of green jobs will educate the next generation of workers for solar installations, wetland restorations, building efficiencies and urban farming.
- **Renewable energy:** Investing time and money to look at renewable energy sources and energy storage options such as solar, wind, hydro, battery or kinetic energy storage can reduce harmful emissions and provide a healthier environment. Additionally, doing so could help communities get to net-zero, as has been recommended by the Intergovernmental Panel on Climate Change (IPCC) to prevent the worst impacts of a changing climate.
- **Waste/landfill elimination:** Landfills are increasing in big cities because of the rise in waste disposal. Planners could encourage industries to design and employ zero-waste manufacturing and construction techniques to reduce dumping of unwanted material. Additionally, alternate methods such as recycling, composting and anaerobic digestion can be evaluated, wherever possible. Like any capital-intensive process with changing technology, maximizing incentives for alternatives to traditional landfilling of waste would encourage greater adoption.
- **Recycling and reuse:** Recycling 100% of wastewater and eliminating a city's primary sources of harmful emissions occurring from garbage is crucial. Although it cannot be achieved in a short period, planning and implementing solutions such as rainwater harvesting, use of biodegradable material, and recycling plastics and other material can solve this problem. Reusing and incentivizing minimal waste regarding packaging and consumer purchases can be a good option. Food waste is a large contributor to landfills; implementing composting and reducing waste at the source point through programs that give useable food to those in need can be beneficial.

While many governments and municipalities are working toward these goals, it is important to use public participation principles and include community input while creating solutions and gaining buy-in from the communities that will be affected. In many cases, community engagement can go beyond input to empowering impacted communities to create community-led solutions for creating socially sustainable infrastructure. Additionally, there are many institutions that have been doing extensive research to find environmentally friendly solutions, such as EcoDistricts, Institute for Sustainable Infrastructure, U.S. Green Building Council and more. By partnering with such institutions and community members, municipalities can create a better road map and rapidly implement effective solutions.

Urban Greening

One key aspect of these large-scale efforts is the greening of urban environments and parks-poor areas.

There is no doubt that street trees and sidewalk gardens beautify cities and towns. Alongside beautification, green scaping provides several other benefits:

- Cleansing air through photosynthesis, using carbon dioxide to help generate oxygen. Two medium-sized healthy trees, for example, can supply enough oxygen for a single person.
- Provides habitat to birds and other wildlife, allowing them to flourish in urban areas and strengthening the ecosystem.
- Helps mitigate the heat island effect by reducing energy costs for cooling in the summer. Maintaining trees and parks also creates jobs.
- Helps with stormwater runoff from streets and sidewalks and can trap contaminants washing off of the roadways before entering the gutter/sewer system.
- Improves overall health of the residents by providing clean air.

Parks and open green spaces should be set aside or otherwise provided. Neighborhoods are unique and have their own requirements. Public agencies and advocates can work with residents to help in creating park projects that will satisfy the needs of each neighborhood. Parks offer a range of benefits:

- They help in managing stormwater because unpaved ground absorbs water quickly, reducing the expenses.
- Urban areas include many features made of concrete, which absorbs heat. Increasing the number of parks in the neighborhood can counterbalance this effect drastically.

- Open spaces provide places for people to socialize, organize events, exercise and feel connected with nature.

Case Studies

Green Alley Initiative

With Los Angeles facing the effects of climate change — rising temperatures, pollution and flooding — the city launched its sustainable city plan in 2015. The goal: a Los Angeles that would be environmentally healthy, economically prosperous and equitable in opportunity for all during the coming 20 years. The plan focuses on short-term results and long-term goals that will transform the city.

As described in the plan, key principles of this initiative include:

- A commitment to the Paris Climate Agreement and to act urgently with a scientifically driven strategy for achieving a zero-carbon grid, zero-carbon transportation, zero-carbon buildings, zero waste and zero wasted water.
- A responsibility to deliver environmental justice and equity through an inclusive economy, producing results at the community level, guided by communities themselves.
- A duty to see that every resident can join the green economy, creating pipelines to well-paying green jobs and a transition to the changing work environment.
- A resolve to demonstrate the art of the possible and lead the way, walking the walk and using the city's resources to drive change.

