White Paper for Tree Protection, Weed Management, and Native Plant Encouragement

MARC
MID-AMERICA REGIONAL COUNCIL

December 2020

Introduction

Gould Evans (GE) and the Center for Neighborhood Technology (CNT) have partnered to produce a model ordinance for the Mid-American Regional Council (MARC), the metropolitan planning organization for the Kansas City region that promotes native vegetation and trees to benefit community beautification, stormwater management, improve climate resistance and for overall local ecosystem health. This brief report accompanies a workshop led by the partnering organizations that included relevant stakeholders brought to the table by MARC. The report discusses the community benefits of green stormwater infrastructure, the strengths and limitations of ordinances focusing on public versus private land, and various ordinance types.

Community Benefits of Native Plants, Trees, and Green Infrastructure

The MARC region is on the land of the Kiikapoi (Kickapoo) People and Osage Nation. Before European settlement and subsequent waves of development, stormwater flowed naturally through watersheds into rivers and lakes and other environmental processes were managed naturally. Plants and trees indigenous to the region played a huge role in those processes. With development came the removal of many such plants, some of which were replaced with plants that serve aesthetic and other purposes, and the sometimes-accidental introduction of invasive plant species. Today, many are attempting to reintroduce and cultivate native plants because of their ability to manage stormwater and provide other community benefits. The same can be said for trees. Meanwhile, green stormwater infrastructure (GSI) utilizes nature-based processes, such as infiltration, to manage stormwater and provide other community benefits.[1] Examples include rain gardens, street trees, bioswales, and permeable pavement that utilize native plants, trees, and soil. The benefits of GSI are not limited to the environment, and communities can see multiple benefits in a variety of categories.

Climate Adaptation/Resilience

GSI can help communities to be better equipped against riverine and urban flooding, droughts, and heat waves. Flooding threatens both the water quality and properties of communities. GSI can mitigate the damage of flooding by improving drainage through infiltration. Permeable pavement, rain gardens, and bioswales all improve infiltration and reduce the risk of combined sewer overflows and stormwater runoff. In 2011, the Environmental Protection Agency (EPA) studied the benefits of expanding GSI to prevent flooding in areas where flooding occurs on average every 5 or 10 years. The EPA concluded that the U.S would save $63 to $136 million annually in flood losses by 2040. Further, GSI can increase shade and improve evapotranspiration, or the transfer of water by evaporation from soil and plants to the air, which cools temperatures in the summer during extreme heat.[2]

[1] CNT. (2020). Green Values Strategy Guide [PDF]. Retrieved from https://www.cnt.org/sites/default/files/publications/Green%20Values%20Strategy%20Guide.pdf
[2] Ibid.

Climate Mitigation/Avoidance

Not only are there benefits in fighting present climate concerns but implementing GSI also offers long-term benefits by reducing the chances of severe weather in the future. GSI can reduce greenhouse gases (GHG), with urban trees, or street trees, absorbing 0.8 tons of carbon per hectare of tree cover annually. Reducing GHG can reduce climate change's impact and severity in the future. Permeable, green, shaded, and heat-reflecting surfaces are components of GSI that can mitigate urban heat island effects. Shaded surfaces alone can be 20 to 45°F cooler than unshaded surfaces, and improved evapotranspiration from green surfaces can reduce temperature peaks by 2 to 9°F. These benefits mitigate severe climate events and decrease the severity of these events in the future.[3]

Health Benefits

The environmental benefits of green infrastructure tie closely to its health benefits. With more native plants, trees, and green infrastructure measures, the impact of ozone air pollution, extreme heat, and flooding on health Increased GSI measures such as street trees and buffer parks can increase absorption of pollutants on roads and other areas where air pollutants are released in large quantities. Mitigating exposure to these pollutants can decrease of hospitalizations and premature deaths due to toxic exposure. Street tress can provide shade, reducing health risks of extreme heat including cardiovascular, kidney, and respiratory disorders. Rain gardens and other GSI measures mitigate potential dampness and mold in households and water-borne diseases by improving drainage through infiltration.[4]

