BECOMING GREENEST Recommendations for a More Sustainable Washington, D.C.

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EXECUTIVE SUMMARY

Washington, D.C. leadership has requested input from a range of organizations as it develops a new "unified vision" and "comprehensive framework" for a more sustainable Washington, D.C. The end goal: to connect sustainability with economic development and become the number-one, most sustainable city in North America. Washington, D.C. is currently ranked eighth in a recent Economist Intelligence Unit report sponsored by Siemens.

As part of this process, the American Society of Landscape Architects (ASLA) polled members from its Potomac, Northern Virginia, and Southern Maryland chapters and incorporated their input into a set of bold recommendations in the priority areas identified by the city government. Because the categories of recommendations will be evaluated by different D.C. agencies, recommendations are repeated when appropriate and relevant. Among them:



ENERGY

Reuse brownfields as solar energy farms. Through revised building codes and local tax incentives, expand use of smart tree placement and green roofs and walls. Reduce building energy use through green infrastructure. Incentivize the use of rooftop solar panels.



CLIMATE CHANGE / MITIGATION

Reduce total greenhouse gas (GHG) emissions by expanding urban park land, further improving bike and pedestrian infrastructure, incentivizing the growth in the number of bicycle and pedestrian commuters, creating highly walkable pedestrian-only areas, and introducing new innovative forms of public space such as parklets and underpass parks.



CLIMATE CHANGE / ADAPTATION

Increase coverage of street trees for shade and expand use of green and cool (white) roofs in order to adapt to higher average temperatures along with more varied temperature fluctuations within the District. Improve building and landscape water efficiency measures. Develop resiliency plans for Washington, D.C.'s plant and animal life within parks and green spaces, including the introduction of wildlife migration corridors and heat and drought-tolerant plants.



WATER

Develop a comprehensive green infrastructure plan that leverages existing grey infrastructure. Use Sustainable Site Initiative[™] (SITES[™]) guidelines to improve water efficiency measures, require the use of appropriate plant species in public and residential landscapes, and enable rainwater capture and filtered or treated greywater (and even blackwater) reuse for landscape irrigation. For stormwater management, require the use of green roofs for new buildings exceeding a minimum size. In addition, approve the use of rainwater cisterns for irrigation of green roofs and other green infrastructure. Improve the permeability of the District's park surfaces and their ability to capture and store water. Create multi-use infrastructure, or rain gardens or bio-retention systems in District parks, turning them into green infrastructure and water treatment systems. Increase the use of bioswales near transportation systems, and add in permanent green street corridors and green alleys. Continue to expand urban tree canopy and preserve larger trees to manage stormwater runoff. Spread use of tree boxes and permeable pavements for stormwater capture. As part of a public education campaign, parks and public green space should follow the highest water efficiency standards.

TRANSPORTATION

Expand bike and pedestrian infrastructure. Create safe bicycle infrastructure. Connect the Metro system with bike infrastructure and bikeshare stations. Require secure bike parking within office and residential buildings. Incentivize the growth in the number of bicycle and pedestrian commuters. Create highly walkable pedestrian-only areas, and introduce new innovative forms of public space such as parklets and underpass parks.

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Recommendations for a More Sustainable Washington, D.C.



WASTE

Set clear, ambitious targets and deadlines for achieving zero waste in the District and measure progress against targets. Ensure all building materials are reused in new buildings (if the materials are nonhazardous). Use Sustainable Sites Initiative (SITES) guidelines for park maintenance and eliminate grounds waste generated from Washington, D.C., parks through composting.

BUILT ENVIRONMENT

Invest in turning more brownfields into parks. Apply bio-remediation and other safe environmental remediation technologies during park development. Develop an Internet-accessible inventory of all brownfields in the city to enable easier remediation and redevelopment of derelict sites by local developers. Create a certification program for remediated brownfields to facilitate faster reuse. Invest in retrofitting older school buildings to make them LEED Platinum and also integrate green school redesign activities into school curricula. Ensure all schools apply Safe Routes to Schools design guidelines.

NATURE

Develop a biodiversity and environmental education action plan based on the concept of biophilia. Recreate wetlands along riverfront edges and reintroduce native wildlife. Reduce the mortality rate of trees and extend their lifespan by enabling them to grow in larger tree pits with structural soils and under permeable pavements. Use appropriate trees grown locally for urban forestry campaigns. Experiment with growing trees in park nurseries.



FOOD

Develop a comprehensive urban agriculture plan. Evaluate all available empty lots (including brownfield sites) as potential opportunities for commercial and community urban agriculture. Develop new codes enabling local food production. As a priority, target food desert communities with high numbers of brownfields. Allow local residential food production. Develop new soil testing and clean-up requirements for growing food in former brownfield sites. Allow and also increase tax incentives for rooftop food production.

GREEN ECONOMY

Invest in bicycle and pedestrian infrastructure improvement projects to boost job growth. Use green infrastructure systems, including green roofs, to increase number of local, non-exportable green jobs. Launch a comprehensive green jobs program, training chronically unemployed and former convicts in brownfield remediation, green roof installation, and other tasks. Launch a national campaign in an effort to lure the best green talent to the District.

GOVERNANCE

Organize watershed councils at the local level and appoint ward-level sustainability advocates to help implement and align SustainableDC initiatives. Use Sustainable Sites Initiative (SITES) guidelines as a management tool for achieving high-performing landscapes across the district.

Here, by category, are some more detailed ideas along with the evidence and reasoning behind them. Again, recommendations are repeated under certain categories based on their effectiveness and relevance to the topic.



ENERGY

New York City, Chicago, and Philadelphia increasingly view their contaminated inner-city brownfield sites as natural locations for large-scale solar installations.