American Society of Civil Engineers (ASCE) international conferences on sustainable infrastructure (ICSI) highlighted the Greater Los Angeles regional commitment to finding solutions to sustainable infrastructure. As a part of this, the ICSI conference in 2019 focused on creating impacts to the region in a meaningful way that carried forward after the conference was over. One example included developing an initial green alley design that would meet or otherwise align with the plan. The proposed design would transform the alley between the Watts Civic Center, Kaiser Permanente and Children's Institute properties into a connecting, sustainable, active green space for the community and is still in progress. This location is critical because it is:

- In the most densely populated community in LA with subsidized low-income housing.
- Adjacent to several community resources including the Ted Watkins Memorial Park.
- Near major transportation corridors including Interstates 105 and 110; the Metro A Line, formerly Blue Line; and the Alameda Corridor.

La Metro

Los Angeles County Metropolitan Transportation Authority (LA Metro) is a leader in maximizing transportation efficiency and performance while minimizing energy consumption, waste and pollution. While a new tax revenue will fund these transportation improvements, the various projects will need environmental resources and sufficient experience to achieve the desired impact.

Burns & McDonnell is providing environmental compliance and sustainability support services for LA Metro. As it connects thousands of passengers daily to destinations throughout the region, we are helping implement sustainable solutions for new rail routes and bus stations.

In 2020, LA Metro named its first-ever chief sustainability officer to secure its $140 billion infrastructure program and its 28 transportation and transit projects that must be completed by 2028, when the city will host the Summer Olympics. The addition of this position allows LA Metro to continue building on its commitment to deliver climate adaptable and resilient projects as part of its Climate Action and Adaptation Plan.

Our team was asked to support this chief sustainability officer and LA Metro's Environmental Compliance and Sustainability Department (ECSD), as well as its ongoing transportation operations and new capital projects with qualified personnel, processes and innovative tools needed to deliver stakeholder value.

These solutions focus on minimizing environmental impacts through their design, construction and operations. We are providing support to develop sustainable infrastructure solutions through:

- Hazardous waste, stormwater, air quality and geographic information system (GIS) consulting
- Project management and project controls
- Civil, environmental and transportation engineering
- Environmental construction, design, planning and analysis support
- Sustainability support
- Stakeholder communication, including education and outreach

Low-Impact Green Infrastructure Initiative

In 2010, to meet the requirements of the Clean Water Act, the City of Kansas City, Missouri, entered into a federal consent decree to complete a series of projects to reduce combined sewage overflows that were happening 35 times annually on average. The improvement costs are estimated at $4.5 billion over 25 years, which would require completing and implementing the control measures by 2035.

Improvement projects included piloting green infrastructure technologies in the Middle Blue River watershed. Burns & McDonnell was hired design green infrastructure to manage stormwater before the runoff reaches the combined sewer system, with the

goal to reduce the frequency of overflows within this watershed. The resilient design included integrating bioretention into existing parks and boulevards in combination with more traditional gray stormwater infrastructure to provide a stormwater solution for the project area.

Upon completion of these improvements, the sewer system did not experience more than six overflow events per year, captured more than 96% of wet weather flows within the basin, and helped the city meet the terms of its consent decree. Additionally, the new green infrastructure features allowed for increased pedestrian traffic and more visually appealing community amenities and educational opportunities.

Conclusion

Having a green infrastructure policy and a robust plan can help in executing green infrastructure projects successfully. Philadelphia and New York City have demonstrated leadership by creating massive green infrastructure projects. Philadelphia has committed to invest $1.2 billion in the next 25 years for such projects. These projects will help reduce harmful emissions, create more jobs and provide healthier living conditions for the community. It also helps pave the way to a carbon-neutral future that could help reduce the number or severity of further catastrophic weather events attributable to climate change.

A city's infrastructure helps attract businesses and tourists, boosting the city's economic development and enhancing the quality of life for its residents. Municipalities should revisit their policies on greening of urban environments and consider working with specialists who can provide sustainable and cost-effective solutions.

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