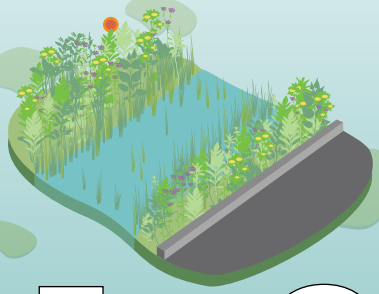
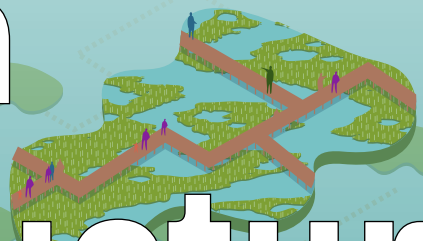


Is Green Infrastructure a Universal Good?



Executive Summary
Spring 2022

THE NEW SCHOOL URBAN SYSTEMS LAB

Cary Institute of Ecosystem Studies

THE KRESGE FOUNDATION

THE JPB FOUNDATION

IS GREEN INFRASTRUCTURE A UNIVERSAL GOOD?

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EXECUTIVE SUMMARY

Four out of five people in the United States live in or near a city. Cities serve as regional, political, and economic hubs facing intersecting environmental and social challenges. Across the US, urban residents deal with sharp disparities in environmental quality and exposure to climate hazards. These inequities are inseparable from growing gaps in wealth, health, and housing security.

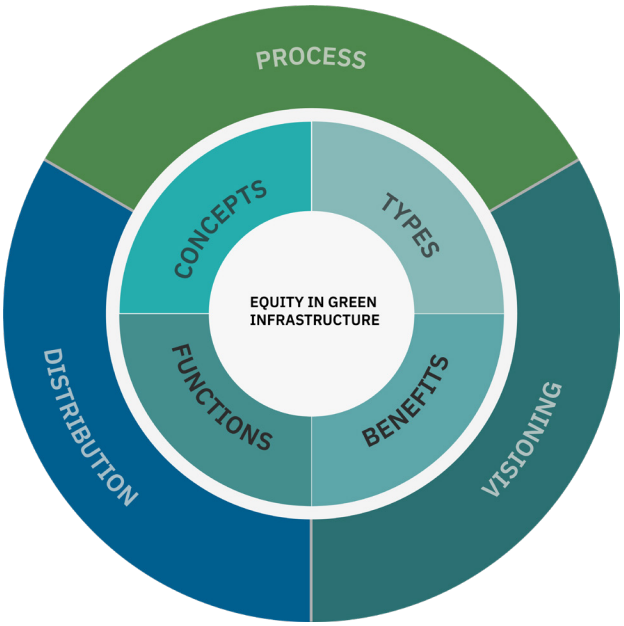
As cities make efforts to "green" themselves to address resilience and sustainability challenges, they must address deep seated inequalities caused by racist and oppressive legacies and current practices of city planning. Green infrastructure (GI) can provide significant value for residents, by managing multiple environmental hazards and simultaneously providing many amenity values and opportunities for wealth building labor. Who receives the benefits of GI investments, or how equitable GI planning is, depends on who makes plans for whom, how, and for what ends.

This report presents findings from an examination of 122 GI city plans in 20 diverse US cities. Our overall goal is to improve how GI planning and policy addresses equity. A team of researchers at Cary Institute for Ecosystem Studies and the Urban Systems Lab conducted a nationwide review of plans to identify how cities plan for green infrastructure, including how it is defined, along with its intended functions and benefits. Twenty medium to large US cities, representing the major biomes, were included. Over 300 city plans were collected and screened for references to green infrastructure, with 122 meeting the criteria for analysis as being current, city led plans. These included comprehensive/strategic, sustainability, watershed restoration, and climate plans.

Cities that were part of the assessment include: Atlanta, Austin, Baltimore, Chicago, Denver, Detroit, Louisville, Miami, Milwaukee, New Orleans, New York City, Philadelphia, Phoenix, Portland, Sacramento, San Juan, Seattle, St. Louis, Syracuse, and Washington DC.

The study uncovered a tremendous diversity of city plans utilizing the GI concept, though often in fragmented ways. Similarly, many plans inconsistently engage affected communities. Despite emerging commitments to equity, and with few exceptions, GI plans do not consistently define or address equity concerns. While many plans focus on managing hazards and providing amenity value, they are largely silent on their current inequitable distributions. A major emerging concern, that of green gentrification, is also largely absent from current planning efforts.

Among the team's findings: 39% of plans referring to green infrastructure do not define what it is. Of those that do, most focus on a stormwater focused definition (59%), followed by landscape concepts (17%). One of the more important findings was that a new and more integrative



Green Infrastructure Equity Framework

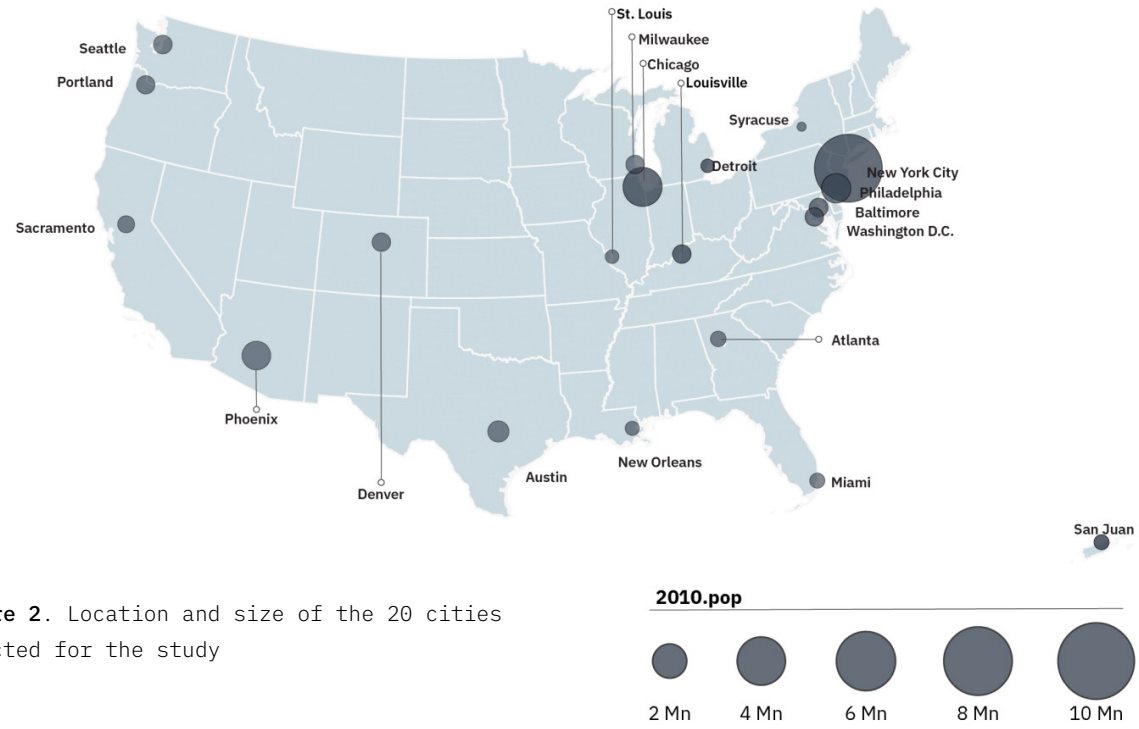


Figure 2. Location and size of the 20 cities selected for the study

concept of GI has emerged, one that seeks to plan for built and natural infrastructures in a more ecologically integrated way, including stormwater, transportation, and energy infrastructures (15% of definitions). And yet significant incoherence remains in plans, as 57% of plans with a definition had contained several different, and sometimes conflicting definitions of GI. This analysis indicates that hat green infrastructure means different things to different city agencies and cities across the US.

Within these definitions, what 'counts' as GI also varied widely. Across GI definitions, 693 different types of green infrastructure were identified. The features most commonly included in plans were trees (90%), rain gardens (75%), 'other stormwater facilities' (55%), blue-green corridors (60%), and green roofs (65%). Some features were notably absent, such as parks, trails, and networks of linked green elements.

Plans for GI sought a large range of benefits, though also varied considerably by city, plan type, and GI concepts. Benefits included water quality, recreation, health, city livability, and property value. Across cities, social benefits were most commonly cited in plans, followed by environmental, economic, 'built environment' (to enhance or support existing built structures, like a sewer or transportation system), and ecological benefits. Some cities also identified more specific benefits such as recovery from extreme weather events (e.g. Washington DC), new business opportunities (e.g. Miami), and social revitalization (e.g. Atlanta).

Taking in the breadth of concepts outlined in the 122 plans, the authors developed a synthetic definition of green infrastructure to guide future research and planning. This integrative and synthetic definition can help cities and researchers adopt a more comprehensive view of what green infrastructure entails and the benefits it confers.

> *Green infrastructure (GI) refers to a system of interconnected ecosystems, ecological–technological hybrids, and built infrastructures providing contextual social, environmental, and technological functions and benefits. As a planning concept, GI brings attention to how diverse types of urban ecosystems and built infrastructures function in relation to one another to meet socially negotiated goals.*

Insights and Recommendations

Planning equitable Green Infrastructure requires a more diverse conceptualization of GI to capture all of its potential services and disservices. Ultimately, procedural equity determines how plans can address persistent inequities and injustices. This requires new forms of genuinely democratic neighborhood and city-level decision-making to produce visions for equitable GI systems that will build lasting value and manage environmental hazards.With this in mind, our analysis yielded three overarching recommendations for city planners and GI advocates.

1. Use Broad GI Concepts to Guide Meaningful Coordination

Some cities employ the GI concept to coordinate disparate planning efforts, and yet planning for green infrastructure remains fragmented across most cities. Such fragmentation treats GI primarily as single-purpose single facilities rather than as a cohesive infrastructure system, limiting opportunities to address equity issues. ities should embrace a broader and more integrative definition of GI, and use it to guide the 'greening' of infrastructure systems such as 'green stormwater infrastructure' or 'green transportation infrastructure in addition to planning for interconnected networks of diverse green spaces and elements.

2. Have Clear and Robust Definitions of Equity Emphasizing Processes

By managing urban hazards and providing multiple values to residents, Green Infrastructure will always have equity implications. Planners must accept this and define equity, including the transparent and meaningful involvement, ownership, and review of plans by affected communities. This type of community led planning requires community labor and should be fairly compensated.

Planners must also be aware of the relationship between planning and historical and ongoing injustice. Equity and governance are closely intertwined. Thus, alternative models of owning and governing land (e.g. limited equity coops, community land trusts), and economic and political systems need to be more deeply explored. Without transforming the underlying injustices in cities, it is unlikely that more participatory planning and a greener urban environment will lead to lasting equitable outcomes for marginalized communities.

3. Move from Participation to Democracy, and Plans to Planning Cycles

The GI planning life cycle includes ongoing processes of planning, designing, implementing, and evaluating projects. Plans often focused on inclusion in the initial stages of planning, but rarely specified mechanisms for engaging communities through design, implementation, and evaluation of GI programs, policies, and projects. Planners must move beyond a framework of minimally required consultation and build participatory processes and good governance through deeper engagement between city agencies and residents. Such efforts should recenter decision-making power with communities. Examples of such recentering include participatory budgeting, community oversight of public agencies, and compensation of communities for involvement in planning exercises.

This type of democratic planning requires upfront investments of time, energy, and financial resources to build authentic relationships and establish forums for expressing concerns and collectively determining paths forward. Cities and states should take the lead on building procedural equity into their planning processes in the absence of strong federal leadership or appetite to enforce Title VI provisions for federally funded infrastructure projects. Current federal proposals to invest in urban infrastructure, including green infrastructure, should support the creation of robust community led planning.

METHODS

Our project, "Is Green Infrastructure a Universal Good?" is motivated by numerous observations that city investments in green infrastructure in the U.S. have not benefited all urban residents equally, and may worsen existing environmental and social injustices. Our initial research was guided by three questions.

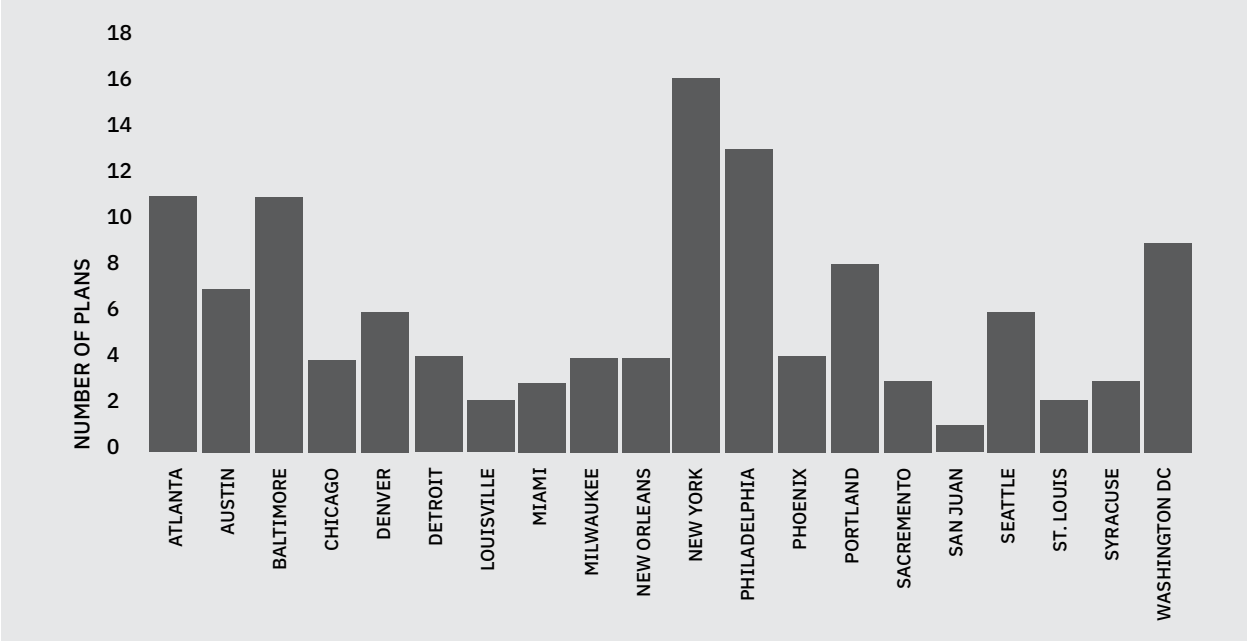
- To what degree do urban plans acknowledge that underserved neighborhoods may have different perceptions, needs, and support for green infrastructure projects?
- Do municipal plans discuss different experiences and perceptions of green infrastructure by diverse communities?
- Do the burdens of GI fall inequitably upon marginalized communities?

For our analysis, we chose 20 different-sized US cities including many recognized as leaders in Green Infrastructure (GI). Our early efforts found that cities plan for GI in diverse types of plans, requiring that we expand our analysis to all city plans addressing 'green infrastructure.' Across the 20 cities we examined, we found 122 plans using the term 'green infrastructure.' Using content analysis methods, we identified how plans conceive of GI, its social impacts, and its relationship with equity and justice. We also evaluated the equity of the GI planning process.

To assess the equity of GI planning, we first had to understand how planners in each city defined GI. This included what was considered part of the city's GI system, along with its functions and benefits.

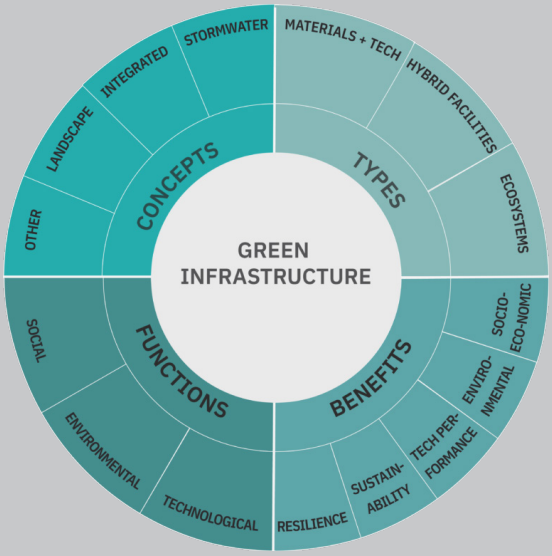
We then examined how plans conceived of and addressed equity within city GI plans in three dimensions:

- **Conceptual**: if and how equity is envisioned, including how it is defined and framed, and if it addressed issues of justice,
- **Procedural**: how impacted communities were involved in the planning, designing, implementation, and evaluation of GI, and
- Distributional: how proposed uses of GI affect current distributions of hazards, value, and labor.



Defining Green Infrastructure

Green Infrastructure (GI) refers to a system of interconnected ecosystems, ecological-technological hybrids, and built infrastructures providing contextual social, environmental, and technological functions and benefits. As a planning concept, GI brings attention to how urban ecosystems and built infrastructures function in relation to each other to achieve socially negotiated goals. In other words, Green Infrastructure combines elements of the natural environment and engineered systems, to provide a variety of services of value to communities.



Concepts

Green Infrastructure as a concept has evolved substantially from its earliest uses in the mid-1990s, and today takes three distinct forms.

1. Landscape: Connecting diverse green elements across landscapes to provide multiple functions and benefits
2. Stormwater: In 2007, the U.S. Environmental Protection Agency (EPA) adopted the term as a cost-effective strategy for managing urban stormwater to meet Clean Water Act (CWA) requirements.
3. Integration: Over time, some cities have integrated the two concepts

Types of GI

We identified over 28 distinct types of GI from definitions in analyzed plans. We organized these into three major categories: ecological (vegetation, plants, soils, riparian zones, parks), 'green' materials (rain barrels, permeable pavers), and hybrid facilities (bioswales and green roofs).

Functions

GI is often referred to as multifunctional. We examined how GI definitions within plans explained functions in terms of what GI is 'assumed to do'. We identified 31 distinct functions of GI, which we organized into three categories: Technological, Environmental, Social.