At the **national Brownfields conference held in Philadelphia** this year, Dave Graham, who works on Chicago's brownfield program, said the City Solar project just "fell into our laps." He was called into a meeting in the mayor's office with representatives from Exelon and SunPower and found they wanted to create a massive solar farm on a derelict brownfield site. Actually, massive is an understatement for this project: It's the largest urban solar plant in the U.S. Its 32,000 photovoltaic (PV) panels provide 10 MW of energy, enough to power 1,500 local homes.

Heavily contaminated sites can cost up to \$150,000 per acre to clean up. The West Pullman site for City Solar, which "has a variety of issues," would have cost \$20 million alone to clean up, "something no one in the city wanted to invest in." As a result, Exelon simply put solar panels on top of the site, leaving the worst soils untouched underground. In some cases, where PV structures need to be installed, the team did actually discover underground storage tanks, which they then removed.

Washington, D.C. should undertake a comprehensive survey of existing brownfield sites to determine which could be used to form a public/private partnership with a solar power firm.

Research cited by the U.S. Environmental Protection Agency says if placed strategically, trees can reduce summertime cooling energy needs by 7–47 percent and wintertime heating needs by 2–8 percent.

The city should encourage the use of smart tree placement around residential and commercial buildings by increasing fines for tree removal and providing direct financial or tax benefits for tree planting near buildings on privately owned property.

According to one Canadian study, a 32,000-square foot green roof on a one-story commercial building in Toronto reduced energy usage by 6 percent in the summer and 10 percent in the winter. Similarly, the **green roof of the American Society of Landscape Architects (ASLA)**, at just 3,000 square feet, reduces energy usage by 3 percent in summer and 10 percent in winter. To ensure the benefits of green roofs are widespread, cities like **Toronto** have mandated the use of green roofs for certain types of buildings.

D.C. should follow <u>Toronto's</u> lead and mandate the use of green roofs in all new buildings. To address older structures, the District can follow <u>Philadelphia's</u> lead and introduce a stormwater runoff fine, which will incentivize the use of green roofs, bioswales and permeable pavements systems that not only cool but also help reduce energy use. The city can also incentivize the use of green roofs in older buildings by providing tax breaks for feasibility studies and other preliminary design assessment costs.

In addition, roofs can accommodate both green roof components along with solar panels. In fact, solar panels will work more efficiently near green roof sedum and plants as the air will be cooler. In the northern hemisphere, solar panels should be installed on commercial and residential rooftops to face south. It's important that tree shade doesn't cover the panels.

Incentivize the use of rooftop solar panels, and use in combination with green roofs.



CLIMATE CHANGE / MITIGATION

Kathryn Gustafon, ASLA, a leading landscape architect, makes an eloquent argument for investing in urban park land, arguing that parks are crucial to making dense urban communities more livable: "Urban sprawl is linked with the energy crisis. Sustainability means trying to live in harmony with the planet. This isn't possible if we don't densify our cities to stop urban sprawl. The only way to densify a city is to have urban space. One of the reasons people move out to the suburbs is to have some sort of space, some sort of breathing room. The interior spaces of landscape in the city can replace that. They're there to enable healthy living. Urban spaces allow you to take out your children, walk your dog, or exercise. Parks provide a place to just stop and rest for a moment, stop and think about where you're going and what you're doing. Those are the roles of urban space in the city." Similarly, David Owen writes in Green Metropolis that New York City, which he argues is the greenest city in the U.S. on a per-capita basis, has successfully used its major parks, to create dense, low-carbon communities.

Washington, D.C., should continue to encourage densification by expanding urban park land through urban redevelopment. New redevelopment and brownfield reclamation projects within the District should be required to include public green spaces.

Transportation infrastructure accounts for 20–40 percent of all urban land. Even in Washington, D.C., which has invested in a range of sustainable transportation options, streets, intersections, and alleys account for 22 percent of all land, and once you include parking spaces, that number easily reaches 30 percent. These systems have also enabled the growth of transportation-related GHGs, which now account for 30 percent of all U.S. emissions.

A study by the National Resources Defense Council (NRDC) found that if all conditions that accompany densely populated communities were present, such as good transit, proximity to shopping, and recreational activities and a walkable environment, families in that community could reduce vehicle use by 25-30 percent. As a result, comprehensive transportation planning must incorporate communityfocused accessibility strategies. Walkable and bikeable communities inspire residents to leave their cars at home. D.C. should undertake a program targeted at reducing car use by making bicycle and pedestrian access even better. The District should systematically survey and address barriers to walkability (narrow sidewalks, difficult crosswalks, and dangerous intersections) across the city through redesign programs. D.C. should significantly expand its network of bicycle infrastructure and further grow its successful bike share program.

New York, San Francisco, and other cities have pioneered programs to transform streets and parking spaces into open pedestrian plaza. New York City just turned parts of Broadway into permanent pedestrian-only spaces. Also, in a new program, the city is finding old parking lots and other under-used areas in communities with low per capita open space and turning them into plazas.

On the smaller scale, parklets are safe, people-friendly environments that offer inviting café-style chairs and tables, benches, and trees and plants. These spaces, which can be created for less than \$20,000, encourage people to get out of their cars, walk, and interact, which helps build the local economy. In San Francisco, one new parklet increased pedestrian foot traffic by 37 percent.

Like innovative cities such as <u>Vancouver</u>, <u>San Francisco</u>, and <u>New York</u>, Washington, D.C., should implement a set of temporary or permanent pedestrian-only spaces where transportation infrastructure exists. A set of parklet pilot projects could be also initiated. Possible locations for pedestrian-only zones and parklets: Georgetown, Adam's Morgan, Dupont Circle, or Chinatown.

Isolated underpasses, which are often spaces for crime, are found directly below highways. As some cities know, underpasses are diamonds in the rough, ripe for polishing. For example, the <u>city of</u> <u>Toronto is reusing one of its highway underpasses</u> to create a 2.5-acre park, connecting neighborhoods and creating valuable green space in the process.

Washington, D.C., is also filled with foreboding underpasses. Many neighborhoods without parks could explore transforming underpasses into park space.