Economic Benefits

Advancing GSI offers multiple economic benefits including improved workforce development, vacant land reactivation, sales revenue and increased property and recreational value. GSI increases the presence and demand for green jobs, or jobs that offer services with environmental benefits, support GSI, and conserve natural resources. In Portland, the installation of GSI since the 1990s has led to green jobs employing 5% of its workforce. GSI projects require installation and maintenance, which demand a variety of jobs such as landscapers or heavy equipment operators. Increasing demand for these jobs offers can fill in the "missing middle" in employment, or jobs that pay more than retail but don't require a post-secondary education. GSI can put vacant land such as brownfields to use and encourage investment that can raise sales and recreational revenue in communities. GSI can also provide more green space, which can raise property values, although this benefit should have a well-panned strategy to avoid displacing existing residents.[5]

Transportation Benefits

Communities with GSI benefit from less traffic collisions, and complete streets that are safe and accessible to multiple modes of transportation. GSI can mitigate flooding on streets, making transportation during rain events safer. GSI measures like parkway bioswales or bioretention planters along roads and parking lots can make streets friendlier to different modes of transportation and lower risks of collision. These measures can create barriers between cyclists, pedestrians, and vehicles that can prevent accidents. Studies also show that green spaces on roads can lower stress and decrease chances of road rage or accidents due to speeding.[6]

Ordinances That Focus on Public Land

Public land, including streets, sidewalks, parkways, public parks, natural areas, and sites of government buildings, offers municipalities the opportunity to consider GSI, especially if developed in collaboration with the public.

---

[3] Ibid.
[4] Ibid.
[5] Ibid.
[6] Ibid.

Opportunities

The key benefits of public land-based ordinances involve their scale, networking, and sustainability. Public lands such as roads, natural areas, parks, and other areas that are widely available across communities provide ample space to implement GSI. Some public lands are linear, like roads, or cover a large area, like parks, which can allow for GSI to be connected. Connecting GSI improves its impacts compared to multiple disconnected GSI projects. Ensuring maintenance of performance standards of GSI in public land would be easier to sustain given that ownership of public lands does not frequently change. Further, public land owners, usually local governments, will likely be earning revenues from GSI based on the aforementioned economic benefits. Increased revenue can potentially encourage consistent maintenance by municipalities. GSI also requires less large-scale and costly maintenance compared to gray infrastructure, since it is based in natural processes. The city of Seattle reduced costs of pavement management by 49% after increasing GSI in its streets.[7]

Weaknesses

A key concern of public land-based ordinances is that additional operation and maintenance costs may become a burden for municipalities. GSI projects are similar to municipal capital projects, which have calculated costs of operation and maintenance. Determining returns on investment from GSI may be difficult since short-term benefits may be difficult to quantify/value. The San Francisco Public Utilities Commission tackled these challenges by developing a Green Infrastructure Maintenance Cost Model.[8] This model calculates the cost of labor, materials, and number of visits required for maintenance to identify cost.[9] It is intentionally flexible and customizable to accurately convey the costs of different regions and GSI projects.[10] Another concern is public perception of green infrastructure and the native plants. In some cases, community members may prefer the aesthetic of mowed grass and highly manicured gardens to taller, larger native plant. These perceptions could lead to misunderstandings by the public that the municipality is not properly conducting maintenance. Education campaigns at the community level are critical to ensure early support for native plants.

Ordinances That Focus on Private Land

Privately held land is frequently the lion's share of property in a community. Municipalities can implement ordinances regulating the use and development of private land in order to minimize costs borne by local governments. Municipalities should make sure that systems are implemented to support effective cooperation / shared responsibility from private landowners.

Opportunities

A key benefit of private land-based ordinances is that they increase the share of community benefit costs with the private sector. The private sector will contribute to the financing of GSI on their property which benefits the entire community without the costs of these benefits being the burden of the government alone.

---

[7] American Rivers, The Water Environment Federation, The American Society of Landscape Architects, & ECONorthwest. (2012). Banking on Green: A Look at How Green Infrastructure
Can Save Municipalities Money and Provide Economic Benefits Community-wide [PDF]. Retrieved from https://lincoln.ne.gov/city/ltu/watershed/cwp/pdf/banking-on-green.pdf

[8] Logsdon, W. (2019). Green Infrastructure Maintenance Cost Model [PDF]. Retrieved from http://www.12000raingardens.org/wp-content/uploads/2019/05/GI-Maintenance-Model-Webinar-050719.pdf

[9] Ibid.

[10] Ibid.

A recent National Resources Defense Council (NRDC) study discusses different approaches municipalities can take to develop financial incentives to property owners to lower the cost of installing GSI.[11] Given that communities often have more private than public land, focusing on private land will provide the opportunity to develop GSI across a larger portion of the community. Further, these spaces are diverse, with solutions being possible from a microscopic scale, ranging from a backyard or lawn to a large bio-infiltration solution in an industrial or office park.