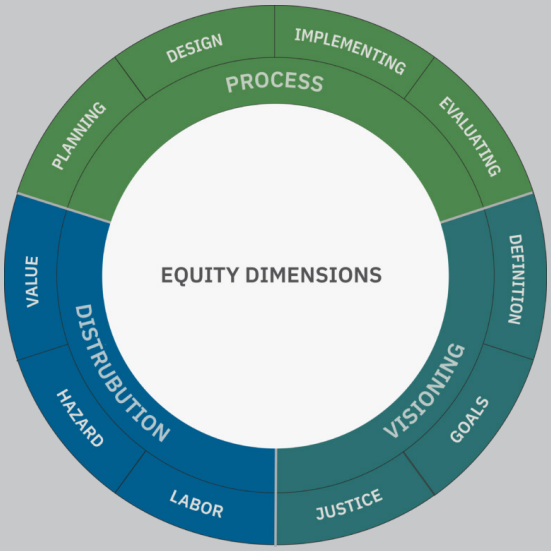
Benefits

Within plans, over 62 distinct types of benefits attributed to GI were identified. These were thematically grouped into categories:
1) Socioeconomic (improving health outcomes, reducing costs, increasing property value),
2) Environmental (enriching biodiversity, improving air and water quality), 3) Technological (reducing energy costs, increasing the lifespan of infrastructure systems), and 4) Improving general resilience and sustainability.

Defining Equity

Equity generally refers to fairness in process and outcomes, including the provision of resources based on need. We evaluate equity on this basis, although the term remains contested. Our guiding principles include the declaration of universal human rights, which includes the right to land, housing, livelihood, and a safe environment, along with the inherent right of political, economic, and cultural self-determination of oppressed and marginalized communities within the political systems that govern them. In planning practice, this right to self determination can take the form through the principles of Free, Prior, and Informed Consent, but this principle must be based on substantive control over the planning process by all communities which will be impacted in order to achieve consensus based consent.

We refined these big ideas to create an evaluation tool to assess the equity of city plans in three major dimensions: conceptual, procedural, and distributional. A general method was used to examine each of these dimensions within urban GI plans, and to compare the equity of planning within and across cities. In plans that were examined, our evaluation framework scored 10 different categories on a scale of 0 (absent) to 4 (ideal) within each dimension. Below, we expand on the definitions of dimension and category, along with an evaluation system.



Envisioning Equity

Envisioning equity in GI plans refers to the way that equity is defined and framed in connection to GI.

- **Definitions**: Where found, definitions were examined in terms of how they addressed equity's conceptual, procedural, and distributional dimensions. We also looked for acknowledgement of the need to address equity in a city's specific historical and present contexts, and if equity was defined by marginalized communities themselves.
- **Framing**: When plans do not explicitly refer to the term equity, they may implicitly frame social concerns of GI. The concept of framing is used to examine if, and how, plans account for the explicit and implicit social interests around GI. Examples include disparities in access to opportunities, and the enjoyment of their related health and income benefits, based on racial, socioeconomic, and/or other social characteristics. Framing statements are often found in the goals of plans, background narratives, and in their vision statements.
- **Justice**: Injustices are defined as the purposeful mistreatment of individuals or groups, often due to their perceived characteristics (such as race, class, gender, sexual orientation, and political ideologies), and/or relationships with land (e.g. forced removal and genocide of Native peoples). We examined plans for explicit references to justice in any sense including: a) Recognitional justice: the recognition of past and present injustices, b) Restorative justice: the description of specific steps to make reparations for those injustices, and c) Transformational justice: the inclusion of commitments to transform the systems that perpetuate harm.

Procedural Equity

In GI planning, procedural or process equity looks at who is involved, and how, from creating plans to evaluating their implementation and impacts.

- **Planning**: Procedural equity is determined by identifying which actors produce the plan and how this is accomplished. Equity is achieved when genuinely participatory and democratic planning methods are used and where affected communities and individuals have substantive input and control throughout the process.
- **Design**: Plans do not often specify designs for GI facilities, however, they can specify the process and means of designing projects and policies. Equity in design requires the inclusion of parties affected by the design in the process.
- **Implementation**: Project implementation may fall outside of a plan's scope. Still, plans can identify mechanisms for bringing GI from the drawing board into the real world, including tools for community involvement.
- **Evaluation**: We cannot know how equitable GI is without robust evaluations of its overall impacts. In order to be equitable, these assessments should come from impacted communities themselves, be transparent, and be used to update planned initiatives.

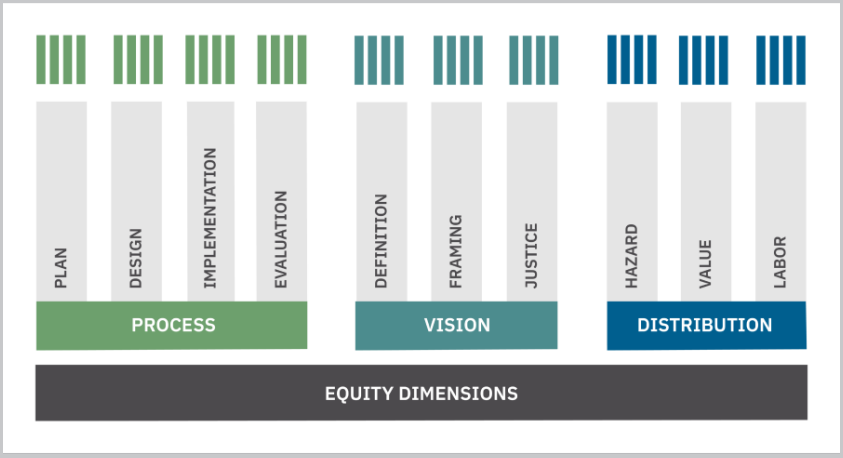
Distributional Equity

The distributional equity of GI refers to the overall spatial and social allocation of services provided, the hazards it seeks to address (including unintended consequences), and the administration of labor required for implementation and maintenance.

- **Value**: Value broadly refers to how the 'goods' or benefits of GI are planned to be distributed spatially and among different social groups.
- **Hazard**: Evaluating the equity of GI hazard management involves examining the existing social and spatial distributions of hazards, how those distributions will be changed by the plan, whether some groups may be made more vulnerable, and if potential unintended consequences are addressed.
- **Labor**: While a number of GI types may be self-organizing and maintaining, most require some form of labor throughout their life cycle. Labor equity refers to whose labor is required to create and maintain GI systems and how they are compensated.

Assess Overall Equity of GI in Plans

Our analysis and plan equity evaluation tool serve as resources for individuals, agencies, and communities to address gaps in the equitable governance of GI through the transformation of planning processes. Equity in GI planning is complex, multidimensional, and ultimately requires transforming urban governance.



WHY EQUITY?

Many view urban greening as a universal good, meaning it benefits all urban residents. Why then should we care about equity issues in Green Infrastructure planning?

In the United States, histories and current practices of urban greening intersect with deep-seated social and environmental injustices inseparable from structural inequality and oppression. While overarching, these forces manifest differently in each city we examined.

As our project progressed, long-standing calls for justice around the United States became louder and louder. Intersecting crises of police violence, climate change, and Covid-19 have brought attention to the deep injustices shaping U.S. cities. With this crisis comes the opportunity to advance the social discourse around the relationship between urban greening and long standing injustices, to bolster social movements, and to build new institutions capable of addressing these long standing harms. This page provides an overview of major forces shaping urban inequality, how they relate to our research process. We hope these prompts and resources invite more critical language and reflection:

Colonialism: Urban greening is always being practiced on Indigenous lands. How have settler logics and practices of nature as a resource to be consumed or disciplined justified the destruction of important ecological resources over time, creating the context for bringing nature back into cities?

Segregation: US cities are often intensely segregated, at both the neighborhood and metropolitan levels. These patterns have been directly influenced by municipal policies and expenditures on various 'public goods.' How have historical and ongoing practices of racist segregation that stratify wealth and property ownership in urban environments created uneven distribution and management of vegetation, air and water quality, microclimate, soils, and the built environment?

Dispossession: Cities have overseen highly unjust and disproportionate impacts of many notable green infrastructure projects that are seen as models. How has urban renewal and other forms of land clearance through eminent domain and uneven housing markets affected urban landscape and produced greenspaces with complicated histories and presents? How have formal programs of nature conservation and ecological restoration dispossessed diverse communities of their means of livelihood and access to customary resources?

Mitigation: The proactive creation of greenways and blueways to mitigate the impacts of hazards and climate change have a complicated history in the United States. How have ongoing land clearance and greenway production programs been critiqued for creating further inequities, even when equity is explicitly stated as a goal? How does the uneven protection of environmental hazards provided by green infrastructure intersect with ongoing inequalities in exposure to toxic chemical hazards in US cities? What strategies exist to address climate and environmental justice simultaneously?

Marginalization: The creation of urban greenways and blueways has produced landscapes of differential access, even when the infrastructure sites are not explicitly segregated. How have planners intervened in green spaces in ways that cause disparate access for people of color, poor people, disabled people, and LGBTQ people? How do power differentials between state agencies, institutions, and 'common' people shape urban futures and possibilities?

Resistance: How have urban green spaces and infrastructures functioned as sites of recreation, resistance, and reclamation for people of color, poor people, women, and LGBTQ people? How have histories of oppression and exclusion contributed to ideas that marginalized groups do not desire these spaces?

FINDINGS FOR ALL 20 CITIES

KEY FINDINGS

Of the 122 city plans examined, over 90% seek to rearrange the values and hazards of urban landscapes affecting the distributional equity of GI. However, only one in four city plans discuss equity issues, and 1 in 9 define the term, with even fewer mentioning justice. Very few city plans acknowledge the potential negative impacts of uneven or disproportionate investment in greening, like green gentrification. Cities that utilize a broad conceptualization of GI in higher-level city plans appear to more consistently address equity concerns and coordinate relevant city initiatives.

Despite a growing emphasis on including affected communities within planning, city plans fail to achieve procedural equity by not specifying methods and processes for inclusive design, implementation, and evaluation. While some city plans focus on creating low-wage maintenance jobs in affected communities, they do not discuss ways to build community wealth through the many different forms of labor that GI requires. Also, given the importance of Traditional Ecological Knowledge (TEK) for managing landscapes, there are surprisingly few mentions of Native peoples, their ecological practices, or relationships with the land in the past or present.

26% explicitly refer to equity

60% seek to address climate and other hazards

16% define equity

67% claim engagement with affected communities in planning

17% mention Native peoples or relationships with land

30% attempt to integrate landscape and stormwater concepts

30% apply a lens of universal good to GI

19% explicitly refer to justice

12% recognize that some people are more vulnerable than others

To learn more read:

Grabowski, Z. J., McPhearson, T., Matsler, A. M., Groffman, P., & Pickett, S. T. (2022). What is green infrastructure? A study of definitions in US city planning. *Frontiers in Ecology and the Environment*. https://doi.org/10.1002/fee.2445

ATLANTA, GA

Green Infrastructure in Atlanta

GI planning in Atlanta encompasses stormwater management and planning for landscape connectivity in the context of large-scale urban development. Examples include the large number of regulatory plans implementing stormwater-focused GI in specific subbasins, the Atlanta Comprehensive and Resilience plans utilizing landscape and integrative concepts of GI, and the Atlanta Beltway plan which refers to GI but does not define it.

Plans utilizing landscape GI concepts focus on larger landscape elements (e.g. parks, the urban tree canopy, and trail networks) while stormwater-focused plans, including those using integrative concepts, focus more on hybrid facilities and green materials.

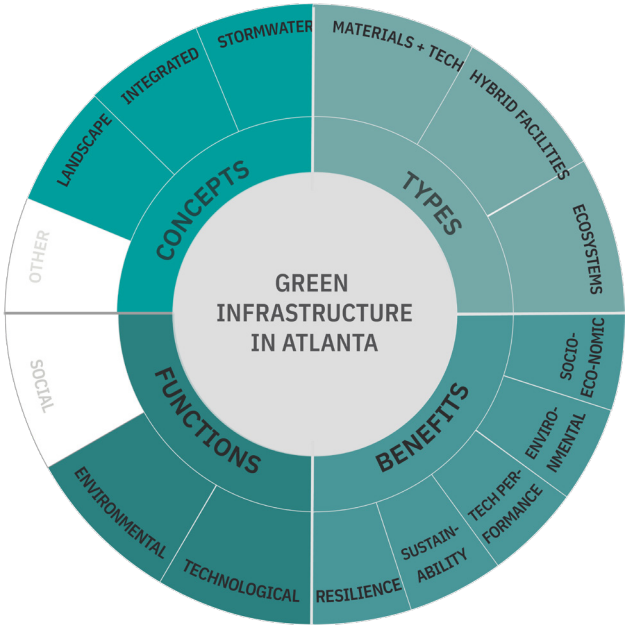
Functionally, plans use GI to manage urban hydrology, though some plans utilizing landscape concepts see it as a tool for supplying transportation and thermal regulation services.

Mirroring this functional focus, most benefits associated with GI relate to improved environmental conditions (largely water quality). However, stormwater-focused plans emphasize the reduced costs of infrastructure services, increasing property values, and a number of other economic and social benefits.

11 plans reviewed

Atlanta predominantly plans for GI to address stormwater issues, although some attempts are made to cohesively plan across the urban ecosystem. Atlanta's current strategic GI, comprehensive, and resilience plans embrace an equity lens, but mechanisms for addressing equity concerns remain sparse.

- Incorporated 1837
- 135.6 sq. miles
- 498,000 Total population
- 3673 people per sq. mile
- Temperate broadleaf and mixed forests
- $55,279 Median household income
- 63% Estimated rent-burdened households



Defining Green Infrastructure in Atlanta

Key Findings

Atlanta has embraced an equity lens in its current Strategic GI Plan and Comprehensive Plan updates and has recognized the need to address gentrification within green urban redevelopment projects. However, mechanisms to do so remain under development. Opportunities exist to better integrate city-wide greening efforts, green stormwater infrastructure programs, and housing justice concerns.

18% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

9% define equity

45% claim engagement with affected communities in planning

27% mention Native peoples or relationships with land

45% attempt to integrate landscape and stormwater concepts

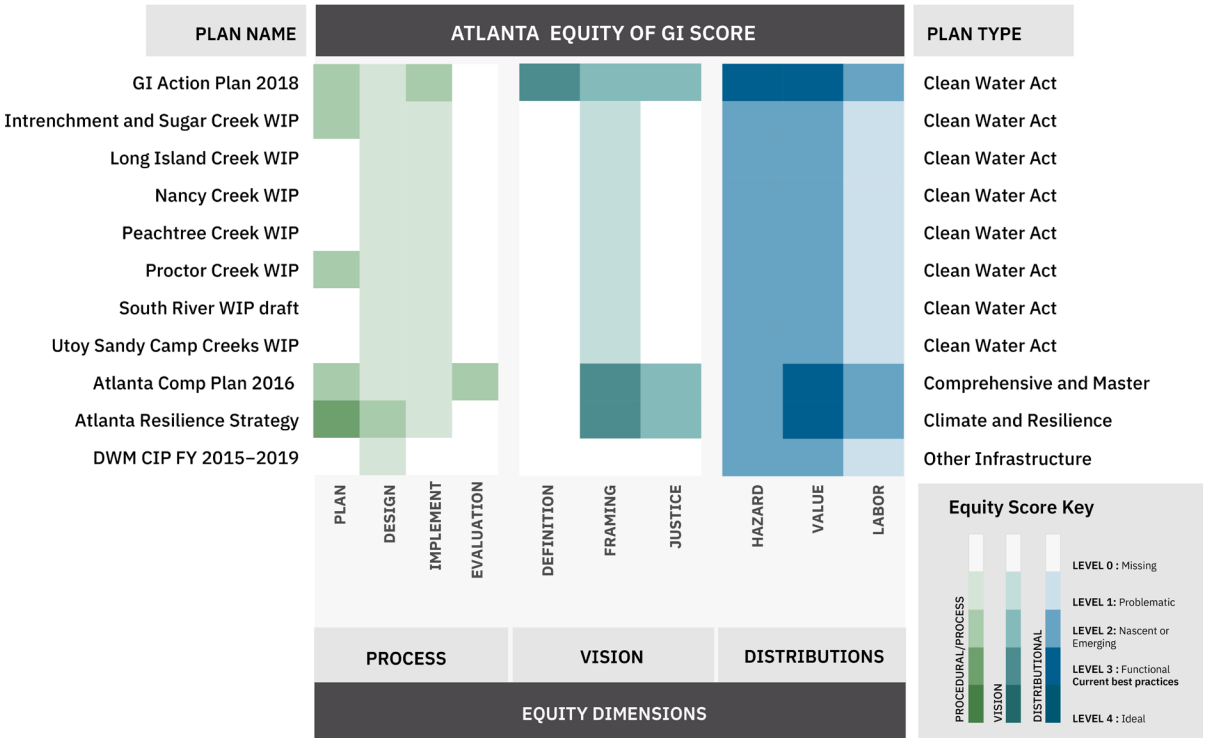
18% apply a lens of universal good to GI

27% explicitly refer to justice

18% recognize that some people are more vulnerable than others

How does Atlanta account for Equity in GI Planning?

Overall, no Atlanta plans cover all 10 of our equity dimensions despite addressing at least some equity concerns. In a few key areas, they represent current best practices across our study cities, namely in understanding the contextual value of GI and the hazards that GI-related redevelopment poses. There is a promising trend in the most current plans to center equity concerns. However, most plans do not define equity or address justice. A major need exists for procedures to involve communities in the evaluation of planning.



Recommendations for Stakeholders

Atlanta has numerous opportunities for improving equity in its GI planning and programs. As the city continues to grow in population and economic activity, a core issue is who benefits and who pays for ongoing redevelopment projects. Like many redeveloping cities, new forms of decision-making are likely required to guide investments in public services, infrastructure, and housing that benefit current residents without displacing them. Like many other cities we examined, Atlanta struggles with implementing creative drainage solutions to meet regulatory requirements while meeting other interdependent social, environmental, and infrastructural objectives in the context of extreme income and housing inequality.