CLIMATE CHANGE / ADAPTATION

Regardless of how extensive climate change mitigation efforts are in the near future, many climate experts argue that some degree of adaptation to climate change is required in order to handle the worst anticipated effects. Human and natural systems must become more resilient to expected changes. In fact, the smartest communities are using the threat of climate change to invest in long-term environmental, economic, and social sustainability while protecting their infrastructural assets and housing stock.

With expected temperature increases along with more temperature fluctuations, Washington, D.C., like many other cities in the U.S. and Europe can pre-emptively adapt by adding additional street and park trees to moderate air temperatures. Washington, D.C., leadership should evaluate whether <u>its goal of 40 percent tree canopy by 2035</u> will be sufficient to achieve the required adaptation benefits.

According to the **U.S. EPA**, trees provide evaporative cooling through their leaves, which increases air humidity. Shaded surfaces can be 20–45 degrees cooler, and evapotranspiration can reduce peak summer temperatures by 2–9 degrees. Cooler air is important because many urban air quality issues are only further exacerbated by higher air temperatures.

Washington, D.C., should pre-emptively adapt by adding more shade trees to streets and parks, particularly in neighborhoods with vulnerable populations.

Furthermore, a green roof project organized by Columbia

University and New York power company Con Edison adds to a growing body of research that demonstrates green roofs reduce the urban heat island effect. Using Con Edison's training center in Long Island City, Queens, the researchers found that a layer of roof-friendly soils and plants reduce the rate of heat absorption by 84 percent in the summer. In addition, a study cited by **The Guardian (UK)** noted that even simple efforts such as painting roofs white, or even light grey can have significant positive impacts. "Computer simulations of Los Angeles show that resurfacing about two-thirds of roads and rooftops with reflective surfaces, as well as planting more trees, could cool the city by 2–3C." Cooler cities also mean less energy use for air conditioning.

D.C. should follow <u>Toronto's lead</u> and mandate the use of green roofs in all new buildings. To address older structures, the District can follow <u>Philadelphia's</u> approach and introduce a stormwater runoff fine, which will incentivize the use of green roofs, bioswales, and permeable pavements — systems that not only cool but also store stormwater. The city can also incentivize the use of green roofs in older buildings by providing tax breaks for feasibility studies and other preliminary design assessment costs. Lastly, white roofs can also be incentivized, if combined with green roof systems, or if the building structure can't handle a green roof.

Kristina Hill, Ph.D., Affiliate ASLA, chair of the landscape architecture department at the University of Virginia, and a <u>leading thinker on</u> <u>wildlife and climate change adaptation</u>, argues that communities must begin to think seriously about the impacts of climate change on local plant and animal species, outlining some expected impacts on ecosystems:

"If species characteristic of a region start to die out, will species that could survive the new seasonal conditions be able to get there, find suitable locations, and successfully reproduce before they die out in their own regions? When will the species that are their food be available locally? When will new predators, parasites, and competitors also move in? It's a very complicated four-dimensional chess game. That's why no one can really predict which species will survive where."

Washington, D.C., can use its parks and man-made landscapes to contribute to the overall ability of the region to sustain plant and animal species by focusing on preserving cooler zones. Hill explains one strategy being developed: "The potential new spatial strategy in all this involves conserving slopes with northern aspects, linking them to each other via waterways and ridges. These slopes can be potential refuges for biodiversity in an era of increasing temperature spikes and drought events. Like the cove forests of Appalachia, these cooler, protected areas will be places where the species that have been characteristic of many regions may persist as climate change occurs — making them key elements of future habitat diversity and possibly trait diversity."

CLIMATE CHANGE / ADAPTATION

Washington, D.C., should undertake a review of its green spaces and infrastructure and develop a comprehensive plan covering how plant and animal species can be preserved, protected, and re-introduced. Dedicated wildlife corridors should be established. Plant lists should be updated to reflect changes in climate. Just as Chicago has done, there should be a new set of "recommended trees" better suited to handle heat and drought conditions.

In an era of rising temperatures, water efficiency will be increasingly important. Washington, D.C., should develop more stringent rules that require commercial owner and homeowners to use drought-tolerant appropriate (native and adapted) plant species, and develop **systems** that infiltrate, store, and recycle water, limiting the use of valuable potable water for landscapes. Residential systems such as green roofs, bioswales / bioretention ponds, rainwater gardens, and water recycling and drip irrigation can all be used to efficiently conserve water. Commercial owners and homeowners should be allowed to use "**Living Machines**," or constructed wetlands, which are systems that recycle and reuse greywater (and even blackwater) for landscape maintenance and other safe re-uses like toilet-flushing and car-washing.

Separately, Washington, D.C., should also ensure all parks and public green spaces meet the highest standards of water efficiency. This can be achieved in part by requiring parks and public green spaces to use appropriate (native and adapted) plants. The <u>Sustainable</u> <u>Sites Initiative (SITES)</u> presents a model for achieving these goals. <u>New York City</u> and other cities have also created local guidelines. Washington, D.C., should also use its own parks to undertake a broad public education campaign about water efficiency in the city.

Washington, D.C,. should incentivize water efficiency measures by requiring the use of drought-tolerant appropriate (native and adapted) plant species in public and residential landscapes, and enabling filtered or treated greywater (and even blackwater) reuse for landscape irrigation. As part of a public education campaign, parks and public green spaces should follow the highest water efficiency standards.



WATER

Philadelphia's green infrastructure plan will turn one-third of the city's impervious asphalt surface, or 4,000 acres, into absorptive green spaces. The goal is to move from grey to green infrastructure. Grey infrastructure includes "man-made single purpose systems." Green infrastructure is defined as "man-made structures that mimic natural systems." As an example, green roofs, bioswales, networks of man-made wetlands, restored flood plains, or infiltration basins would all qualify as green infrastructure. The benefits of such systems include: evaporation, transpiration, enhanced water quality, reduced erosion / sedimentation, and restoration. Some grey / green infrastructure feature integrated systems that create hybrid detention ponds or holding tanks, which are designed to slow water's release into stormwater management systems.