Weaknesses

A primary concern with private land-based ordinances involves working with property owners. To ensure the integrity of the investment and maintain performance standards for the sake of the public good, owners need to be accountable to the medium- and long-term maintenance of plants, soil, and grading. Further, owners of private property are more likely to change than public property. A dedicated owner can easily be replaced with a less dedicated one, which would make ensuring the maintenance of performance standards even more difficult. Any ordinance should consider incorporating a transition plan.

Public Land Ordinances and Policies

Public land ordinances and policies can take a variety of forms. For example, all federally funded transportation projects are mandated to include a drainage plan to compensate for lost pervious land area. The Northwest Indiana Regional Plan Commission (NIRPC) requires that any project proposals for federal transportation funding utilize natural solutions such as bio-infiltration to manage drainage or justify their inability to use these natural solutions.[12] Federal funds could also be used as a subsidy for natural solutions on public lands. However, these subsidies would cover costs of implementing these solutions but not operating and maintaining them, which leaves a key financial concern unanswered for local governments.

Capital Improvement Plan (CIP)

A CIP can be a useful vehicle to promote green infrastructure in communities. To date, CNT is not aware of traditional capital improvement planning being used to promote GSI. A CIP treats green infrastructure and other natural solutions like a public asset, similar to roads and pipes. Given that CIPs usually identify alternatives and conduct an assessment on the best alternative, should a natural solution be found as the best alternative it will become part of the CIP. Engineering studies on green infrastructure initiatives and an analysis of costs and community benefits would also be provided through a CIP. As part of the CIP, green infrastructure and other natural solutions would receive a portion of municipalities' budget.

---

[11] Valderrama, A., Lochner, J., & Koval, M. (2017). Catalyzing green infrastructure on private property: Recommendations for a Green, Equitable, and Sustainable New York City [PDF]. Retrieved from https://www.nrdc.org/sites/default/files/catalyzing-green-infrastructure-on-private-property.pdf

[12] NIRPC. (2011). 2040 Comprehensive Regional Plan: A Vision for Northwest Indiana Plan Summary [PDF]. Retrieved from https://nirpc.wpengine.com/wp-content/uploads/2017/02/CRP_Summary_Corrected_02_2017_Compressed.pdf[8] Logsdon, W. (2019). Green Infrastructure Maintenance Cost Model [PDF]. Retrieved from http://www.12000raingardens.org/wp-content/uploads/2019/05/GI-Maintenance-Model-Webinar-050719.pdf

Public/Private Ordinances – Tree Ordinances

Tree ordinances can operate as either public or private land-based ordinances. There are three types of tree ordinances: street tree, tree protection, and view ordinances. Street tree ordinances, which are public land-based, focus on the planting and removal of trees in public lands, particularly rights of way. These ordinances include removal of trees that are hazardous to the public and requirements for planting trees. Tree protection ordinances can be either public or private land-based and focus on protecting historically significant trees or ones that provide benefits. Any action involving these trees under this ordinance would require a permit. View ordinances are entirely private land-based and focus on solving altercations between property owners over trees that can block sunlight or views. The International Society of Arboriculture (ISA) provides a useful guide on the development of effective tree ordinance.[13]

Private Land Ordinance

Private land ordinances regulate what can and cannot be done on private property and are diverse in both focus and approach. Although this diversity is beneficial, there are strengths and limitations to each type.

Stormwater Management

Stormwater management ordinances focus on increasing GSI-based stormwater management measures on private property. These ordinances set a standard for the volume of stormwater a private property is required to manage on-site. These standards are often determined by a scientific assessment of a community's risk of stormwater runoff. Private property can be existing, re-developed, or a proposed development. Stormwater management ordinances are easier to implement when developed for new, proposed developments, rather than those developed for pre-existing developments built prior to the ordinance. Planned developments would have to acquire permits confirming their plan is in line with the required amount of stormwater volume that a private property should retain. Recurring inspections can ensure maintenance of the GSI. Nonetheless, ensuring consistent quality of maintenance across all developments and properties can be difficult since they are private. Stormwater management ordinances targeting new developments also rely on private development markets, which can be a limitation for communities that have few new developments or are not seen as investment worthy. It is worth noting that stormwater management ordinances were voted of highest interest by attendees to the MARC-hosted workshop in August 2020.