Foundations and Funders

Foundations and funders in Atlanta have contributed to community-engaged planning processes dealing with Green Infrastructure. However, these plans are not binding upon city agencies. While policy makers and planners should build in such mechanisms, funders can support community organizing which forms the foundation of effective and just urban environmental governance.

1. Support Intersectional Organizing

2. From the Grassroots to City Hall

3. Rethinking and Remaking Urban Form

Community Groups

Atlanta has numerous communities that have long fought for their right to thrive within the city, and unfortunately current plans only rarely discuss their ongoing struggles. Some headway has been made with community-based planning practices that sought to create binding visions for neighborhood planning and guiding city investments in public infrastructure, as evidenced within the Proctor Creek and Sugar and Intrenchment creek WIPS (which reference community-led visions from plans not authored by city agencies).

1. The Need for Substantive and Transparent Community Engagement

2. Reclaiming the Value of GI = Reclaiming the Value Of Urban Land

3. Building Community Cohesion Through Community Organizing

Policy Makers and Planners

A diverse array of city agencies and government entities are involved in GI planning in Atlanta and the GI Strategic Plan has a welcome focus on equity issues. However, the Atlanta plans at large are contradictory about what GI is and what it does and contain limited processes for public engagement and participation from planning through evaluation.

1. Rooting GI in the urban landscape for community needs

2. From Words to Action

3. Clarifying Definitions and Making them Count

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

AUSTIN, TX

Green Infrastructure in Austin

Austin utilizes a diverse array of GI concepts, especially in the Imagine Austin Comprehensive Plan, which provides an overarching framework for other plans including those addressing stormwater management, the urban trails network, the urban forest, and capital investments. However, GI is defined only in the Climate and Forest Plans.

Functionally, stormwater-related hydrological and built environment functions dominate the plans. However, the role that GI plays in the urban ecosystem, its ability to mitigate the urban heat island, and reshape transportation networks and options are also present within definitions.

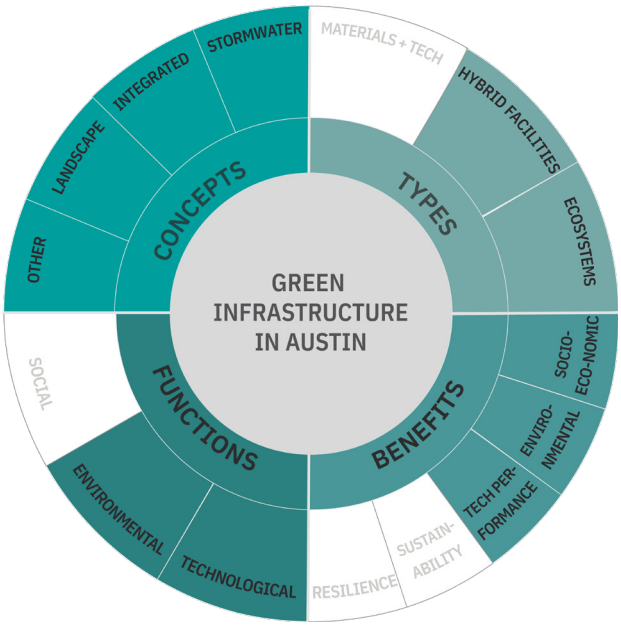
Beyond those definitions, there are a variety of concepts reflected in a large diversity of GI types, which prioritize connecting ecosystems, farms, waterbodies, parks, trails, the urban forest, and river networks with several other GI elements.

Austin plans define the benefits of GI broadly, emphasizing its role in providing recreation, livability, and outdoor experiences while allowing for regulatory compliance, improving the design and performance of the built environment, and providing a range of environmental benefits.

7 plans reviewed

Austin plans diverge in GI concepts and strategies dealing with ecological elements and hybrid infrastructures. Austin plans seek to engage communities to provide multiple values, but visions and evaluation mechanisms need development.

- Incorporated 1835
- 327.4 sq. miles
- 935,755 Total population, 2917 people per sq. mile
- Temperate grasslands, savannas, and shrublands
- $67,462 Median household income
- 61.3% Estimated rent-burdened households
- 8.5% Housing units vacant



Defining Green Infrastructure in Austin

Key Findings

Austin plans emphasize collaboration with residents, although affected communities have limited mechanisms to influence design, implementation, and evaluation. Most plans lack visions that extensively define equity and address justice except for the Comprehensive and Forest plans. The majority of plans address urban hazards and value but are mixed in if, and how, they consider the labor needs and opportunities of GI.

17% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

14% define equity

100% claim engagement with affected communities in planning

0% mention Native peoples or relationships with land

14% attempt to integrate landscape and stormwater concepts

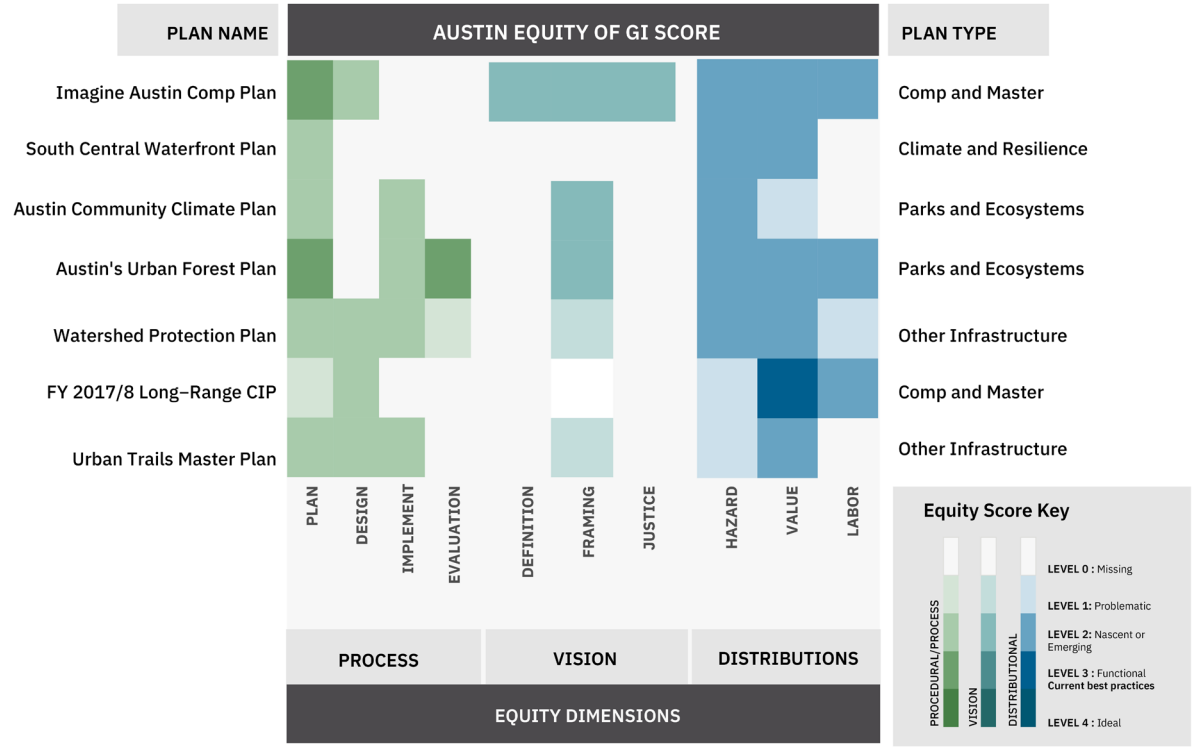
14% apply a lens of universal good to GI

14% explicitly refer to justice

0% recognize that some people are more vulnerable than others

How does Austin account for Equity in GI Planning?

With an emphasis on GI connectivity and values embedded within the planning system, Austin plans exemplify several best practices of inclusive planning processes, including specifying toolkits and assessment mechanisms for the multiple values of GI. However, despite this emphasis on inclusive planning, evaluation mechanisms remain sparse, and the overall framing of equity concerns in plans has much room for improvement. The City's commitments to inclusive planning offer a strong foundation for process improvement and for collecting diverse perspectives on what would constitute equitable processes, visions, and resultant distributions of labor for the city as a whole.



Recommendations for Stakeholders

Austin has a strong foundation of inclusive planning. The diversity of elements considered within GI plans allow for a networked and city-wide planning approach delivering benefits and hazard reduction appropriate to the context. Delivering these services equitably will require more substantive mechanisms for community-led design, implementation, and evaluation. It can improve upon its framing of equity concerns and address other historical and ongoing injustices in the city. Additional opportunities for supporting community wealth building center on the need to think creatively about built environment improvements, and fostering place-based industries that incorporate green technologies alongside improvements to the urban ecosystem.

Foundations and Funders

Austin's Comprehensive Plan borrows a robust Green Infrastructure definition from the Conservation Fund (p 151) and thus appears to rely on non-profits for core aspects of its GI programs. However, non-profit or foundation support appears to be limited in city initiatives. The Urban Forest Plan in particular outlines a strategy of assigning a monetary value to GI to make the case for its expanded implementation. However, how monetary values are arrived at remains poorly specified, with limited means of accruing to residents or public budgets. In collaboration with existing partners, such as the Trust for Public Land, more nuanced evaluations of value recapture may be necessary to influence the overall austerity mindset in Austin's GI plans.

1. Support Research on Transformative Funding Mechanisms
2. From Opportunities to Community-Led Programs for Redesign

Community Groups

Many groups in Austin have rallied around social, economic, and environmental justice. Current GI plans seem open to their involvement during plan development, yet aside from the CodeNEXT revision process, mechanisms are lacking to meaningfully include communities in the design, implementation, and evaluation of GI programs and projects. Improving procedural equity in the city may be the way forward to tackle social and environmental challenges. It is concerning that the potential for displacement from large GI investments is not discussed within city plans.

1. From Engaged Planning to Co-Design, Implementation, and Evaluation
2. Daylighting the Housing Affordability and Infrastructure Relationships
3. Emphasizing Labor Equity Amidst Rapid urban change and systemic challenges

Policy Makers and Planners

The implementation of Austin's planning projects appear to be supported by a large number of city agencies and coordinating task forces, but mostly lacks mechanisms for substantive public input. These formal coordinating bodies have the potential to significantly improve communication and joint implementation among city departments and appear guided by the city's comprehensive planning. However, equity concerns remain poorly articulated and framed, and this is reflected in incomplete mechanisms for community involvement in the processes of creating and enacting plans.

1. Thinking Deeply about Equity
2. Power Sharing
3. Embracing Labor Innovation

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

BALTIMORE, MD

Green Infrastructure in Baltimore

The majority of GI plans in Baltimore deal with stormwater management, although ambitious city-wide efforts, such as the Green Network Plan, supported by the Sustainability Plan, seek to unify a larger number of landscape elements in a broader push for urban redevelopment. Like many other cities, several plans utilizing the GI concept do not define it, including the MS4 and TMDL WIP, Inner Harbor 2.0, and S. Baltimore Gateway Master Plans.

Broadly, plans do not differ substantially in the types of elements considered green infrastructure, although definitions of GI omit the use of green materials and technology, focusing on ecosystems and hybrid facilities. Only plans utilizing landscape concepts include parks and gardens.

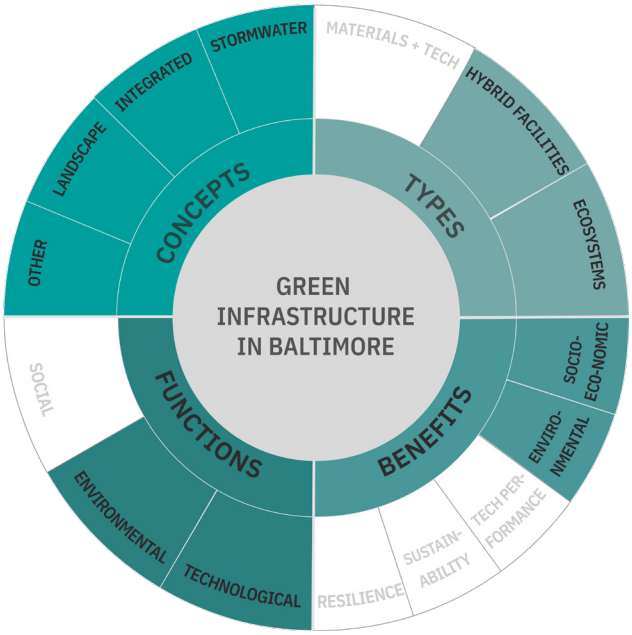
GI is primarily managed to provide environmental functions and is often dominated by a diverse array of hydrological services with a lesser emphasis on air quality.

Baltimore plans focus on the socio-economic benefits of GI with a limited focus on environmental and technological benefits. Two plans in particular – the Sustainability Plan and the Healthy Harbor Plan – seek to provide a wide array of social and ecological benefits.

11 plans reviewed

Baltimore plans primarily use GI to manage stormwater; however, plans also include large scale efforts for a city-wide green network and redevelopment. Baltimore plans emphasize community involvement and revitalization, but lack definitions and mechanisms.

- Incorporated 1729
- 92.1 sq. miles
- 614,700 Total population, 7594 people per sq. mile
- Temperate broadleaf and mixed forests
- $48,840 Median household income
- 64% Estimated rent-burdened households
- 19% Housing units vacant



Defining Green Infrastructure in Baltimore

Key Findings

GI Plans in Baltimore commonly refer to the need to address equity and justice concerns, and yet equity remains poorly defined, with few binding mechanisms for equitable design, implementation, and evaluation. GI implementation is widespread and occurs alongside city-wide efforts for greening and urban renewal.

82% explicitly refer to equity, 100% have equity implications

82% seek to address climate and other hazards

18% define equity

100% claim engagement with affected communities in planning

0% mention Native peoples or relationships with land

9% attempt to integrate landscape and stormwater concepts

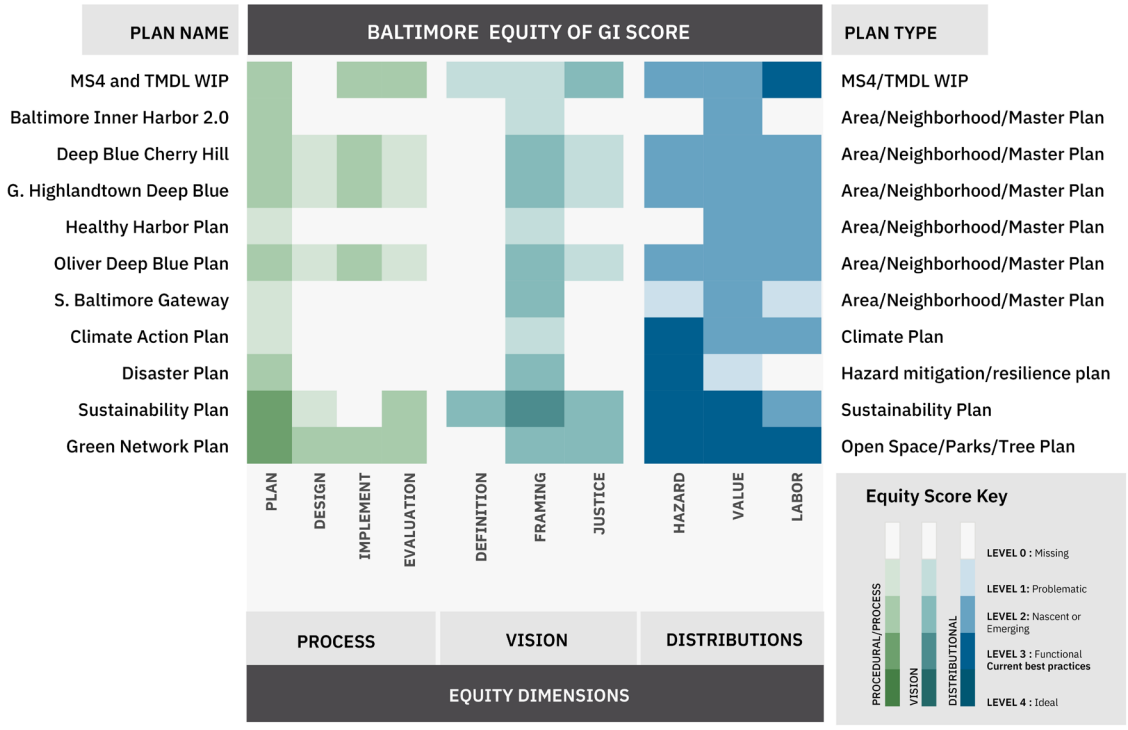
36% apply a lens of universal good to GI

63% explicitly refer to justice

18% recognize that some people are more vulnerable than others

How does Baltimore account for Equity in GI Planning?

While many plans make significant commitments to equity and inclusion, few mechanisms exist for community involvement throughout the GI lifecycle. No plan in Baltimore accounts for equity across our ten equity dimensions. We only found two definitions of equity across 11 plans, and although the Sustainability Plan seeks to address historical oppression, it only briefly discusses how city policies and programs have contributed to environmental and social injustice. Mirroring our broader findings, there are significant equity implications for how the city plans to use GI to manage urban hazards and rearrange the value of the urban landscape. Several plans have devoted considerable space to discussing the equity implications of city-wide and neighborhood-specific GI initiatives, though no protocols were put forth to address potential housing displacement.



Recommendations for Stakeholders

There are many opportunities to improve the equity of GI planning in Baltimore especially given an ongoing effort by the City of Baltimore to apply an equity lens to all of its municipal agencies' activities. While a deeper analysis of implementation equity is ongoing, Baltimore already has a diverse array of non-governmental stakeholders, both nonprofit and private, involved in GI planning and implementation. Like other cities, targeted investments in GI coupled with city incentives to attract real estate capital for urban redevelopment pose significant risks of displacement. Yet the city has a very real need to build community and intergenerational wealth in oppressed communities while improving long-standing environmental hazards.

Foundations and Funders

Existing nonprofits have contributed heavily to GI deployment and planning within Baltimore and some mechanisms for dedicated maintenance support and community labor have led to favorable outcomes. In other cases, poorly tracked outcomes and limited community engagement have led to numerous problems in facility maintenance and inequitable burdens of GI. Importantly, significant opportunities exist to support community-led efforts in developing institutional tools that will embed more equitable procedures and funding in GI and related community revitalization efforts.