Set clear, ambitious targets and deadlines for reducing stormwater runoff in the District and measure progress against targets. Like New York City and Philadelphia, develop a robust green infrastructure action plan that leverages existing grey infrastructure systems. Enact green infrastructure rules that enable the use of fines for private properties that don't store their own runoff.

According to the **U.S. Environmental Protection Agency**, the average family of four uses 400 gallons of water every day, and some 70 percent of that water is used indoors. Of indoor use, some 16 percent is consumed by showers, 16 percent by faucets, and 22 percent by clothes washers. These numbers are highlighted because these are all forms of greywater that can be reused.

Washington, D.C., should develop more stringent guidelines and rules that encourage commercial owners and homeowners to use appropriate (native and adapted) plants and develop **systems** that infiltrate, store, and recycle water, limiting the use of valuable potable water for landscapes. Residential systems such as bioswales / bioretention ponds, rainwater gardens, and water recycling and drip irrigation can all be used to efficiently conserve water. Commercial owners and homeowners should be allowed to use "Living Machines," or constructed wetlands, which are systems that

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Washington D.C. should incentivize water efficiency measures by requiring the use of appropriate plants in public and residential landscapes, and enabling filtered or treated greywater (and even blackwater) reuse for landscape irrigation.

As city managers know, green roofs are necessary for taking pressure off of over-worked combined water / sewage systems. The EPA cites **some powerful data**: Green roofs can catch 40-60 percent of stormwater, reducing flow into a city's sewers. Ken Sandler, with the Office of Federal High Performance Green Buildings at the General Services Administration, adds that recent U.S. government research shows that green roofs retain 1.5 inches of stormwater runoff. Also, Steven Peck, Honorary ASLA, head of Green Roofs for Healthy Cities, says all that retained stormwater has great financial benefits: The **average stormwater mitigation benefit** is \$4.26 per square foot. Like Philadelphia, Washington, D.C., should get the word out on the benefits and create a **public education program** on how to use green roofs for residential stormwater management.

In addition, Washington, D.C., has the opportunity to be an innovator by enabling the use of rooftop rainwater cisterns to water green roofs during the hotter months, saving on any potable water use for watering purposes.

WATER

D.C. should follow <u>Toronto's lead</u> and mandate the use of green roofs in all new buildings. To address older structures, the District can follow <u>Philadelphia's</u> lead an introduce a stormwater runoff fine, which will incentivize the use of green roofs, bioswales and permeable pavements systems that not only cool but also store stormwater. The city can also incentivize the use of green roofs in older buildings by providing tax breaks for feasibility studies and other preliminary design assessment costs.

As city park managers already know, a park may look green but not actually be green. Many cities are investing in ensuring park lawns are actually pervious and store water in plant roots and soils. According to <u>one study</u>, regular lawn is about 80 percent as impervious as asphalt, so not all green spaces are pervious. To ensure D.C.'s green spaces maximize their ability to mitigate stormwater runoff, <u>Sustainable Sites Initiative (SITES)</u> guidelines on soils, vegetation, and hydrology should be applied.

Improve the permeability of the District's parks and improve their ability to capture and store water.

Some cities like Toronto have invested in innovative multi-use infrastructure. As an example, Sherbourne Commons is not only a remarkable public space but also a water treatment facility. In a marvel of thoughtful design and engineering, the new 3.6-acre, \$30 million park commissioned by Waterfront Toronto and designed by a team led by landscape architecture firm Phillips Farevaag Smallenberg uses ultraviolet light to clean polluted water coming in from Lake Ontario.

Create multi-use infrastructure – parks with rain gardens and bio-retention systems along with water treatment systems – turning them into smart green infrastructure.

At an **event at the National Building Museum**, Jennifer Toole, ASLA, the designer of Washington, D.C.'s bicycle infrastructure, said that the city should come up with a plan for integrating bicycle and green stormwater management infrastructure together into one system. Other cities like Portland have used curbs as locations for bioswales.

Washington, D.C. ,has experimented with green street pilot projects in the past. Using lessons learned from those pilots, the city should create permanent green street corridors in multiple neighborhoods, just as <u>Vancouver</u> and <u>San Francisco</u> have done to great success. In the case of San Francisco, the city agencies addressed the coordination challenges between the agencies by basically throwing out the code for the first corridor and then building a new framework from the experience. One such location for a green street corridor would be on Eye Street (in front of the ASLA headquarters) from 6th through the new CityCenter development. ASLA would provide the public education component for this green street.

The city could experiment with carefully redesigning components of the city's many historic circles so they become <u>circular stormwater</u> <u>management systems</u>. Also, like <u>Chicago</u>, Washington, D.C. should start a green alley program using the latest permeable pavement and asphalt technologies.

Increase the use of bioswales near transportation systems (like bike lanes), add in permanent green street corridors in areas where the traditional combined water / sewage system is under heavy strain, and develop a green alley program.

As city officials already know, trees provide excellent stormwater management benefits as they capture rainfall with their leaves and through their roots and leaf litter create soil conditions that enable water absorption.

However, at last year's GreenBuild, Peter MacDonagh, the Kestrel Design Group, made the case that larger, older trees are far more valuable than younger ones in terms of stormwater management, so work needs to be done to preserve these and use new techniques to enable younger trees to stay in place longer. Citing data, he argued that a tree with a 30-inch diameter provides 70 times the ecological benefits of a 3-inch diameter tree. For example, a large tree intercepts 79 percent of rain hitting the ground, providing the "best green infrastructure you can find."



Washington, D.C., should further invest in ensuring the current **<u>6 percent tree mortality rate</u>** is further lowered and larger, older trees are kept healthy. One way to do this would be to use larger tree boxes with structured soils and add permeable pavements around the trees, which would enable the tree to both grow and get enough water, capturing stormwater in the process.