---

[13] ISA. (2001). Guidelines for Developing and Evaluating Tree Ordinances [PDF]. Retrieved from https://www.isa-arbor.com/Portals/0/Assets/PDF/Certification/Tree-Ordinance-Guidelines.pdf

Low-Impact Development (LID) Ordinances

LID ordinances are similar to stormwater management ordinances but are not as strongly driven volumetric management of stormwater runoff. The premise of LID ordinances is to install GSI measures that replicate nature-based processes to manage stormwater (like infiltration, retention, etc.). These measures are defined as best management practices (BMP) and range from rain gardens to pervious pavement. Traditionally, these ordinances require developed areas to achieve a particular number of points in their implementation of BMPs. Each BMP has a different number of "points" which increase based on the impact/benefit of the BMP. The town of Merrillville in Indiana has established an LID ordinance, which mandates that developments implement enough BMPs to achieve at least 100 points, with a minimum of three different BMPs required.[14] The town offers fifteen different potential BMPs, presenting a benefit of LID ordinances which is the diversity of approaches to implement it. This flexibility can improve implementation and maintenance by property owners. Although not as impactful as stormwater management ordinances, LID ordinances may be more acceptable to property owners.

Native Plants Ordinances

Native plant ordinances focus on planting native plants on private property. Native species have characteristics that make them more suitable to local weather patterns, soil strata, and other geophysical characteristics.[15] Native plant ordinances often update existing property maintenance guidelines to include or require native species. The township of Lower Makefield in Pennsylvania, for example, amended its land and subdivision development code to include native plants.[16] These ordinances may also include a required minimum area that must contain native plants on private property.[17] A key concern with native plant ordinances is that they tend to place the onus on property owners to select and install native vegetation. Municipalities should ensure there are educational resources and technical assistance available as needed. It should be noted that not all property owners may be receptive of planting native plants due to aesthetic or simply lack of interest. While this could limit the impact of these ordinances, it's important for communities to accommodate a variety of property owner preferences and abilities.

---

[14] Town of Merrillville. The Town of Merrillville Indiana Storm Water Management Ordinance: Manual 1 [PDF]. Retrieved from http://merrillville.in.gov/document_center/Management_Ordinance_Manual.pdf

[15] Massner, K., Rosenbloom, J, & Duerksen, C. (n.d.). Use of Native Plants/Vegetation. Sustainable Development Code. Retrieved from https://sustainablecitycode.org/brief/require-use-of-native-plants-vegetation-7/

[16] Township of Lower Makefield. Ordinance No.368 [PDF]. Retrieved from http://pa.audubon.org/sites/default/files/static_pages/attachments/native-plant-ordinance-final-2017.pdf

[17] Ibid.

Invasive Plants Ordinance

Invasive plant ordinances are similar in nature to native plant ordinances, except they regulate invasive plant species. These ordinances may mandate removing or containing invasive species on private property. Unlike native species, invasive species are not suited for the environment they are in and can hinder native plant growth, disrupt ecosystems, and negatively impact nature-based stormwater management processes. Invasive plant ordinances share the same limitations as native plants ordinances, but there are examples of their successful implementation in cities across the U.S. For example, the city of Chesterfield in Missouri implemented a nuisance ordinance that allows planting native species that are free of weeds, grasses, or invasive species.[18]

Cost Sharing Program

Cost-sharing programs are another approach to implementing GSI in private properties. These programs encourage property owners to invest in GSI by offering a financial incentive in which the local government reimburses property owners for a portion of the installation costs. A key concern with this type of approach is that the degree of maintenance is difficult to maintain and private property owners can frequently change. Missouri Department of Conservation, Johnson County, KS, Lenexa, Overland Park, Olathe and other local municipalities have stormwater cost sharing programs. CNT's RainReady program in Oak Park offers a useful example of cost-sharing benefits for GSI. RainReady assesses households and provides recommendations for GSI. Household owners receive a grant that covers 50% of the costs of the GSI project's installation with grants going up to around $1,500.[19] Homeowners are supported in the financing of GSI, benefiting them as private property owners and the larger community by improving stormwater management.

[18] Native Landscaping Ordinances [PDF]. (2013). Retrieved from https://www.marc.org/Environment/Air-Quality/pdf/NativeLandscapingOrdinances-4pg-June2013.aspx

[19] CNT. RainReady Oak Park: Frequently Asked Questions [PDF]. Retrieved from https://www.cnt.org/sites/default/files/pdf/RainReadyFAQ_2019.pdf