1. Supporting Intersectional Organizing
2. Seizing Opportunities for Structural Change
3. Rethinking and Remaking Urban Form - A Green New Deal for Baltimore?

Community Groups

Baltimore is home to many robust social movements and community organizations that do not appear well represented within current GI planning efforts. A community's infrastructure assets form the underlying basis for its material and social well-being. Given the capacity of comprehensive GI planning to address persistent environmental injustices, a greater emphasis could be placed on using public resources and planning efforts to support the intersectional goals of existing community organizations. However, planning fatigue has been noted in Baltimore, so efforts must be focused on those areas where positive impacts can be delivered.

1. The Need for Substantive and Transparent Community Engagement
2. From Increasing Value to Transformative Justice
3. Mechanisms to Hold Planners Accountable

Policy Makers and Planners

While many nonprofit actors are involved in implementing green stormwater infrastructure facilities, the larger push for GI and associated policy instruments and initiatives has largely come from city policy makers and planners responding to federal and state regulations. With a recent Baltimore City ordinance requiring city agencies to consider their contributions to historical and ongoing patterns of injustice, it would be timely for city actors to initiate changes in standard operating procedures and planning models.

1. Being Clear on What Equity Is, and Is Not
2. From Words to Action
3. Redistributing Decision Making Requires Redistributing Labor and Resources

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

CHICAGO, IL

Green Infrastructure in Chicago

Chicago is unique among the cities we examined for differentiating between natural and engineered green infrastructure in its Green Stormwater Infrastructure Strategy. The GSI plan defines natural GI using an integrated concept and engineered GI using a stormwater-focused concept. Neither the cities Sustainability Plan or Adding Green to Urban design plans define GI. GI planning in Chicago is further complicated by the fact that the Metropolitan Water Reclamation District of Greater Chicago oversees significant portions of the city's sanitary and water supply infrastructure.

Types of GI in Chicago span all three of our major categories and include designed elements such as green roofs, rain gardens, and permeable pavers. However, plan definitions do not consider a diverse set of open space and ecosystem types.

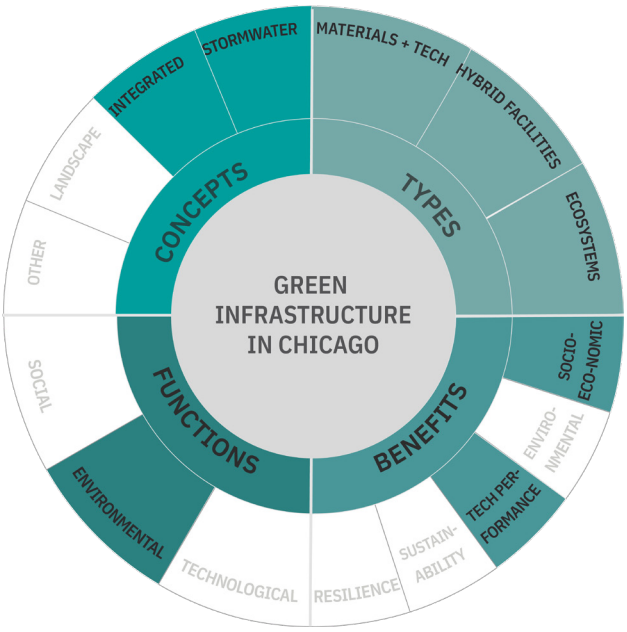
Functionally, GI is managed to provide environmental functions, dominated by a fairly limited set of hydrological services.

Despite the care to differentiate broadly between natural and engineered GI, the benefits of GI remain weakly defined, focusing only on property values and energy conservation.

4 plans reviewed

Chicago plans focus on stormwater, though also include the integration of 'natural' and 'engineered' GI. Chicago plans inconsistently address equity, despite commitments to multiple values and functions, they lack definitions.

- Incorporated 1789
- 234.2 sq. miles
- 2,718,555 Total population, 11,956 people per sq. mile
- Temperate grasslands, savannas, and shrublands
- $55,198 Median household income
- 61.5% Estimated rent-burdened households
- 12.6% Housing units vacant



Defining Green Infrastructure in Chicago

Key Findings

GI plans in Chicago make almost no mention of equity or justice issues and do not define equity or justice. There are some attempts to include affected communities in the planning lifecycle, especially in the Sustainability Plan and the Green Urban Design Plan. While the city has developed an extensive GI based stormwater management program, there does not appear to be a comprehensive or systematic GI planning approach in the city.

25% explicitly refer to equity, 100% have equity implications

75% seek to address climate and other hazards

0% define equity

100% claim engagement with affected communities in planning

0% mention Native peoples or relationships with land

25% attempt to integrate landscape and stormwater concepts

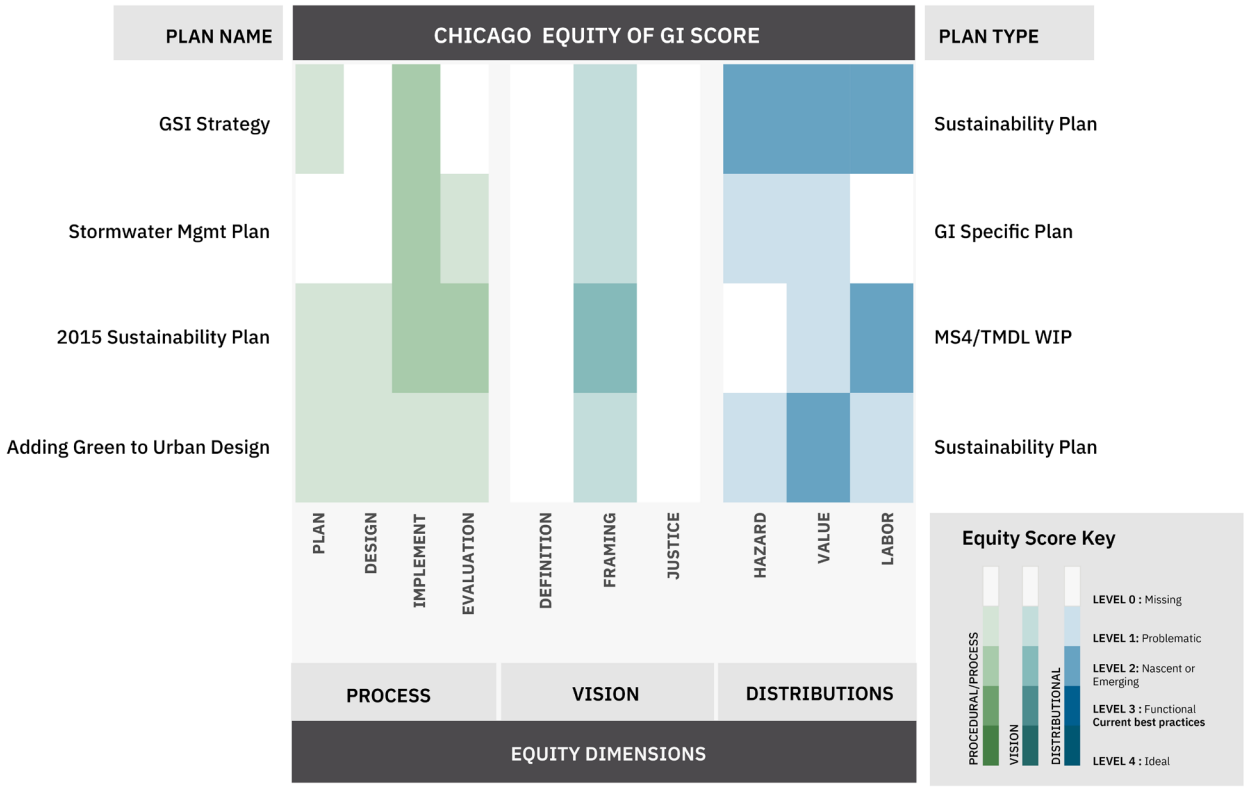
75% apply a lens of universal good to GI

50% explicitly refer to justice

0% recognize that some people are more vulnerable than others

How does Chicago account for Equity in GI Planning?

Chicago GI plans are startlingly absent of any substantive mentions of equity but still have significant equity implications. No plans in Chicago addressed all ten dimensions of equity we examined. Across plans, there are weak commitments to participatory planning, with some unspecified commitments to interdepartmental equity in GI implementation, although evaluation remains nascent or problematic. There were no definitions of equity or justice. Framings of equity were weak and general across plans. One exception was found in the sustainability plan. Considerations of justice were absent across plans.



Recommendations for Stakeholders

Chicago has pivoted in 2020 to address equity issues through its 'We Will Chicago' planning process. Yet despite a careful articulation of a Green Stormwater Infrastructure planning concept and the elaboration of 'green design' principles, Chicago plans do not appear to provide a cohesive framework for integrating diverse ecological and technological elements into a city-wide GI system. Current GI plans have largely failed to even define equity, let alone detail processes of how diverse communities will have meaningful input with city agency initiatives, or how their values and concerns will be addressed in city-led planning. In light of the ongoing demands from a diverse range of community groups for the city to meaningfully address equity and justice in GI planning, Chicago will need to re-examine its planning legacy and its shortcomings in this arena.

Foundations and Funders

Existing nonprofits have contributed heavily to GI deployment and planning within Baltimore and some mechanisms for dedicated maintenance support and community labor have led to favorable outcomes. In other cases, poorly tracked outcomes and limited community engagement have led to numerous problems in facility maintenance and inequitable burdens of GI. Importantly, significant opportunities exist to support community-led efforts in developing institutional tools that will embed more equitable procedures and funding in GI and related community revitalization efforts.

1. Supporting Intersectional Organizing
2. Seizing Opportunities for Structural Change
3. Rethinking and Remaking Urban Form - A Green New Deal for Baltimore?

Community Groups

Existing GI initiatives and plans appear to have largely failed to address the needs of disenfranchised and marginalized communities. The current push to include equity in the city's comprehensive planning process should provide space for community-led planning efforts in diverse domains. While 'green infrastructure' as a stormwater planning concept has been extensively applied by city agencies through the City's green roof and stormwater programs, significant improvements can be made to ensure that the multiple benefits and functions of diverse green elements throughout the city can deliver the benefits that communities need.

1. Framing Equity and Justice Issues
2. Shifting Narratives around Housing, Renewal, and Environmental Justice
3. Building Community Power

Policy Makers and Planners

The current push for a city-wide plan centering 'equity, diversity, and resiliency' must embrace a robust concept of equity and justice if it is to meaningfully address the legacies of systemic racism in the built environment and beyond. While the general principles of equity and justice detailed in our framework page can inform this process, we hope that it is clear that these principles call for the meaningful inclusion of affected communities in the decisions that shape their lives. Policy makers and planners have multiple opportunities to change existing institutions and planning procedures. To aid in this process, we identify several recommendations below.

1. Opening Planning to Equity and Justice
2. Democratizing City Planning and Agencies
3. Examining differential vulnerability and exposure to hazards

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

DENVER, CO

Green Infrastructure in Denver

Denver has a diverse set of plans addressing GI. Alongside the dedicated GI Strategy, which largely addresses stormwater management, the concept is employed to guide landscape conservation and integrative planning efforts. The Comprehensive Plan and Neighborhood Planning Initiative lay out a city-wide vision for interconnected parks, green spaces, and stormwater infrastructure systems. All the plans examined in Denver defined GI, aside from the current Capital Improvement Plan, which nevertheless supports a wide range of GI-related programs across the city.

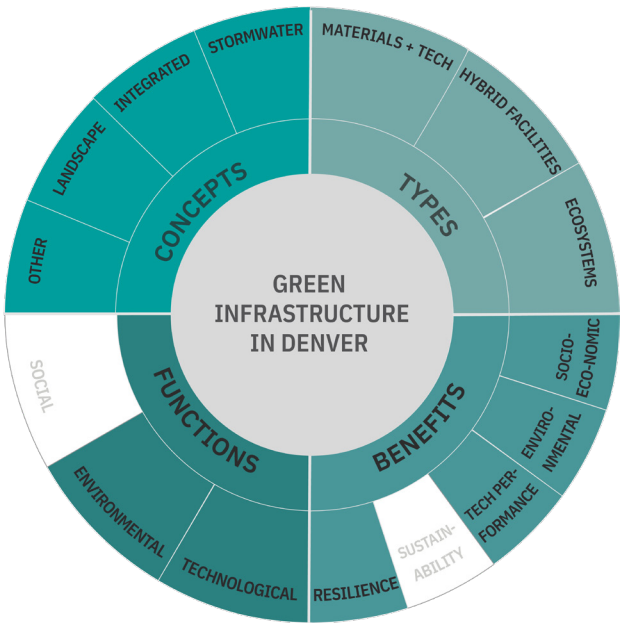
Denver plans address the range of categories of GI types, although some specific types, such as wetlands, trails, and green streets are lacking, indicating that more green elements could be included in the city-wide definitions of GI. Plans focus on the environmental and technological functions of GI: managing stormwater, in addition to supporting ecological processes, regulating heat, improving air quality, sequestering carbon, and improving the overall functionality of the built environment.

Denver GI definitions emphasize a narrower range of benefits than half the cities we examined and did not appear to frame GI as contributing significantly to urban sustainability.

6 plans reviewed

Denver plans embrace multiple GI concepts and focus on a more connected urban ecosystem including parks, trails, and rivers. Denver plans emphasize participatory planning, targeting underserved communities, but lack mechanisms for evaluation.

- Incorporated 1858
- 154.9 sq. miles
- 693,417 Total population, 4523 people per sq. mile
- Temperate grasslands, savannas, and shrublands
- $63,793 Median household income
- 60.1% Estimated rent-burdened households
- 6.3% Housing units vacant



Defining Green Infrastructure in Denver

Key Findings

Among all plans in our analysis, Denver plans clearly lead in terms of thinking through equity issues around health disparities and explicitly targeting GI programs.

83% explicitly refer to equity, 100% have equity implications

67% seek to address climate and other hazards

67% define equity

100% claim engagement with affected communities in planning

0% mention Native peoples or relationships with land

17% attempt to integrate landscape and stormwater concepts

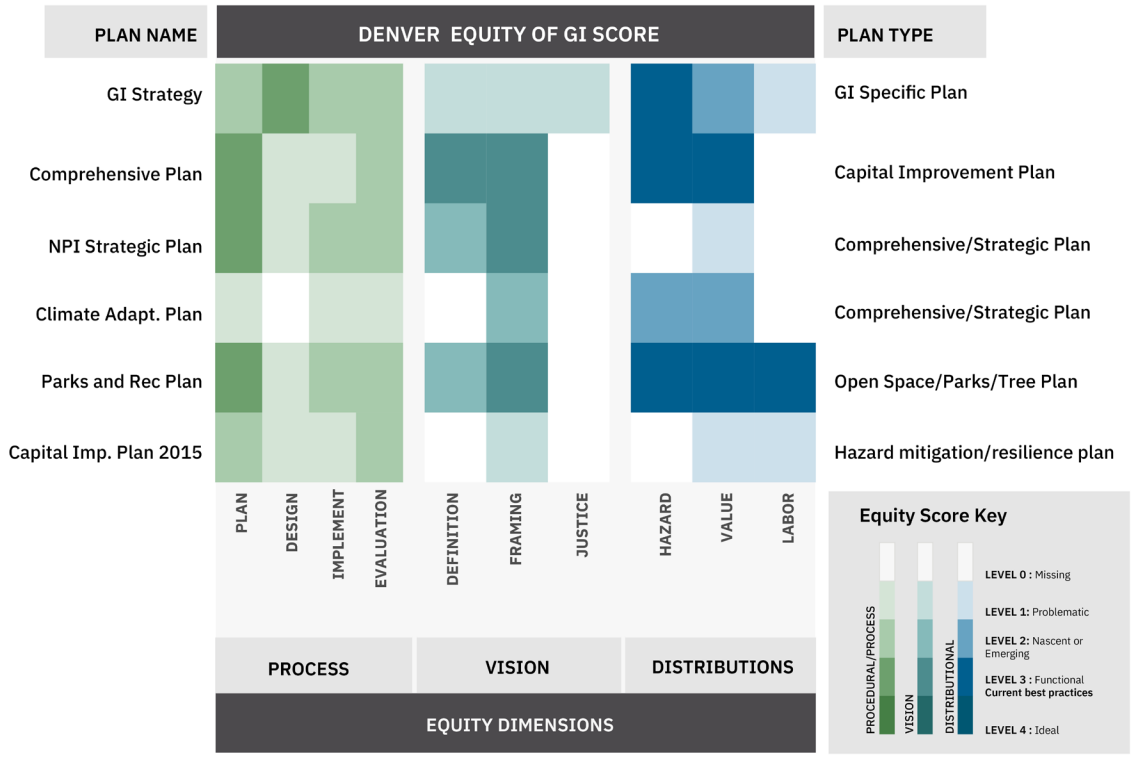
67% apply a lens of universal good to GI

17% explicitly refer to justice

50% recognize that some people are more vulnerable than others

How does Denver account for Equity in GI Planning?

The Denver GI strategy addresses all aspects of equity evaluated using our screen. The city's GI siting framework centers health disparities connected to environmental hazards; it aims to use GI to mitigate risks that disproportionately harm residents' health in low-income areas. Many of the plans define equity in relation to GI but only the Comprehensive Plan contains a robust definition addressing procedural and distributional components. Yet, it falls short of the ideal by not explicitly addressing the need for justice. Another strong example is the Parks and Recreation Plan. It touches on 9 of our 10 screening categories and contains current best practices in examining the distributional components of equity. Overall, though, mechanisms for including input from communities are lacking, and a vision for GI that includes a robust consideration of justice is not expressed in any plan.



Recommendations for Stakeholders

Denver's strength with equity lies in its formalization of equity criteria in its GI planning efforts. However, these equity-forward approaches are largely ahistorical, fail to recognize justice, and lack mechanisms for transforming planning so that historical injustices are not recreated by current practices. Addressing the shortcomings in procedural justice, the democratization of planning, the distributions of services GI seeks to provide, and the labor required to ultimately realize them, may help to align the diverse efforts of the numerous nonprofits, city agencies, and philanthropic organizations that are active within the city and its planning efforts.