Continue to expand urban tree canopy and preserve larger trees to manage stormwater runoff. Spread use of tree boxes and permeable pavements for stormwater capture.

Separately, Washington, D.C., should also ensure all parks and public green spaces meet the highest standards of water efficiency. This can be achieved in part by requiring parks and public green spaces to use appropriate (native and adapted) plants. The <u>Sustainable</u> <u>Sites Initiative (SITES)</u> presents a model for achieving these goals. <u>New York City</u> and other cities have also created local guidelines. Washington, D.C., should also use its own parks to undertake a broad public education campaign about water efficiency in the city.

As part of a public education campaign, parks and public green space should follow the highest water efficiency standards.



MANSPORTATION

Transportation infrastructure accounts for 20–40 percent of all urban land. Even in Washington, D.C., which has invested in a range of sustainable transportation options, streets, intersections, and alleys accounts for 22 percent of all land, and once you include parking spaces, that number easily reaches 30 percent. These systems have also enabled the growth of transportation-related GHGs, which now account for 30 percent of all U.S. emissions.

A study by the National Resources Defense Council (NRDC) found that if all conditions that accompany densely populated communities were present, such as good transit, proximity to shopping, and recreational activities and a walkable environment, families in that community could reduce vehicle use by 25–30 percent. As a result, comprehensive transportation planning must incorporate communityfocused accessibility strategies. Walkable and bikeable communities inspire residents to leave their cars at home.

D.C. should systematically survey and address barriers to walkability (narrow sidewalks, difficult crosswalks, and dangerous intersections) across the city through redesign programs. D.C. should significantly expand its network of bicycle infrastructure and successful bike-share program.

Washington D.C. has some of the highest number of mass transit commuters in the country. However, in comparison with the top biking cities, the total percentage of bike commuters remains low at 3.9 percent, despite the explosive growth of the District's highly successful bike share program. To encourage increased bicycle use, the District needs to make the bicycle infrastructure appear safer and integrate Metro and bicycle infrastructure.

As one ASLA member wrote, "Please incorporate bike lanes where the cyclists are protected by parked cars, as opposed to the parked cars being protected by the cyclists." Another ASLA member saw an opportunity to create one network between Metro and bikeshare: "Integrate the Metro and bicycle networks. This is the only way to really go car-free. Install bike racks in Metro cars in the underused end spaces of the cars, lift the ban on bikes during rush-hour and implement an education program to make people aware of bike etiquette. This could substantially improve sustainable mobility." District government should also ensure bike-share stations are co-located with Metro stations and accept payment via smart cards and also enable commuters to load SmartTrip benefits. In addition, the District should require ample and secure bike parking within offices and large residential buildings.

Lastly, to help generate demand for bicycle infrastructure, local businesses should be recognized through "Best Places to Work" programs for giving employees a bicycle or walking benefit or paying for the purchasing of bikes and bike equipment or walking shoes.

Create safe bicycle infrastructure. Connect the Metro system with bike infrastructure and bikeshare stations. Require secure bike parking within office and residential buildings. The District's bike-share program should accept SmartTrip cards and offer benefit payments as well. The city should encourage businesses to offer bicycle and walking commuter benefits.

New York, San Francisco, and other cities have pioneered programs to transform streets and parking spaces into open pedestrian plaza. New York City just turned parts of Broadway into permanent pedestrian-only spaces. Also, in a new program, New York City is finding old parking lots and other under-used areas in communities with low per capita open space and turning them into plazas.

On the smaller scale, parklets are safe, people-friendly environments that offer inviting café-style chairs and tables, benches, and trees and plants. These spaces, which can be created for less than \$20,000, encourage people to get out of their cars, walk, and interact, which helps build the local economy. In San Francisco, one new parklet increased pedestrian foot traffic by 37 percent.

Like leading cities such as <u>Vancouver</u>, <u>San Francisco</u>, and <u>New York</u>, Washington, D.C., should implement a set of temporary or permanent pedestrian-only spaces where transportation infrastructure exists. A set of parklet pilot projects could be also initiated. Possible locations for pedestrian-only zones and parklets: Georgetown, Adam's Morgan, Dupont Circle, or Chinatown.



The U.S. Environmental Protection Agency offers some disturbing facts on U.S. food waste: Each person throws away about <u>one</u> <u>pound of food waste every day</u>, generating about 30 million tons of food waste annually, or about 12 percent of the total waste stream. Only 2 percent of that food waste is composted, whereas in comparison, some 67 percent of yard waste is reused. <u>Discovery</u> reports that food waste, much of which is due to avoidable spoilage of fresh produce, is equal to throwing out \$17 billion annually.

A number of innovative cities have instituted zero-waste policies (meaning no waste to landfills). <u>San Francisco</u> is aiming at becoming zero waste by 2020. In addition to recycling and compositing efforts, San Francisco is banning plastic bags and Styrofoam, encouraging donations, and asking producers to make recycling and reuse easier.

Set clear, ambitious targets and deadlines for achieving zero waste in the District and measure progress against targets. Like San Francisco and <u>Palo Alto</u>, develop a robust waste action plan that leverages compost for <u>urban agriculture</u>, <u>including rooftop farms</u>. Enact waste rules that create fines for homes and offices that don't recycle and compost. Recognize businesses that are voluntary early adopters in these efforts with "Best Zero-Waste Places to Work" or similar certificates. Promote zero-waste policies throughout the District.

Traditional ways of constructing buildings create pollution and waste. Building materials contain vast amounts of embedded energy. According to **Architecture 2030**, building construction and materials account for 5.5 percent of global greenhouse gas emissions. In addition, while exact numbers aren't available, trucks and cranes transporting and installing materials at construction sites produce considerable amounts of greenhouse gas emissions.