Foundations and Funders

Denver has embarked on promising initiatives to address systemic racism in city government. However, given the extensive displacement of low-income and predominantly POC populations, a primary struggle in Denver is reclaiming areas for affordable housing and protecting other communities from further displacement. Some initiatives, like those led by Groundwork, take a community-first approach for greening to mitigate climate hazards. Yet such programs appear to receive limited support from the city government despite the potential that exists within the neighborhood planning initiative. Other planning processes such as Blueprint Denver, the Neighborhood Planning Initiative, Denver Right, and Denver Moves all center community engagement with city agencies. The success of these initiatives will depend on how effectively organized communities can steer city agency activities and hold them accountable in implementation.

1. Supporting Community Organizing

Community Groups

Denver has a rich ecosystem of community groups and statewide organizations working on racial and housing justice. Given the observed relationship between housing displacement, affordability, and green improvements, the implementation of a city-wide green infrastructure strategy will have relevance to advocates for social and racial justice. Organizations like Groundwork Denver have been supporting communities in greening initiatives to address justice issues, also discussed in city plans. There is a need for sustained community organizing to confront intersectional issues of housing, environmental hazards, climate resilience, and economic justice.

1. Windows of Opportunity for Transformative Change

2. Coalitions for Fair Housing and Greening

3. Holding Equity Planning Accountable

Policy Makers and Planners

Denver plans do not reflect the equity frameworks or aspirations of the current city Administration, and inconsistently define and operationalize equity concerns. Our framework provides for a robust conceptualization of equity from the creation of plans through their implementation and evaluation, with careful consideration of impacts of planned activities on values, hazards, and labor markets. Policy makers/ planners concerned with equity issues can utilize this framework, along with three major arenas:

1. Operationalizing Equity in Prioritization and Beyond

2. Fitting solutions to Place, Across Scales and Generations

3. Scaling Equitable Growth

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

DETROIT, MI

City-led Green Infrastructure in Detroit

City-led GI plans in Detroit focus on stormwater management exclusively. The city will invest over $50 million in GI over the next decade to solve long-standing issues with surface water quality caused by storm runoff and combined sewer overflows. City-led plans also seek to improve socio-economic conditions with green stormwater infrastructure investments. In addition to extensive stormwater-focused programs, there is some integration of community initiatives to reclaim vacant lots and homes in broader efforts of greening and community revitalization.

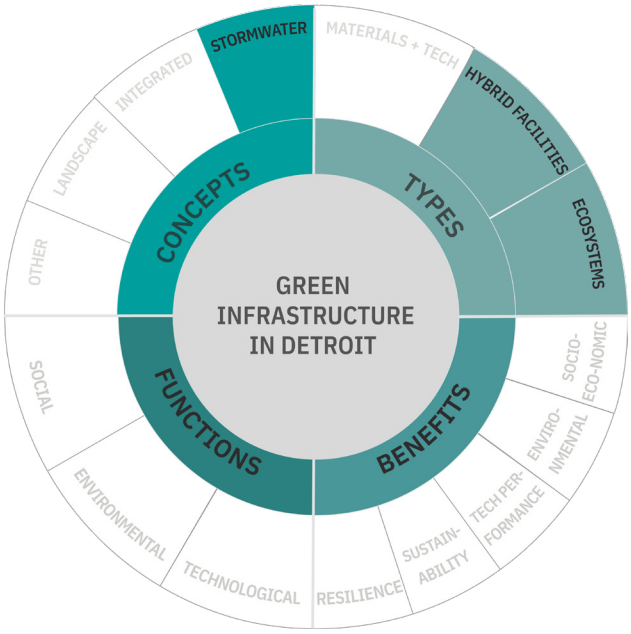
Within city-led stormwater and sewer management plans GI is not defined with precision. The exception is the definition offered in the Upper Rouge GI Plan. However, this definition is somewhat narrow and only mentions trees, bioretention processes, and other stormwater management features, and does not encompass the broad range of community-led GI initiatives.

Importantly, plans do not seem to analyze the potential social benefits or overall impacts of GI, even though the Upper Rouge Tunnel GI Plan states that part of the rationale for examining GI as a stormwater management strategy was its broader social value. While some community-engaged initiatives, like the Detroit Future City program and the Water Agenda, have broader concepts of GI and equity at play, they do not appear to be binding on city agencies, and so fall outside the scope of this analysis.

4 plans reviewed

Detroit city plans currently limit their definitions of GI to stormwater management through the use of ecosystem elements and hybrid facilities. City of Detroit GI planning predominantly targets combined sewer overflows under regulatory plans that have some engagement but do not explicitly address equity and justice issues.

- 142.9 sq miles
- 677,155 Total Population
- 0.6% Forest cover
- Temperate Broadleaf / Mixed Forests
- 5.4% Developed open space
- $29,481 Median household income
- 31.3% Live below federal poverty level
- 72.4% Est. rent-burdened households
- 28.5% Housing units vacant
- 0.3% Native, 10.5% White, 78% Black, 7.7% Latinx, 0.1% Multi-racial/'other,' 1.7% Asian, <0.1% Pacific Islander



Defining Green Infrastructure in Detroit

Key Findings

No city-led GI plans in Detroit define the concepts of equity or justice. They also frame the equity implications of existing GI programs weakly or problematically. While there are attempts to be transparent about inclusion in the planning process itself, these attempts often lack mechanisms for accountability and do not fully carry over into the phases of designing, implementing, or evaluating programs. Similarly, plans are inconsistent in their discussion of how GI will manage hazards, add value, and require new forms of labor to be realized.

25% explicitly refer to equity, 100% have equity implications

75% seek to address climate and other hazards

0% define equity

100% claim engagement with affected communities in planning

0% mention Native peoples or relationships with land

0% attempt to integrate landscape and stormwater concepts

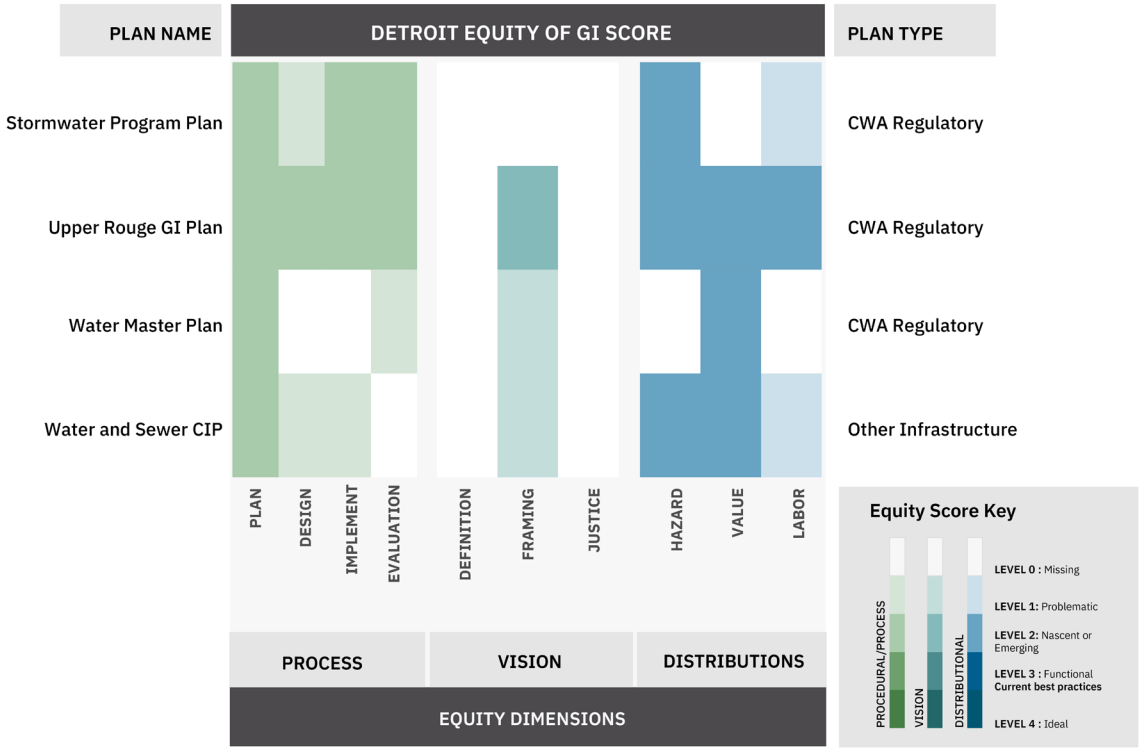
0% apply a lens of universal good to GI

0% explicitly refer to justice

0% recognize that some people are more vulnerable than others

How does Detroit account for Equity in GI Planning?

No city-led plans in Detroit define equity or justice, let alone account for equity across all ten equity dimensions. This is striking, given the existence of other community-engaged efforts to create equitable visions for diverse types of GI. While some city-led plans name stakeholders in planning processes, few efforts appear to have been made within current plans to foster community inclusion. Plans have explicit equity implications through their focus on managing combined sewer overflows and surface runoff pollution, as well as some mention of addressing other social values. Labor issues are largely absent or problematically discussed.



Recommendations for Stakeholders

Current city-led GI plans do not meaningfully address equity issues in the City of Detroit. However, the more holistic process for creating the Sustainability Plan, which falls outside the scope of our current analysis as it did not explicitly address GI, seeks to integrate equity into all 43 of the city's sustainability initiatives. The plan includes a Diversity, Equity, and Inclusion Initiative that may represent an opportunity to operationalize systematic approaches toward greenspace planning that contain equity and justice considerations at their core.

Community Groups

Detroit has numerous community groups working towards racial and environmental justice who have been deeply involved in GI planning. Examples of community engaged planning practices in the city include the Detroit Future City Initiative and Strategic Framework which is referenced by city plans, but not in a binding manner. The Land and Water Works coalition also explicitly seeks to foster engagement between residents and planning agencies. However, despite years of including them on task forces, such as the Green Task Force, The People's Water Board, city-led GSI plans appear to have limited mechanisms for direct community input. There thus appears to be a disconnect between robust community-led GI planning practices, and their inclusion in formal GSI plans led by DWSD. A reason for this absence of community voices in GI planning is likely due to GI being only thought of as a stormwater management strategy. Another major reason is likely that outreach is seen as a voluntary component of city-led planning, which is dominated by technical practices. Given ongoing advocacy by community groups for comprehensive approaches, several areas of opportunity exist for community needs to shape city implemented initiatives.

1. Centering Community Needs in GI Planning
2. Pushing the Boundaries of Sustainability

Foundations and Funders

Existing nonprofits such as the Sierra Club, Greening of Detroit, The Nature Conservancy, and funders like the Erb Family Foundation have been crucial to promoting blue-green infrastructure initiatives in Detroit and building connections with affected communities. Recognizing that Detroit's GI system encompasses more than stormwater infrastructure can lead to new opportunities and ways of supporting community organizing efforts as they seek to revitalize communities while preventing housing displacement and making green reparations. These efforts can be combined with existing well-funded racial justice initiatives.

1. Support Intersectional Organizing
2. Transformative Justice through Just Transitions and Appropriate Technology

Policy Makers and Planners

Detroit policy makers and planners should consider a systematic approach towards understanding the distribution of diverse green spaces and their relationships with communities across the city. Existing coalitions for non-profits, community groups, and government agencies could be formally supported in an approach for city-wide greening going beyond the use of Green Infrastructure merely as a stormwater management tool. Alongside a systematic approach to GI, equity and justice issues must be addressed in city plans. Below we provide several recommendations to achieve both high-level needs.

1. Embracing Landscape Level Green Infrastructure
2. Centering Environmental Justice and Equity
3. Building Systems for System Building

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

LOUISVILLE, KY

Green Infrastructure in Louisville

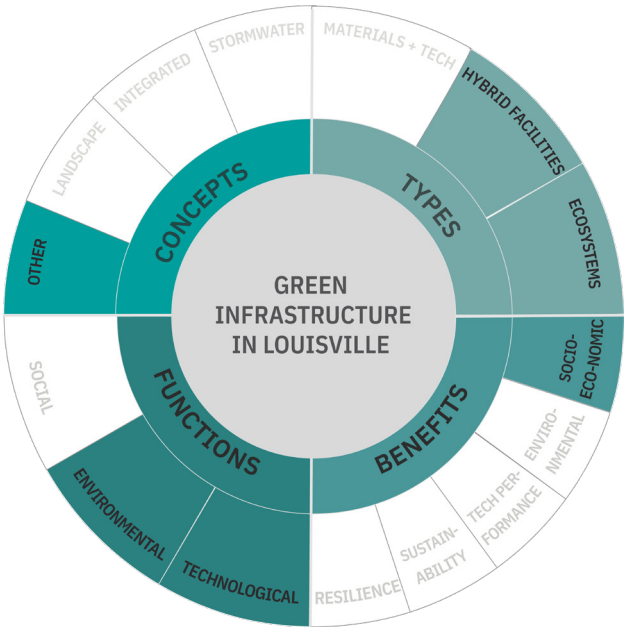
Louisville has numerous beautiful green spaces, including the Olmsted-influenced city park system and other parks connected through the Loop plan. The city has made large investments in flood infrastructure near the Ohio river and seeks to address rainfall runoff induced flooding. Yet, the concept of Green Infrastructure does not feature prominently in Louisville plans. City of Louisville plans focus primarily on the health benefits of GI and, in some cases, GI elements were seen as providing ecological functions and improving the performance of the built environment.

Two plans address the GI concept. The Sustainability Plan defines GI as a key part of the city's infrastructure systems with elements that include trees, bioretention facilities, and green roofs. The Louisville Loop plan refers to integrating GI into plans for trail and path connections but does not define the term Green Infrastructure. The regional Metropolitan Sewer District manages an extensive GI program but the regional utility's plans and compliance mechanisms were outside the scope of this analysis.

2 plans reviewed

Louisville plans treat GI as part of the city's core infrastructure systems and support a city-wide network of green spaces. Louisville plans are largely silent on equity issues. Despite promising mechanisms of public engagement, they lack procedures for evaluation.

- Incorporated 1778
- 275.2 sq. miles
- 617,032 Total population, 2,343 people per sq. mile
- Temperate broadleaf and mixed forests
- $51,307 Median household income
- 58.5% Estimated rent-burdened house-holds
- 10.6% Housing units vacant



Defining Green Infrastructure in Louisville

Key Findings

Equity is sporadically referenced but not defined in Louisville's GI plans. While the Louisville Loop and Sustainability Plans seek to incorporate multiple equity concerns framing the visions for GI, there are significant procedural gaps in involving communities in design and evaluation. Further, distributional dimensions of equity are problematically addressed.

50% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

0% define equity

100% claim engagement with affected communities in planning

0% mention Native peoples or relationships with land

0% attempt to integrate landscape and stormwater concepts

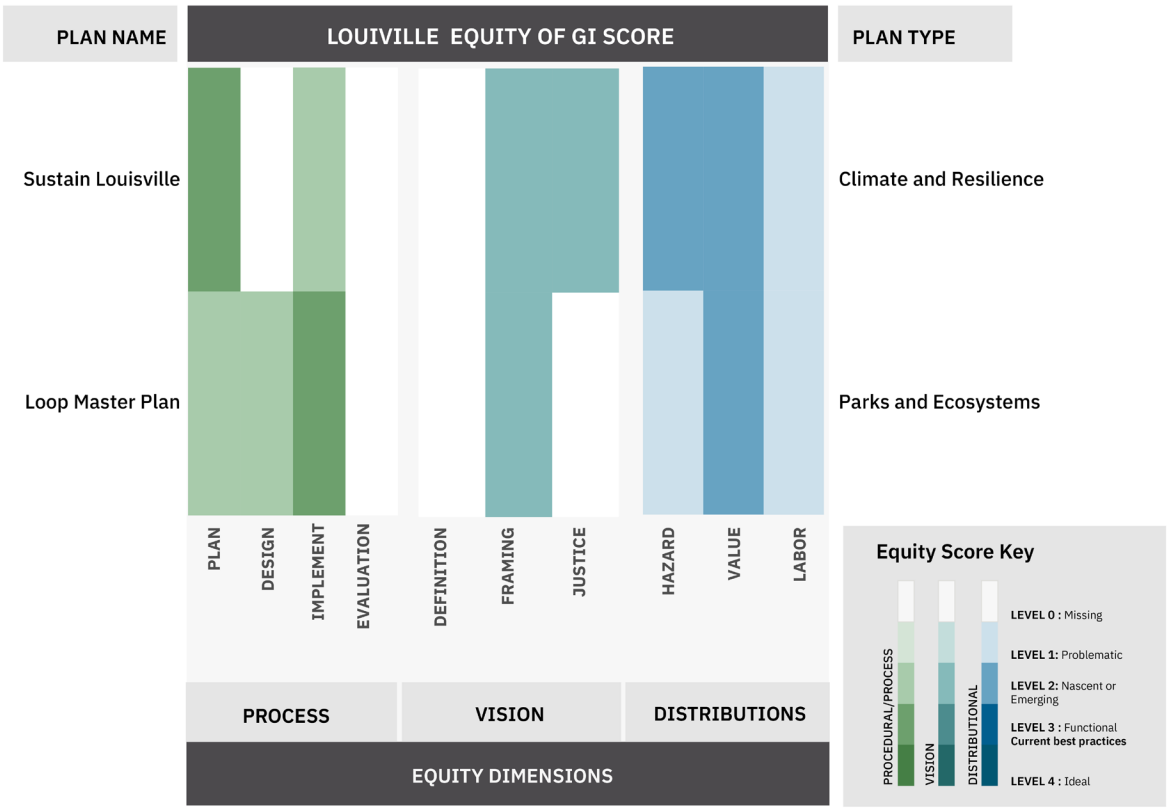
50% apply a lens of universal good to GI

50% explicitly refer to justice

50% recognize that some people are more vulnerable than others

How does Louisville account for Equity in GI Planning?

Louisville plans do not robustly consider equity, with several dimensions completely unaddressed. Like other cities, intentions to involve communities in GI planning often fall short. While plans seek equitable distribution of the benefits of GI, there is room for improvement in how plans address the distributions of hazards and labor. The Sustainability Plan makes notable efforts to discuss equity issues somewhat comprehensively but omits the procedural dimensions and ongoing demands for justice. Despite the intentions to address equity and justice in the Sustainability Plan, there is limited discussion of what either of those terms mean.



Recommendations for Stakeholders

Racial justice issues have gained renewed prominence in Louisville since 2020. The city garnered national attention with the murder of Breonna Taylor in an area of the city that many say is being forcibly gentrified. At the same time, the administration of Greg Fischer has made headline commitments to addressing racial injustice, and as a member of the Government Alliance on Race and Equity, the city has made numerous commitments to addressing racism and injustice in plans and policies. Here we provide several recommendations for how community groups, city agencies, and funders could pursue strategies of equitable greening.

Foundations and Funders

Foundations and Funders have a historic opportunity to fund community groups in Louisville to demand restructuring of the city decision-making and funding apparatuses that implement city plans. Such restructuring requires deep deliberation among community members, followed by the experience of being heard and of seeing community concerns and aspirations translated into meaningful institutional change. Nonprofits and foundations in Louisville have already operationalized new models of funding community-based organizing to focus on within-community leadership. This turn towards increased representation is welcome, and yet, relying on representative forms of governance are inherently competitive and promote a mindset of resource scarcity rather than building collective power.

1. Building Collective Power to Shape Urban Futures

2. Restructuring without Renewal

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

Community Groups

For many years, Louisvillians have been persistently working on racial justice and environmental quality issues. Existing campaigns for environmental and racial justice include the long-running efforts of REACT and KFTC. This same type of sustained community engagement will be required to successfully build meaningful inclusion and institutional transformation into current planning efforts for a city-wide green infrastructure network. After locating current gaps in community engagement practices, we identified two opportunities for community groups to shape the future of equitable GI in Louisville.

1. Demand Systemic Approaches to Environmental Issues

2. Call for Institutional Change

Policy Makers and Planners

In recent years City Government has committed to several racial justice initiatives, including a review of racism in Planning and Zoning and how the Land Development Code perpetuates racial segregation. While the city has received credit for how it has pursued community-based development in the Russell Neighborhood, there are many criticisms within the community from long-standing residents who have felt left out or ignored as the community gentrifies, and who are continuing to fight for the right to emplacement. It is up to planners and policy makers to make space and provide resources for community groups to lead on visioning city redevelopment projects and to actively evaluate and govern outcomes of ongoing initiatives. The city's legacy of high-quality public infrastructure requires both a guiding vision and accountability to those whom the infrastructure is supposed to serve.

1. Defining Equity and Justice

2. Equitable Governance of GI

MIAMI, FL

Green Infrastructure in Miami

In stark contrast to other cities focusing exclusively on stormwater infrastructure, Miami Green Infrastructure plans focus almost exclusively on creating a high quality and city-wide system of parks and urban canopy, through its Parks and Tree Plans.

Both the Parks and Tree Canopy Master plans refer to diverse and networked green spaces, engineered streetscapes, and ecological elements using a landscape concept of GI.

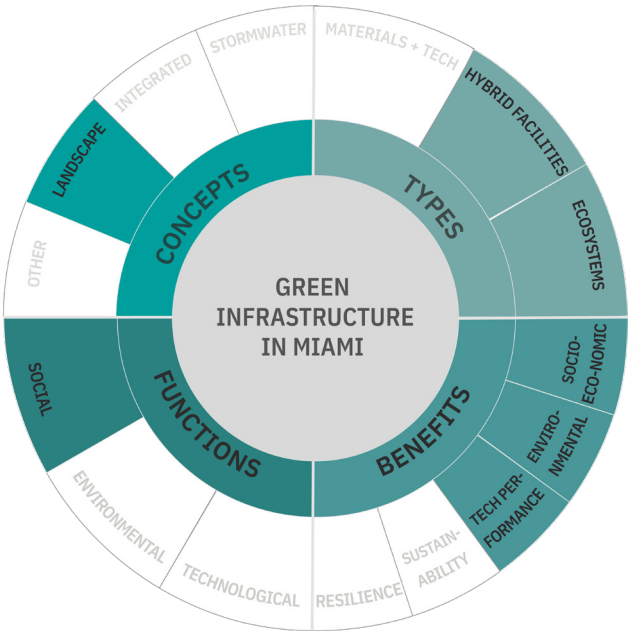
GI is primarily seen as fulfilling social functions, providing opportunities for gatherings, recreation, and building a sense of identity. The benefits of GI in Miami are defined across environmental, technological, and socioeconomic domains.

Plans recognize that GI provides numerous socio-economic benefits, assists with climate adaptation, and functions as a core part of the city's infrastructure and urban fabric. The Climate Plan references the GI concept, yet it does not provide an explicit definition.

3 plans reviewed

Miami plans emphasize a connected park system, urban forests, and complementary urban form, yet omit stormwater management. Miami has actionable frameworks for inclusive park system planning and assessing distributional dimensions of equity, but plans lack definitions and consistency.

- Incorporated 1825
- 56.1 sq. miles
- 451,214 Total population, 12,535 people per sq. mile
- Tropical and subtropical moist broadleaf forests
- $36,638 Median household income
- 75.9% Estimated rent-burdened households



Defining Green Infrastructure in Miami

Key Findings

Miami GI Plans refer to equity and justice and yet fail to meaningfully define either. Despite this omission, the Parks Plan exemplifies some best practices in procedural equity. All plans are concerned with the distributional aspects of equity. Weak framings appear to prevent a robust and contextual exploration of current distributional issues and how they could be addressed by planning.

100% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

0% define equity

100% claim engagement with affected communities in planning

0% mention Native peoples or relationships with land

0% attempt to integrate landscape and stormwater concepts

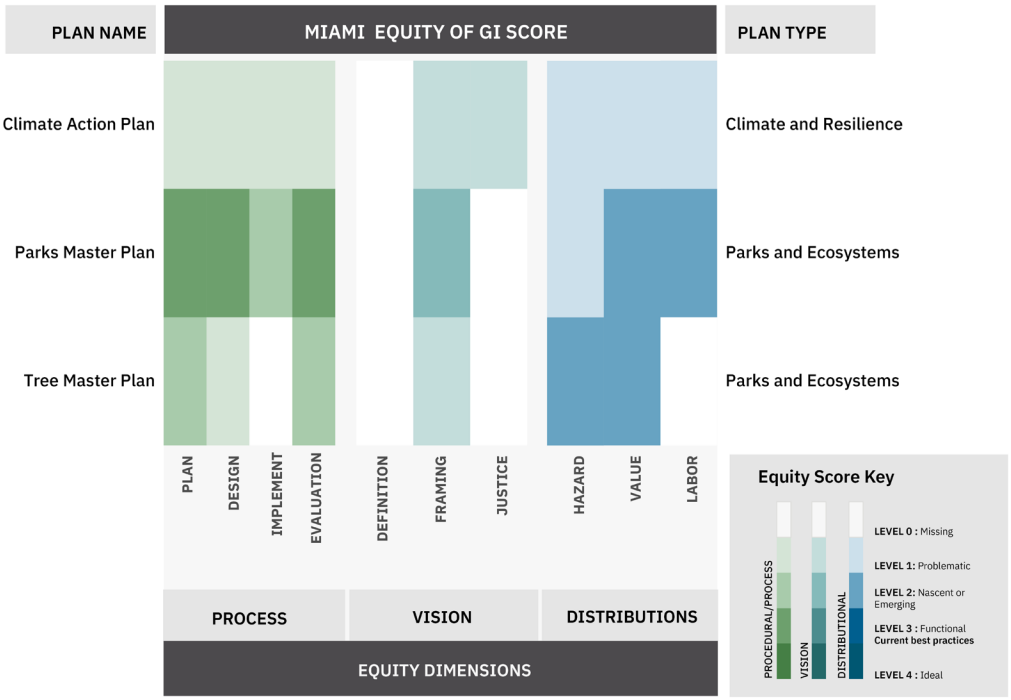
66% apply a lens of universal good to GI

33% explicitly refer to justice

33% recognize that some people are more vulnerable than others

How does Miami account for Equity in GI Planning?

Miami City plans make admirable commitments to participation and addressing contextual uses of GI. However, no single plan in Miami addresses the dimensions of equity in our analysis, and visions of equity in plans are largely problematic. Mechanisms for procedural equity were inconsistent across plans. Distributional elements are discussed, but not robustly analyzed. No plans define equity or justice and framings are generally universalist with no mention of potential adverse impacts. Planning processes are highly centralized, with appointed commissions and city staff primarily responsible for implementation and evaluation. The exception is the Parks Master Plan which considers the needs of diverse user groups benefits of GI. It also utilizes extensive outreach surveys for planning, design, and evaluation, although overseen by an appointed commission.



Recommendations for Stakeholders

Miami Plans provide a basic scaffold for community-led planning of a city-wide green infrastructure network. Given ongoing initiatives to adapt to climate change in the city, especially those operating across federal and county levels, we provide several key recommendations to improve the equity of GI planning in Miami. We offer these in recognition that the most recent climate change adaptation plan fell outside the scope of our formal analysis.

Foundations and Funders

Miami has a rich ecosystem and history of community organizing that can be supported by local and national foundations and funders. Existing Green Infrastructure plans highlight several areas for consideration.

1. Support Intersectional Organizing

2. Building Participatory Governance From the Ground Up

Community Groups

There are numerous social and racial justice organizations working in Miami that can be engaged and supported in organizing communities to proactively lead planning processes addressing the intertwined crises of climate change, housing, and economic justice. While the City appears to have made great strides in connecting with community groups in park system planning and evaluation, much more needs to be done to activate Miami residents to address the intersecting climatic and social challenges faced by their communities.

1. Rallying around a Just Transition Framework

Policy Makers and Planners

The City's existing and emergent approaches focus on a citywide GI network, with the most recent climate plan integrating stormwater systems with the urban canopy. This is an improvement over the existing landscape-focused approaches in the city's parks and tree plans, though integrating infrastructure systems poses new sets of challenges. There is a risk of omitting the equitable processes developed in the park system plans in the city's climate adaptation programs.

1. Integrate Emergent Climate Planning With Park's System Planning

2. Expand Community Based Evaluation Frameworks

3. Address Economic and Racial Justice in GI planning

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

MILWAUKEE, WI

Green Infrastructure in Milwaukee

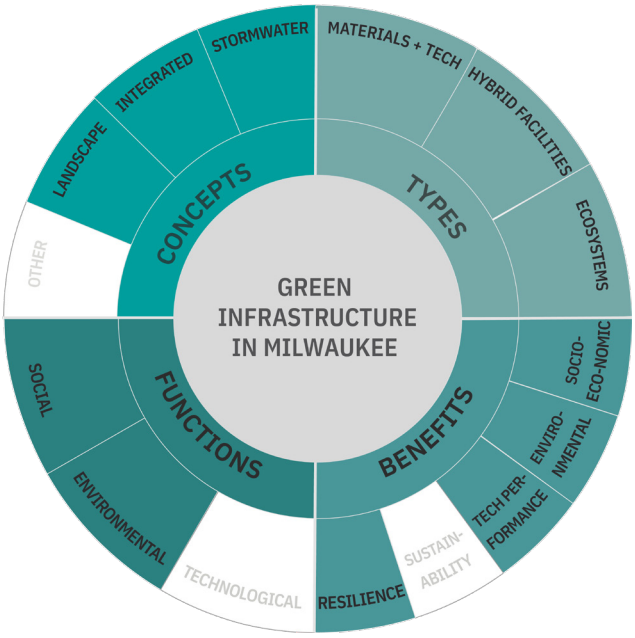
The City of Milwaukee plans for GI through a dedicated Plan, a city-wide Green Streets Plan, a comprehensive Citywide Policy Plan, and its sustainability plan, ReFresh Milwaukee. The city has long been recognized as a leader in using GI for stormwater management in its separated sewer areas, and must plan alongside the Metropolitan Milwaukee Sewerage District overseeing the combined sewer system service much of the city (whose plans fall outside the scope of this analysis). More recently, its extensive green stormwater infrastructure programs have been combined with city-wide approaches for urban greening.

Reflecting this broad and integrated approach, Milwaukee led among cities in terms of the diversity of elements considered as part of its green infrastructure system. While the city includes networks and corridors, it appears to omit trails from consideration. Functionally, GI plans focus on regulating urban hydrology. GI functions also include filtering air and are unique among cities examined in defining health as a core function. The benefits attributed to GI by Milwaukee GI plans are diverse, pertaining to numerous socio-economic, technological, and environmental benefits along with its contribution to overall urban resilience.

4 plans reviewed

Milwaukee plans integrate extensive stormwater planning with interconnected systems of parks, greenways, and waterfronts. Milwaukee plans emphasize participatory planning and robust labor force development, but lack definitions and evaluation mechanisms.

- Incorporated 1846
- 96.8 sq. miles
- 596,886 Total population, 6205 people per sq. mile
- Temperate broadleaf and mixed forests
- $40,036 Median household income
- 65.5% Estimated rent-burdened households
- 10.9% Housing units vacant



Defining Green Infrastructure in Milwaukee

Key Findings

Milwaukee GI plans provide an example of how a city can create a GI-based economic sector that develops new forms of expertise and builds wealth in urban communities. Milwaukee GI plans refer to the need to consider equity, and in some cases justice, but do not define either term. Despite a proliferation of non-profit led initiatives for consultative planning, GI plans would benefit from elaboration of dedicated inclusive means for implementation and evaluation.

75% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

0% define equity

75% claim engagement with affected communities in planning

25% mention Native peoples or relationships with land

25% attempt to integrate landscape and stormwater concepts

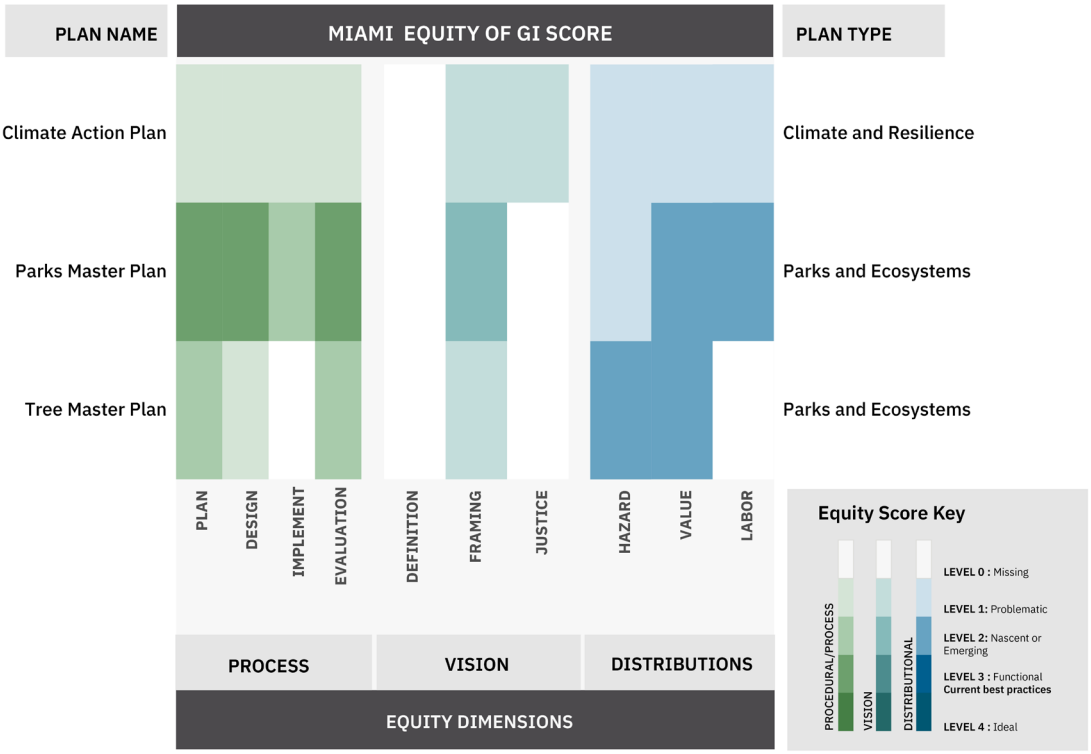
50% apply a lens of universal good to GI

25% explicitly refer to justice

0% recognize that some people are more vulnerable than others

How does Milwaukee account for Equity in GI Planning?

Despite a legacy of grappling with equity issues, Milwaukee GI plans do not define equity or justice. Some plans include promising mechanisms for public engagement; and have some best practices for community engagement, however, there is room for improvement and consistency. All of the Milwaukee plans that address GI seek to redistribute multiple hazards and improve multiple values of urban lands, but weakly consider context and existing disparities. Plans are also notable for their GI-related labor strategies.



Recommendations for Stakeholders

Like other cities, Milwaukee has embraced official equity planning and created an Office of Equity and Inclusion since the beginning of this project. However, as of the writing of this analysis, neither of these initiatives address the city's green infrastructure programs. Milwaukee has a long history of urban ecological education, outreach, and research, focusing on reconnecting urban communities with their resident ecosystems, which is reflected in its focus on creating a citywide green infrastructure system. Given the inconsistency in addressing equity issues in the city's current GI plans, we offer several recommendations to stakeholder groups that are working on GI and equity issues.

Community Groups

Residents and communities in Milwaukee have long been working on environmental and social justice issues. The city has one of the oldest chapters of the NAACP and has long been an area of intensive organizing and struggle around racial justice issues. Community groups appear focused on attracting investment into neglected neighborhoods. This work has been supported by reclaiming narratives of what makes spaces valuable undertaken by the Milwaukee Environmental Justice Lab. Despite city and community-led initiatives, the Building Movement Project's Race to Lead series found significant gaps in the racial equity of nonprofit sector leadership in the City. These tensions highlight several issues at the intersection of urban greening, governance, and community organizing that align with our findings of inconsistent community inclusion in GI planning. Flagship projects, such as the Walnut Way initiative, offer scalable models within the city. To expand upon these initiatives,. we offer two recommendations to improve the equity of community-oriented green infrastructure.