Typically, materials from torn-down buildings and sites are carted off to the landfill. The U.S. Environmental Protection Agency says only 40 percent of building and construction material is now "recycled, reused, or sent to waste-to-energy facilities, while the remaining 60 percent of the materials is sent to landfills." Many sustainable architects, landscape architects, and construction firms are now moving towards a more sustainable construction process to reduce waste and greenhouse gas emissions. In a sustainable reconstruction, building materials are reused or recycled, dramatically reducing waste. For example, a new park can be created out of old building materials. Once the materials have been separated, some are kept at the construction site and reprocessed. Reclaimed soils, concrete rubble, glass, wood, and steel can be **reused or recycled to serve new functions**, reducing greenhouse gas emissions in the process. With climate change, any new construction methods that help landscape architects avoid producing additional emissions are a major benefit both to the project and society as a whole.

Ensure all building materials are reused in new buildings (if the materials are non-hazardous). Like <u>Chicago</u>, invest in building material reuse exchanges and also create a new park material reuse exchange.

Parks, like any man-made landscape, generate yard or grounds waste. It should be a matter of practice that park waste is composted and reused, perhaps for urban agriculture projects on rooftops within the District.

Use Sustainable Sites Initiative (SITES) guidelines for park maintenance and eliminate grounds waste generated from Washington, D.C., parks through composting. Reuse compost in urban farms within the District.



BUILT ENVIRONMENT

Brownfields are abandoned, environmentally-contaminated industrial or commercial sites. People who come into frequent contact with the leftover solvents, cleaners, and oil found on these sites often develop major health issues. In addition, the chemicals found in brownfields contaminate soils and often leak directly into underground water resources. Degraded parts of some major U.S. cities contain up to 1,000 brownfields per square mile.

Bioremediation involves using plants, fungi, or soil microbes to clean up toxic brownfields. Some types of deep-rooted plants can even be used to remove toxic metals from the soil. One example is *Thlaspi Caerulescens*, commonly known as Alpine Pennycress. According to Cornell University researchers, a normal plant can only store about 100 parts per million (ppm) zinc and 1 ppm cadmium. Thlaspi can store up to 30,000 ppm zinc and 1,500 ppm cadmium in its shoots without being negatively affected. In fact, these types of plants thrive while restoring the brownfield to its natural state.

Cleaning up these sites is not only good for the environment, but also helps create economically-strong, healthy communities. The U.S. Environmental Protection Agency (EPA) says brownfield clean-ups can increase nearby residential property values by 2 to 3 percent. Healthy buildings, schools, and parks have taken shape on redeveloped brownfields. Formerly poisonous sites can even turn into valuable community green space: the new Olympic Park in London, Brooklyn Bridge Park in New York City, and Toronto's new park network are coming in over hectares of previously bombed-out, toxic sites.

Just as the city and developers did with the highly successful <u>Yards Park</u>, which transformed abandoned, polluted waterfront properties into a valuable community asset, Washington, D.C., should incentivize turning more brownfields into parks. Apply bio-remediation and other safe environmental remediation technologies during park development.

Many cities have undertaken comprehensive surveys of their brownfields to determine opportunities for remediation and redevelopment. In one example, New York City launched **SPEED**, a searchable database of brownfield properties, a "real estate search engine," that has gotten great traffic from the local developer community. At a brownfields conference, Dan Walsh, Mayor's Office of Operations, New York City government, said SPEED includes historical maps so developers can "toggle through time" and explore some 3,150 vacant commercial and industrial brownfield sites spread throughout the city.

To make it even easier for developers, New York City has also launched a \$9 million brownfield reinvestment fund. Each developer of a brownfield site gets \$60–140,000 "fast" if they commit to cleaning-up a brownfield or redeveloping for energy uses. The grants can be used to cover expenses involved in design, investigation, clean-up, or insurance. For brownfield sites that will be used by the public, the city has also launched a <u>Green Property Certification</u> <u>program</u>, which can be shown on site as proof that the area is fit for its intended use. "This is a voluntary, not regulatory program."

Develop an Internet-accessible inventory of all brownfields in the city to enable easier remediation and redevelopment of derelict sites by local developers. Create a certification program for remediated brownfields to facilitate faster reuse.

Almost one in five Americans is housed in schools for the better part of each day, but many of these schools offer toxic environments with poor daylight and are sited in far-off places, which means they are both unhealthy learning environments and contribute to sprawl (or unhealthy communities). Creating green and healthy schools, which are in walkable, bikeable neighborhoods, is key to increasing test scores and graduating children who can be future stewards of the environment.

In a <u>session</u> at the National Building Museum, Glen Cummings, Assistant Deputy Secretary, U.S. Department of Education, said 14 million children go to school each day in "outright dangerous" schools. As you see in Washington, D.C., before the school term starts, schools scramble to "remedy buildings so they will be legal to occupy." The U.S. has hundreds of thousands of school buildings, many of which were created up to 50 years ago. "The real challenge is retrofitting older buildings so they can be turned into green buildings."

BUILT ENVIRONMENT

If a school can't afford to retrofit, Howard Frumkin, director, National Center for Environmental Health / Agency for Toxic Substances and Disease Registry, U.S. Centers for Disease Control and Prevention, said they can replace toxic cleaning supplies, ensure they are keeping HVAC maintenance up-to-date, and continually and safely discard art / science lab chemicals.

While integrating learning about green buildings into school curricula would be innovative, one ASLA member also called for education about the greater ecological context in D.C.: "Design and develop and series of outdoor classrooms throughout the District to highlight the varied ecosystems within D.C., and provide students with a real education about their surroundings. Have a DC 'Green Week' in the schools and create an award for innovative environmental solutions."

Budgets permitting, Washington, D.C., should invest in retrofitting older school buildings to make them LEED Platinum and also integrate education about green schools and local nature into school curricula.