1. Intersectional Urban Greening
2. Reclaiming Value and Mitigating Hazards

Policy Makers and Planners

Currently, Milwaukee policy makers and planners are grappling with equity and displacement issues but not actively in GI plans. This gap needs to be addressed because for urban dwellers GI is a key component of their quality of life. GI impacts infrastructure performance, property value, and many residential services. Additionally, since Milwaukee County is a member of the Government Alliance on Race and Equity, there is a structure in place to address regional equity issues. To improve the equity of GI planning in the city of Milwaukee, policy makers and planners should consider the following gaps identified in current plans.

1. Specifying Equity in Relation to GI
2. More Inclusive and Equitable Planning

Foundations and Funders

Multiple organizations have funded green infrastructure-related activity in Milwaukee. More work is needed to determine the impact and efficacy of current efforts to improve the equity of GI, especially since current GI plans do not have an equity focus. Existing efforts could be expanded in several concrete ways.

1. Supporting Intersectional Organizing

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

NEW ORLEANS, LA

Green Infrastructure in New Orleans

New Orleans' GI programs focus almost exclusively on implementing a stormwater concept through the Sewerage and Water Board of New Orleans (SWBNO) stormwater management and GI plans. Additional planning support for GI in the city comes from the New Orleans Master Plan (Plan for the 21st century) and the City of New Orleans Capital Improvement Plan.

Plans examined were in broad agreement about what constitutes GI, including ecological elements, engineered facilities, and green materials, although they did not include parks or greenspaces.

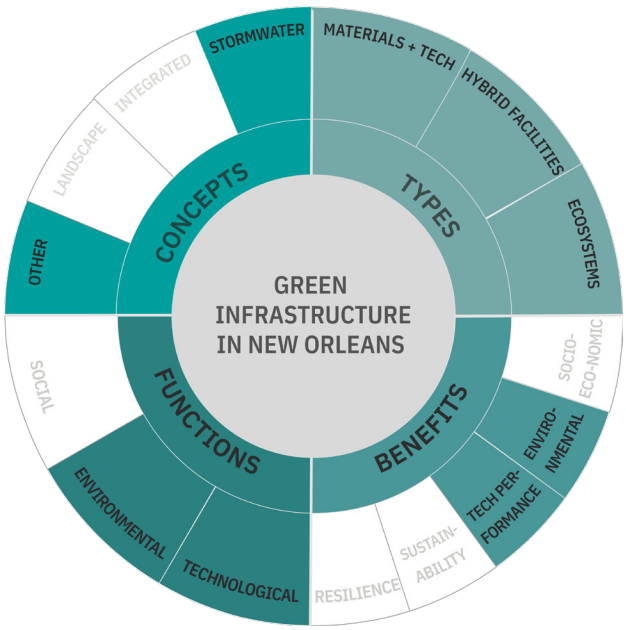
The functions of GI were focused on integration with the stormwater and flood control systems, as well as restoring some ecological functions of coastal habitats.

The benefits of GI were also focused on improving environmental quality and built infrastructure performance, as well as positioning the city as a leader in the water management sector.

4 plans reviewed

New Orleans GI plans focus on city-wide hazard reduction by using diverse GI facilities for stormwater management. Comprehensive planning makes notable improvements over other existing GI plans which largely fail to address equity.

- Incorporated 1718
- 169.4 sq. miles
- 389,648 Total population, 2,299 people per sq. mile
- Temperate broadleaf and mixed forest biome
- $39,576 Median household income
- 71.7% Estimated rent-burdened households
- 19.7% Housing units vacant



Defining Green Infrastructure in New Orleans

Key Findings

The New Orleans Comprehensive Plan offers a strong framework for considering equity issues across city programs including GI planning. In the remainder of the evaluated plans, equity is not addressed directly or with any vigor. While plans seek to address the enormous disparities in exposure to the hazards managed by GI, mechanisms for public engagement are sparse and notions of justice remain underdeveloped.

25% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

25% define equity

75% claim engagement with affected communities in planning

25% mention Native peoples or relationships with land

0% attempt to integrate landscape and stormwater concepts

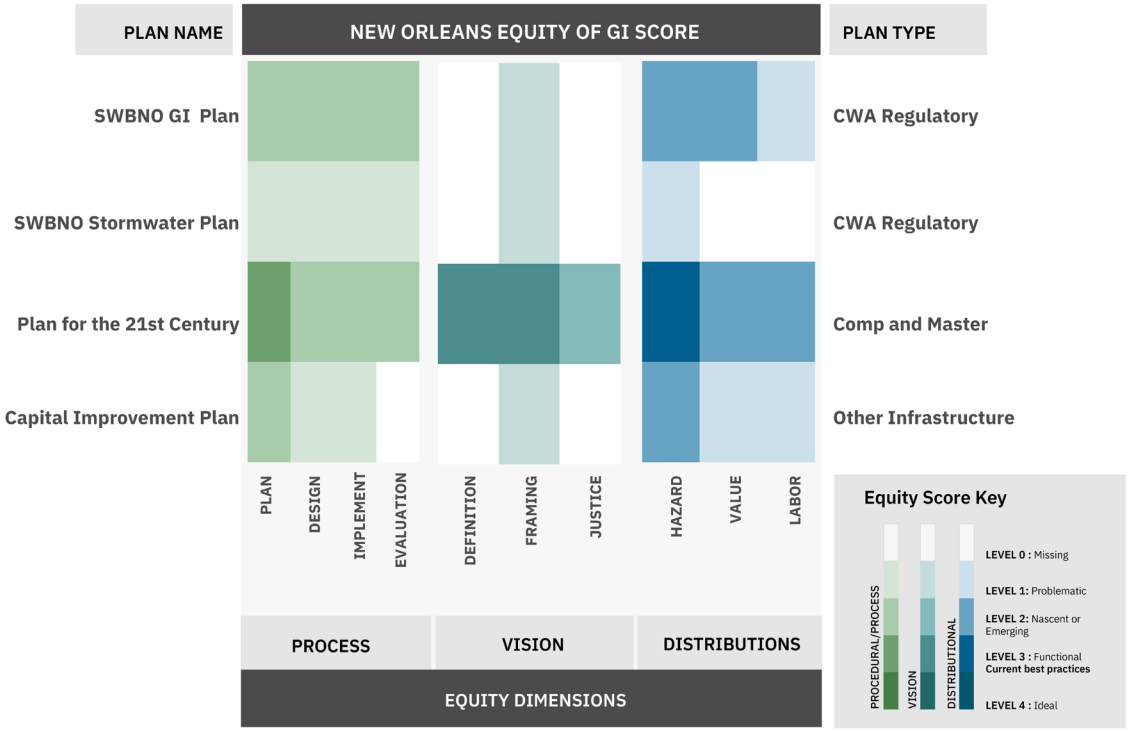
25% apply a lens of universal good to GI

25% explicitly refer to justice

25% recognize that some people are more vulnerable than others

How does New Orleans account for Equity in GI Planning?

New Orleans' Comprehensive Plan is one of the few plans that addressed each of the 10 dimensions of equity we examined with our screen. Written in the wake of Hurricane Katrina, the plan uses a definition of equity that focuses on inclusive government and fair outcomes by confronting institutional racism and discrimination. Otherwise, framings of equity issues were weak and we found no other definitions of equity or justice within the other three plans. While the Comprehensive Plan focused on inclusionary planning, procedures for public engagement across the GI lifecycle require further development. Plans emphasize the role of green infrastructure in mitigating the highly uneven distribution of urban stormwater and flood hazards but with limited discussion of the value of GI and the labor it requires.



Recommendations for Stakeholders

The City of New Orleans in combination with Policy Link and the Government Alliance on Race & Equity has committed to creating the Equity NewOrleans initiative. Despite several promising attempts to address equity through GI planning, there are notable gaps. Below, we outline several key areas to improve the City's GI planning in collaboration with community groups, city officials, and funders.

Policy Makers and Planners

New Orleans City Planners have made commendable improvements in the most recent Comprehensive Plan to address some equity dimensions of GI. As our analysis above points out, work remains to be done to ensure that GI can address long-standing injustices to equitably manage hazards and improve the public realm. To that end, we offer several recommendations to address the gaps in current GI plans.

1. Building Inclusion Over the GI Lifecycle
2. Proactively Addressing Climate Gentrification and GI Displacement
3. Advocating for GI at Scale

Community Groups

City leadership's commitment to equity must extend to the public realm investments in the city's green infrastructure systems. The significant expenditures being made at both the city and federal levels to counteract flooding and improve the city's storm and sewer systems must also support communities on the frontline of climate change. The long history of creative resistance to displacement by frontline communities in New Orleans is being severely tested by climate gentrification. In the current political climate, community groups can push to fill several key gaps in how current GI plans address equity issues.

1. Demanding Genuine Inclusion
2. Addressing Housing Displacement and Climate Gentrification

Foundations and Funders

Numerous funding organizations were identified as crucial to implementing the city's GI plans. There are several key areas where funders could improve the equity of the GI planning process and its outcomes.

1. Planning from the Grassroots

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

NEW YORK CITY

Green Infrastructure in New York City

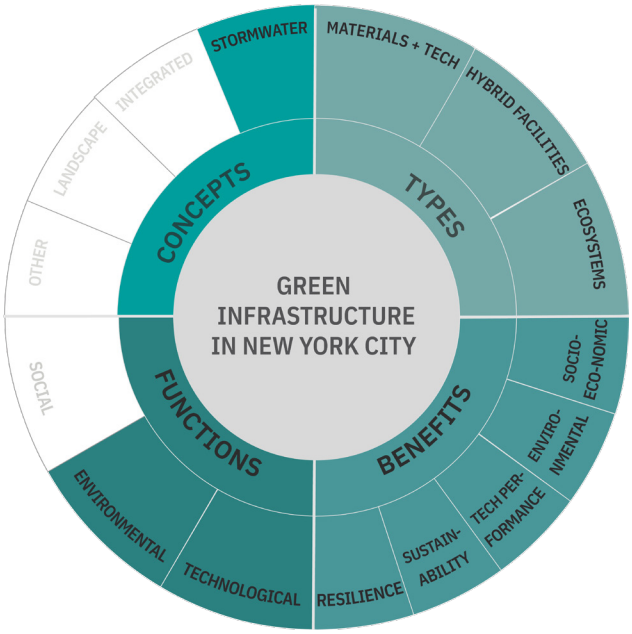
New York City has numerous, sizable, and ambitious green stormwater infrastructure programs that are integrated into city-wide tree planting initiatives. While the city also has extensive source water protection areas and programs, these are only tangentially referred to as part of the city's green infrastructure. A central tension in GI planning in NYC is the inclusion of softer coastal defenses, as well as the challenges of rising sea levels and associated extreme weather events.

These intersecting challenges are reflected in diverse elements of the city's GI plans, yet plans do not include parks, trails, farms, gardens, waterfronts, parkways, ecosystems more broadly, or blue-green networks. For example, the Staten Island Bluebelt was labeled as a corridor in our analysis. The city's GI plans primarily deal with controlling combined sewer overflows and regulating many aspects of urban hydrology in addition to supporting carbon sequestration. Despite the limited functional focus of GI in NYC, city plans tout the diverse benefits of GI projects.

16 plans reviewed

New York City plans emphasize stormwater and combined sewer programs, with some integration of street trees and the urban forest. New York City plans lack robust mechanisms of community engagement, and are largely silent on issues of intersectional justice.

- Incorporated 1624
- 468.2 sq. miles
- 8,443,713 Total population, 28,110 People per sq. mile
- Temperate broadleaf and mixed forests
- $60,762 Median household income
- 64% Estimated rent-burdened households
- 9.2% Housing units vacant



Defining Green Infrastructure in NYC

Key Findings

NYC GI plans are largely silent on equity issues, with few definitions, limited mechanisms of community engagement, and weakly developed distributional aspects. Promising exceptions include the public participation mechanisms in the initial stages of the city's overarching Stormwater Plan and OneNYC. OneNYC, the city's combined comprehensive and sustainability plan, was one of the few plans that addressed all ten dimensions of equity in our scoring tool.

13% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

13% define equity

100% claim engagement with affected communities in planning

13% mention Native peoples or relationships with land

0% attempt to integrate landscape and stormwater concepts

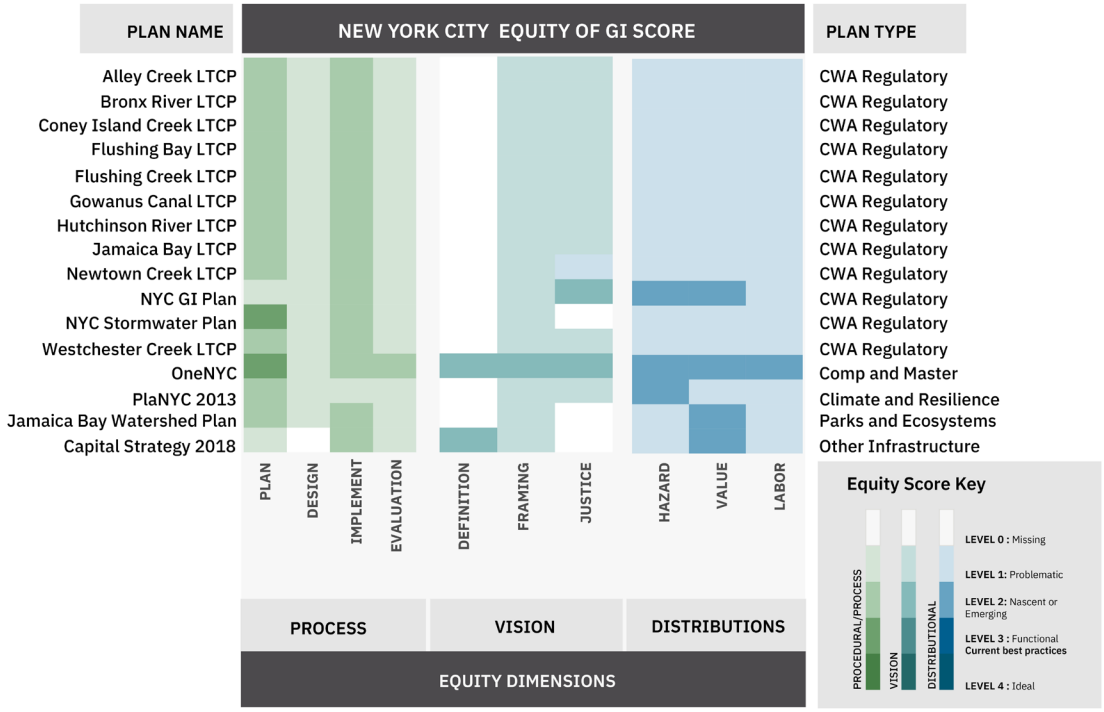
13% apply a lens of universal good to GI

81% explicitly refer to justice

19% recognize that some people are more vulnerable than others

How does New York City account for Equity in GI Planning?

Overall, equity is weakly addressed in plans, with few definitions provided. The city's numerous plans for compliance with Clean Water Act regulations consistently mention environmental justice communities but in a check-the-box approach. Framings of the social impacts of GI are generally underdeveloped. The OneNYC plan stands out for addressing all 10 dimensions of equity analyzed with our evaluation framework, and yet does not exhibit many best practices. Mechanisms of community engagement are largely underdeveloped, with very few opportunities for communities to be involved. Despite public outreach mentioned during the planning process and in implementation, they do not reflect current best practices. NYC's GI plans consistently seek to minimize hazards and add value with GI. However, these approaches do not reflect the concerns or needs of affected communities and, therefore, are largely problematic. Labor issues are also poorly addressed.



Recommendations for Stakeholders

New York City is in many ways an equity enigma. The Office of Citywide Equity and Inclusion has been in existence in some form for over 30 years. Prior and current administrations have promised to increase equitable opportunities for economic advancement and in mitigating climate hazards, especially in the post-Sandy, post-2008 financial crisis, and the looming post-Covid-19 era. Despite these high-level, institutionalized commitments, there are opportunities to improve upon equity concepts and practices in NYC's GI planning.

Policy Makers and Planners

Current calls to address systemic racism and injustice in city decision-making and policy, primarily through the standing Taskforce on Racial Inclusion and Equality and the Racial Justice Commission, should extend to the city's extensive green infrastructure programs. Given that both the Taskforce and Commission are in their formative stages, we offer several considerations for these bodies and existing city agencies involved in the city's green infrastructure programs. Below we elaborate on how current plans could address issues in their implementation and outline considerations for the evolution of city-level green infrastructure policy.

1. From "Planning For" to "Planning With"

2. From Ecological Security to Community Well-being Through Citywide GI

3. Defining Equity and Justice

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

Community Groups

Current NYC movements emphasize the need for economic and racial justice. They also call for a just transition, which would include revitalizing green manufacturing and addressing long-standing environmental justice issues. The city's reform planning history is evident in its parks system, with organizations like the Central Park Conservancy grappling with the racist histories of park creation and current issues of violent policing. Ongoing green revitalization, such as the High Line project, has also faced criticism for contributing to housing displacement and has led to an evolved conversation on the relationship between urban revitalization and community stabilization. Organizations like WeACT for Environmental Justice have led the charge to responsibly remediate brownfields, address intersecting concerns around housing, and support affordable and accessible housing.

1. Treating GI as a City-wide System Supporting Community Well Being

2. Embedding Equity in Planning

Foundations and Funders

Many foundations and nonprofits are active in addressing the city's long-standing justice issues, including many that focus on building grassroots power and organizing capacity. These efforts intersect with the city's green infrastructure policies in several ways, especially with regard to how GI policy supports redevelopment, brownfield remediation, climate resilience, and access to environmental amenities. Current large-scale social movements and grassroots political pressure present opportunities to significantly advance discourse and organizing so that the root causes of environmental degradation and injustice can be addressed. This includes advancing long-standing efforts of the Lenape community to recognize and restore their cultural relationship with local land and water systems.