Learning within green healthy, sustainable environments is critically important, but getting there in a healthy way is also crucial. Many schoolchildren face enormous obstacles that can be addressed through **Safe Routes to Schools programs**.

In addition to greening buildings, Washington, D.C., should ensure all schools apply Safe Routes to Schools design guidelines.



NATURE

In Biophilic Cities: Integrating Nature into Urban Design and

Planning, Timothy Beatley, Teresa Heinz Professor of Sustainable Communities at the University of Virginia, argues that cities must be designed so people feel intimately connected with nature. Beatley describes how "biophilia," a term coined by famed sociobiologist and conservationist E. O. Wilson, can inform how we plan, design, and manage our cities.

Wilson writes in the foreword: "The evidence is compelling that frequent exposure to the natural world improves mental health, it offers a deep sense of inner peace, and, in many ways we have only begun to understand by scientific reason, it improves the quality of life."

Beatley then defines a "biophilic city" as one that puts nature first. "It recognizes the essential need for daily human contact with nature as well as the many environmental and economic values provided by nature and natural systems." In addition, these cities are places where "residents spend time enjoying the biological magic and wonder around them. In biophilic cities, residents care about nature and work on its behalf locally and globally."

Within the District, the goal should be to increase connections to nature — locally, regionally, and globally. Institutions that could have particularly strong roles include botanical gardens, municipal zoos, natural history museums, and conservation groups.

Some sample questions used to guide the development of a biodiversity and environmental education action plan:

- What is the percentage of time residents spend outside, understanding that climate must be accounted for?
- What percentage of the population is active in nature or outdoor clubs or organizations? How many of these organizations exist in the city?
- What percentage of the population can recognize common species of native flora and fauna?
- To what extent are residents curious about the natural world around them?

Develop a biodiversity and environmental action plan based on the biophilic design work of Professors E.O. Wilson and Timothy Beatley.

Washington, D.C.'s great riverfronts present opportunities for ecological restoration and preservation as a nature preserve. Tours could be offered through recreated wetlands, and recreation opportunities, including kayaking, could also be extended throughout the District's river habitats. Native wildlife, including fish and water bird species, could be reintroduced in restored areas.

Recreate wetland along riverfront edges and reintroduce native wildlife.

In 2009, the District adopted an urban tree canopy goal of 40 percent by 2035. Currently, the city has 35 percent tree canopy. According to **Casey Trees**, the District will need to add 2,401 acres of tree canopy to achieve the 40 percent goal. "Based on a mortality rate of 6 percent and using the rate of 100 trees equals 1 acre, 216,300 total new trees, or 8,600 trees a year, will need to planted over the next two decades."

D.C.'s tree mortality rate is better than many cities, including New York. However, more could be done to ensure trees live long, healthier lives, thereby providing more environmental benefits. In a session at GreenBuild, Peter MacDonagh, the Kestrel Design Group, said the key to preserving larger older trees and keeping younger ones in place up to 50 years or more is to use large amounts of loam or bioretention soils that are 65 percent sand, 20 percent compost and 15 clay silt. These soils are not only the best growing mix for trees, but also filter out heavy metals, phosphorous, and nitrogen most efficiently. Nitrogen runoff can cause algae blooms and kill other life if it's allowed to get to the watershed in large amounts.

The rule needs to be two cubic feet of loam for one square feet of tree canopy. So, for a tree that provides a 700 square foot canopy a designer needs to use 1,400 cubic feet of high-quality soil. These soils can be combined with "silva cells" that prevent soil compaction to enable the growth of tall, healthy trees. To prove this, MacDonagh showed the work of Bartlett Tree Lab's Urban Plaza study, which

NATURE

demonstrated that loam soil grew trees that had 300 times more leaves and were 1.7 times taller than those grown in compacted soils. "This is important because the average street tree only lasts 13 years."

In addition, the use of larger tree boxes with structured soils and permeable pavements around the trees enable the tree to both grow and get enough water, capturing stormwater in the process.

The District should aim at further reducing the mortality rate of trees and extending their lifespan by enabling them to grow in larger tree pits. Use larger tree boxes with structured soils and add permeable pavements around the trees, which would enable the tree to both grow and get enough water, capturing stormwater in the process. As D.C. adds new trees, it should also ensure trees are distributed fairly between communities of different socio-economic levels.

Some cities grow trees elsewhere and then truck them in. In these instances, massive urban forestry campaigns may not be carbon neutral once all those transportation-related emissions are factored in. The city should ensure it uses only appropriate (native and adapted) plant species planted within 100 miles of the District. Other cities like Philadelphia and New York are exploring growing trees in nurseries within parks.

Use appropriate trees grown locally for urban forestry campaigns. Experiment with growing trees in park nurseries.



FOOD

According to the EPA, urban agriculture is the "production, distribution, marketing, and disposal of food and other products in the centers and edges of metropolitan areas." This budding field deals with neighborhood mobilization, land and water use, pollution, health, and other issues. Programs can be private or public, volunteer-led, linked with food banks, or constructed by a landscape architect or horticultural expert. Urban farms can take shape in empty lots, remediated brownfields, or even on roofs. Some park departments are also starting urban farming programs.

At a <u>session of EPA's Brownfields conference</u>, Kenneth Kastman, URS, said a number of cities are moving forward with new urban gardening ordinances. San Francisco, Cleveland, Detroit, Denver, New York City, Philadelphia, Portland (Ore.), Seattle have or are in the process of releasing new codes.

In Detroit, the city is approaching landlords of vacant properties and asking them to sell their properties back to the city at reduced rates. The city is then turning these over to urban farmers if they commit to "making tangible benefits" to the property. If they fail to live up to their end of the bargain, the property goes back to the city. Detroit has also significantly reduced permitting fees for community gardens.

San Francisco allows residential sales of homegrown produce, which most cities don't. However, urban gardeners can't create storefronts or any permanent retail structure, only a temporary table. Also, foods can't be baked or "value-added." Plain fences (no chain link ones) are a must. No mechanized equipment can be used. In contrast, Madison, Wisconsin, is "totally laid back and allows for basically everything."

In Chicago, Zachary Clayton, Chicago's city government, said restaurants have been the driving force. "They want sustainable, local produce." Currently, there's nothing official on the books in Chicago. "The zoning code doesn't even allow urban farming." However, the city is in the process of revising and creating some very progressive codes. Community gardens can be a maximum of 18,750 square feet. Incidental sales will be allowed. Commercial gardens will need parking, screening, and retail areas. The city has also made commercial and residential composting acceptable. Washington, D.C., should develop a comprehensive urban agriculture action plan, systematically evaluate all available empty lots (including brownfield sites) as potential opportunities for commercial and community urban agriculture, and develop new codes enabling local food production. The District should target "food desert" communities with high numbers of brownfields first, expanding access to fresh produce via local food stands and street markets.

As Fritz Haeg, author of *Edible Estate: Attack on the Front Lawn* notes, in many communities it's still illegal to take out lawn in favor of food productive landscapes. Either local codes prevent these activities or restrictive homeowner associations ban these programs.

If allowed, these local yard farms can also be used to composted household and yard waste, which will help the city reach its waste reduction goals.

Note: For residential urban gardens, it's important to look at whether the backyard used to be part of an industrial brownfield site. There are safety issues: Backyards could have been a brownfield in the past, or near a defunct facility. Residential gardens may also have been sites of historic "burn pits," used to burn garbage. Lastly, lead paint flakes can get into soils.

Given yard gardens help reduce the costs of fresh produce, increase food security, and help improve environmental conditions, the District should allow local residential food production. Working with the EPA, the District should also develop new soil testing and clean-up requirements for growing food in former brownfield sites. Food production must be safe for the growers, and the produce must be safe to eat.

Green roofs can also be used to produce food. As Washington, D.C., moves up the rankings in terms of total acreage of green roofs, many of these could also be transformed into food-productive landscapes.

FOOD

As noted, some <u>restaurants</u> (and even big box stores) are buying food from rooftop gardens. One <u>prime example in Chicago</u>, designed by a landscape architect, brings in school groups and teaches kids about producing their own food. Washington, D.C., now has a progressive green-roof tax rebate. This could be further increased for property owners that produce food on their roofs.

The District should allow and also increase tax incentives for rooftop food production.

\$GREEN ECONOMY

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With the District's unemployment rate stuck at 10.8 percent, the impact of bicycle and pedestrian projects on job creation must be underscored. According to a <u>recent Political Economy Research</u> <u>Institute study</u>, bicycle and pedestrian projects create about 11.4 jobs for every \$1 million spent compared to 7.8 jobs created through road projects.

Washington D.C. should continue to invest in bicycle and pedestrian infrastructure improvement projects to boost job growth.

Green economy jobs can come from a variety of sources. Green infrastructure is infrastructure so needs to be designed, installed, and maintained – and is then a source of jobs. Green roofs, for example, are highly labor intensive, and these jobs can't be exported.

At a **recent conference**, Steven Peck, Honorary ASLA, head of Green Roofs for Healthy Cities, said that adding green roofs to 1 percent of U.S. buildings would cost \$9 billion and create 190,000 jobs. For 5 percent of buildings, the cost would rise to \$48 billion and create almost a million jobs. Finally, if 10 percent of all buildings had these green infrastructure systems, the cost would be \$96 billion but almost 2 million jobs would be created. Locally, Washington, D.C,. would be expected to increase the number of green infrastructurerelated jobs as it rolls out requirements for new buildings and introduces stormwater runoff fees.

Use green infrastructure systems, including green roofs, to increase number of local, non-exportable "green" jobs.

In a <u>recent talk at the National Building Museum</u>, Majora Carter, founder of Sustainable South Bronx and MacArthur "Genius" grant winner, called for a boost in local green job training programs, which are crucial to creating and maintaining the community infrastructure needed for more sustainable inner-city communities. A key part of building healthy, more sustainable inner-city communities is training inner-city residents for green jobs, which "can't be outsourced" and provide new skills and a way out of poverty or prison.

One ASLA member argued that park maintenance is lagging within the District. More could be employed in ensuring parks are clean and healthy. Washington, D.C.'s many brownfields present job opportunities through bio-remediation and redevelopment. The city's budding green roof industry also presents opportunities. It's important that local skilled, certified labor is available to do this work.

Launch a comprehensive green jobs program, training chronically unemployed and former convicts in park maintenance, brownfield remediation, green roof installation, and other tasks.

Lastly, it's important that the city become better known as a top green city. Currently, there is little awareness about all the great things the District is doing. If the District successfully promotes itself as a leading green city in North America, it will also in turn attract green talent who can open sustainable businesses, using sustainable business practices, creating a virtuous cycle. Other cities are competing for the same talent.

Washington, D.C., political leaders should be out at conferences, visiting other green cities, and finding national press opportunities to speak about the District's achievements. A new Web site and other materials can be developed to attract green entrepreneurial talent.

Washington, D.C., should launch a national campaign in an effort to lure the best green talent to the District.



GOVERNANCE

One ASLA member recommended organizing "watershed councils" to address stormwater pollution and other environmental concerns within each area. Watersheds will likely cross neighborhood lines, creating an opportunity for ideas exchanges, and community concerns across the socioeconomic spectrum. They will foster a new sense of identity, beyond neighborhood identity, and highlight environmentally co-dependent populations.

Another idea: Create locally appointed ward-level sustainability officers to advocate for sustainable design best practices, work with local BIDs, and aid in the implementation of SustainableDC.

Lastly, the Sustainable Sites Initiative (SITES), like LEED, can be adopted by the District government to ensure all man-made landscapes within the city are healthy, regenerative, and don't create additional waste or pollution. The District government should consider requiring landscapes to meet a minimum of 2-star SITES.