1. Centering Governance and Right Relations in Discussions on Indigeneity

2. Intersectional Green Infrastructure in a Just Transition

PHILADELPHIA, PA

Green Infrastructure in Philadelphia

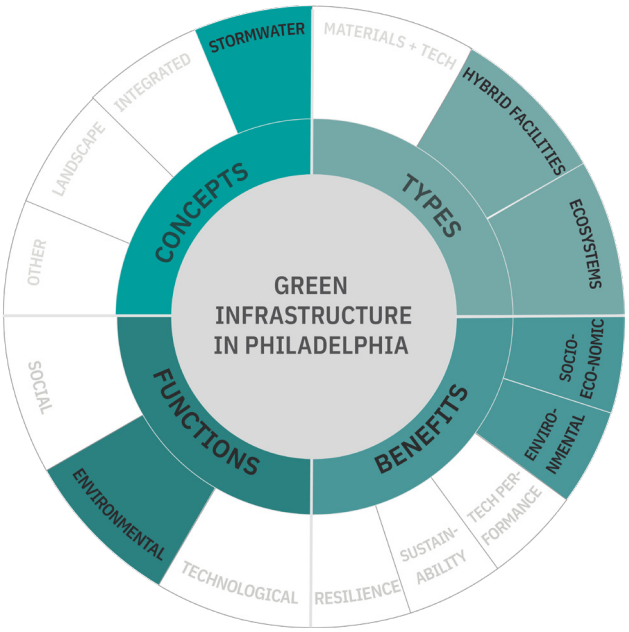
Philadelphia has long been recognized as a green stormwater infrastructure (GSI) leader and innovator through its 'Green City' program. The city has sought compliance with combined sewer system regulations through ambitious city-wide GSI programs. These programs have been integrated into numerous area master plans as well as the City Climate Resilience and Sustainability plans. Even with such extensive GSI planning, the city's GI plans do not robustly articulate an explicit 'green infrastructure' concept. When GI is defined, plans emphasize efforts to expand street tree plantings and green streets, alongside efforts to green schoolyards, and expand urban agriculture.

Philadelphia GI plans focus on providing environmental functions and the benefits of improving water quality, livability, the health of residents, and reducing the cost of infrastructure services.

13 plans reviewed

Philadelphia GI plans focus on green stormwater infrastructure with some inclusion of tree canopy and open space. Philadelphia plans emphasize participation and adaptive management without robustly addressing equity and justice issues.

- Incorporated 1682
- 134.2 sq. miles
- 1,575,522 Total population, 11,737 people per sq. mile
- Temperate broadleaf and mixed forest
- $43,744 Median household income
- 66% Estimated rent-burdened households
- 12.9% Housing units vacant



Defining Green Infrastructure in Philadelphia

Key Findings

Despite several plans explicitly referring to the need to address equity in GI planning, plans have numerous gaps. These include the failure to create mechanisms for meaningful public involvement. Plans examined do not generally define equity or justice issues, and often problematically frame and discuss equity issues. The city's focus on private sector-led implementation is problematic, as the real estate market and property value become the drivers of how GI will rearrange urban hazards. Finally, labor issues are questionably or incompletely addressed.

13% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

8% define equity

77% claim engagement with affected communities in planning

23% mention Native peoples or relationships with land

0% attempt to integrate landscape and stormwater concepts

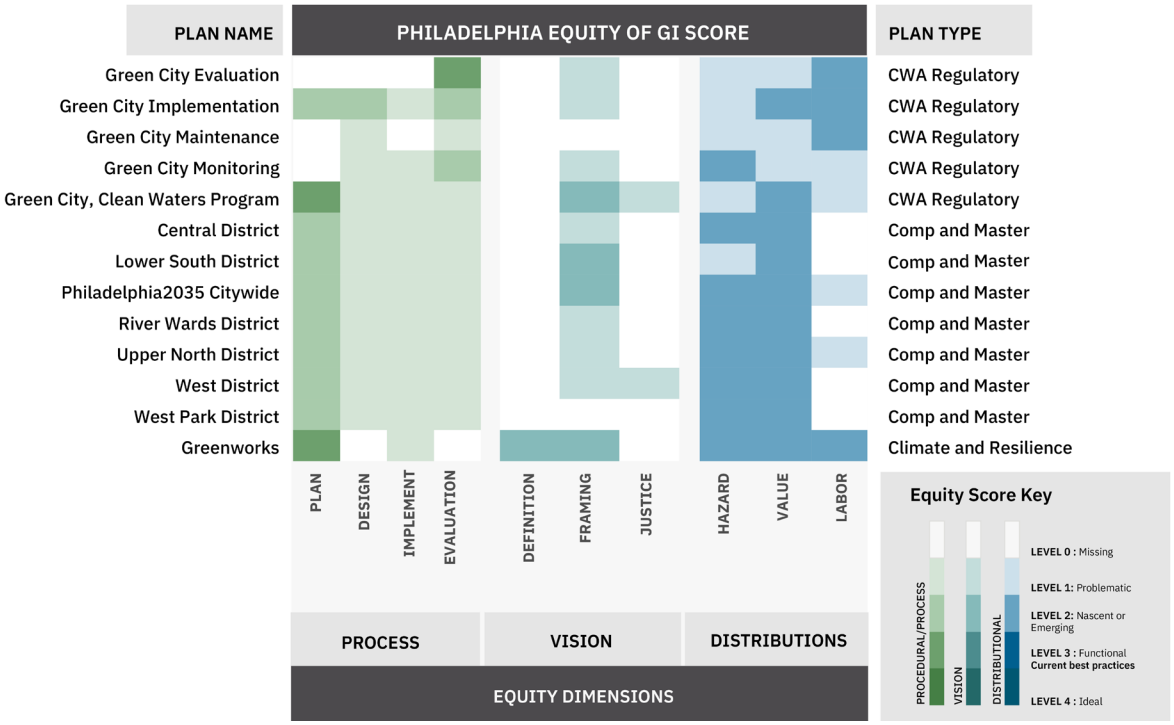
54% apply a lens of universal good to GI

15% explicitly refer to justice

15% recognize that some people are more vulnerable than others

How does Philadelphia account for Equity in GI Planning?

Despite numerous green stormwater infrastructure planning efforts spurred by the need to comply with Clean Water Act regulations, GI plans in Philadelphia do not robustly address equity or justice issues. Only one plan defined equity and no plans defined justice. Plans weakly or problematically framed equity issues, with several not discussing equity issues at all. Despite an admirable emphasis on inclusive planning, plans describe limited means for community inclusion through design, implementation, and evaluation, with some notable exceptions. All GI plans in Philadelphia explicitly seek to rearrange the distribution of urban hazards while adding value. Only half of the plans acknowledge the labor required to do so, often in problematic ways.



Recommendations for Stakeholders

Like many cities examined in this set, the plans do not reflect current efforts or initiatives by government agencies, community groups, and funders to address long-standing social and environmental justice issues. Numerous gaps in addressing equity issues in Philadelphia's GI plans have been identified in this analysis. See below for city-specific recommendations to guide the inclusion of equity and justice considerations in the implementation and improvement of Philadelphia's GI plans and programs.

Policy Makers and Planners

Philadelphia green infrastructure planning remains limited in scope by the green stormwater infrastructure concept. The city would benefit from planning across infrastructure systems and incorporating parks and open space planning into a more holistic approach. As in other cities, there is a need to focus on how to use GSI programs to build community wealth, recognizing that treating communities as experts requires compensating them as such. There is also a need to be more clear about what equity and justice mean in the context of city-wide GI strategies. We elaborate on these recommendations below.

1. Broadening GI and Specifying GSI

2. Embedding the Triple Bottom Line

3. Centering Community-led Planning to Address Housing Displacement

4. Improving Public Evaluation Processes

5. From Facilitating Redevelopment to Wealth Creation

6. Addressing differential vulnerability

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

Community Groups

Philadelphia has long been a center for oppressed and marginalized communities to positively and collaboratively reimagine urban futures for themselves in the face of historical, continued, and often violent, oppression. The current turn towards addressing equity in city government policies and programs through the creation of the Mayor's Office of Diversity, Equity, and Inclusion presents an opportunity to expand the conversation about racial and environmental justice, and to restructure institutions to meet the needs of marginalized communities. Our recommendations provide ways in which GI planning efforts can be positively influenced by, and support, ongoing efforts led by Philadelphia's diverse grassroots organizations and their initiatives.

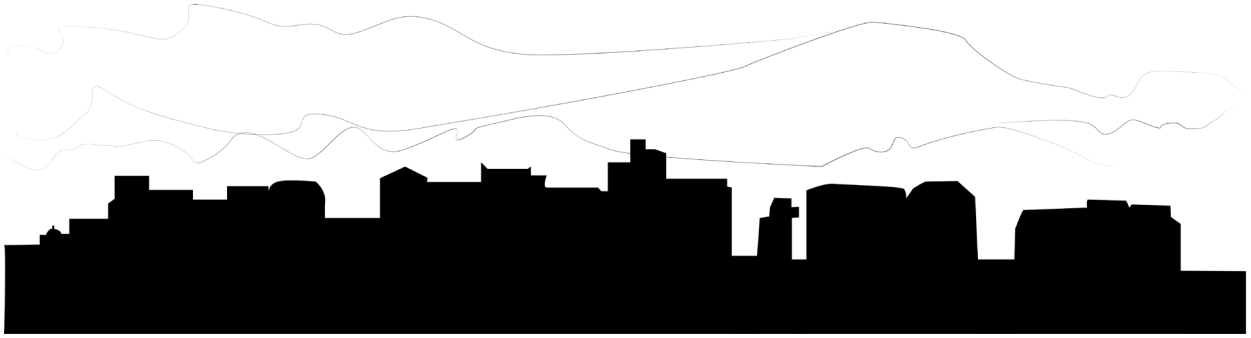
1. Make GI planning address community environmental justice

2. Amplify Housing Concerns

Foundations and Funders

We recommend the embrace of a broader and more integrative concept of GI. Numerous nonprofit groups have been involved in the creation and implementation of GI plans. This is reflected by the participation of multiple watershed partnerships, environmental NGOs, and business networks in GI programs. Organizations like the Pennsylvania Horticultural Society have also contributed to GI installations, by incorporating native plants into environmental designs. This constellation of environmental and business advocacy groups should be broadened to include those working on social justice issues, in the spirit of 21st-century conservation approaches that simultaneously address infrastructure improvements and environmental justice. These more integrated efforts provide new opportunities for existing GI project funders, such as the William Penn Foundation. We recommend involved organizations adopt an intersectional approach in their relationships with communities and environmental initiatives.

1. Supporting Intersectoral Organizing



PHOENIX, AZ

Green Infrastructure in Phoenix

Official city plans addressing GI in Phoenix include PlanPHX, the Phoenix Strategic Plan, and the Strategic Infrastructure Plan, all of which defined GI using a landscape concept emphasizing city-wide networks of connected ecological elements. The City's Separated Stormwater System Plan uses the term green infrastructure but does not define it, despite Phoenix's history of do-it-yourself green stormwater infrastructure. While many documents referred to the 2010 Shade Master Plan, that plan did not utilize the green infrastructure concept or reference equity.

City plans defined GI as networks of hybrid facilities and ecosystem elements, including trails, habitats, parks, street trees, and natural lands. These ecological networks function to mitigate environmental harms while serving as part of the city's infrastructure systems to mitigate heat, manage stormwater, and improve pedestrian mobility. Yet, definitions of GI did not describe any of the benefits of GI explicitly.

4 plans reviewed

GI planning in Phoenix emphasizes comprehensive city-wide ecological networks for multiple functions. Phoenix GI plans do not address equity or justice issues despite their intentions to improve urban quality of life.

- Incorporated 1867
- 518.9 sq. miles
- 1,610,071 Total population, 3,110 people per sq. mile
- Deserts and xeric shrublands
- $54,765 Median household income
- 60.3% Estimated rent-burdened households
- 9.7% Housing units vacant

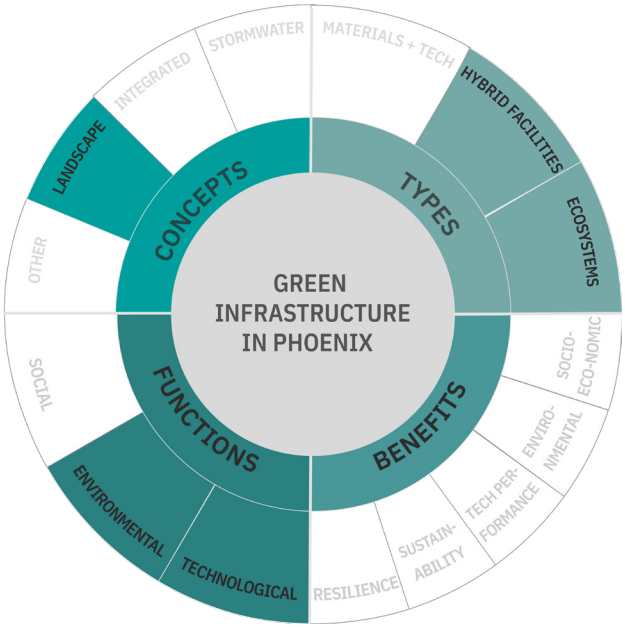


Fig. Defining Green Infrastructure in Phoenix

Key Findings

Plans in Phoenix do not define or address equity and justice. Only one plan uses the word equity, and in general, plans do not appear to be created or implemented with thoughtful public engagement. Distributional equity of GI planning is also largely emergent. Despite some promising beginnings, the city has a long way to go to plan equitably for green infrastructure.

20% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

0% define equity

50% claim engagement with affected communities in planning

50% mention Native peoples or relationships with land

0% attempt to integrate landscape and stormwater concepts

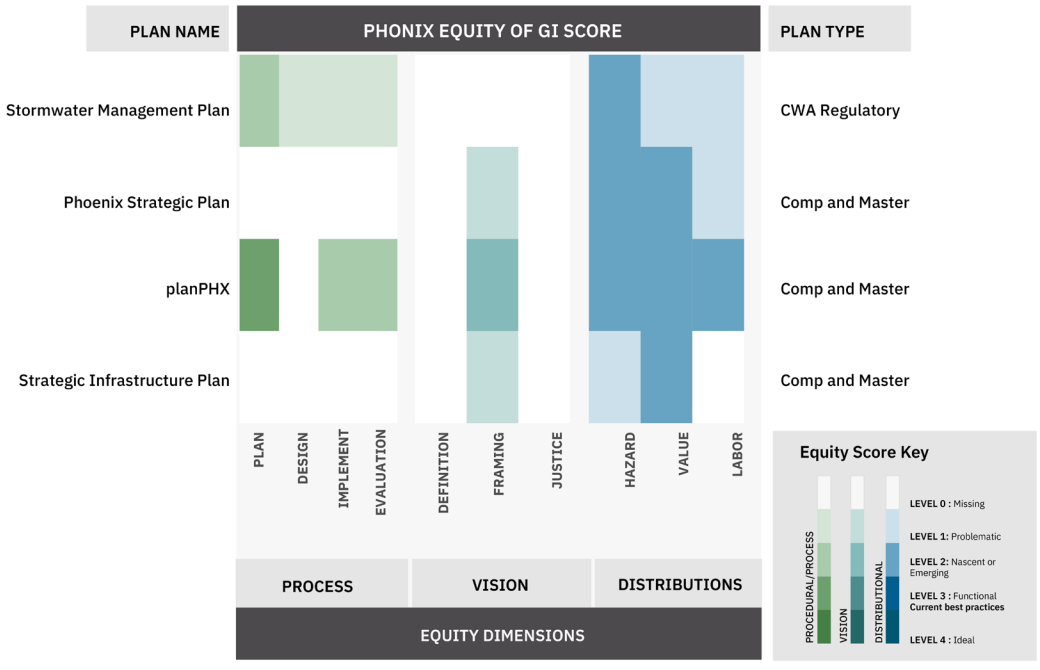
50% apply a lens of universal good to GI

0% explicitly refer to justice

0% recognize that some people are more vulnerable than others

How does Phoenix account for Equity in GI Planning?

No Phoenix plans focus on equity. While PlanPHX does explicitly use the term, it is not defined. Justice outside of the criminal justice connotation is not mentioned in any plan. When framing the social impacts of GI, it is generally referred to as a universal good, providing equal benefit to all. Phoenix was one of few cities that acknowledged its location on Native lands, and yet it appropriates both Indigenous history and identity. Aside from PlanPHX, plans in Phoenix did not have robustly developed public engagement mechanisms, nor did they indicate intentions to include community groups in their overarching policies for design, implementation, or evaluation. All plans examined in Phoenix sought to use GI to manage the distribution of hazards, especially climate-related hazards, and add value to the urban landscape, but were not sensitive to the needs of different communities. Labor issues were largely underdeveloped.



Recommendations for Stakeholders

Despite decades of community activism and research on endemic environmental racism and injustice in South Phoenix, current plans make no mention of these issues aside from their relevance for Clean Water Act compliance. PlanPHX's vision of a connected oasis "...embodied by a pervading sense of ... equity" can be realized, but the concerns and needs of frontline communities must lead any planning efforts to do so. Below, we offer recommendations for those concerned with equitably planning and implementing city-wide green infrastructure in Phoenix.

Policy Makers and Planners

Current plans do not address equity or justice concerns despite ongoing demands from impacted communities. How can policy and planning center the needs of those who have been most marginalized and oppressed within the city? Below we offer several concrete recommendations for improving the equity of existing policies and transforming city planning for green infrastructure.

1. Define and Operationalize Equity
2. Abandon Regressive Taxation and Come Clean on Vacant Lands
3. Support DIY GI in a Systematic and Comprehensive Way

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

Community Groups

Many groups are working on racial, social, climate, and environmental justice in Phoenix. However, their concerns and missions are not reflected in current city plans. Given the urgency, scale, and complexity of advancing climate adaptation and a just transition in Phoenix, we offer several proposals for how a city-wide GI system could support existing calls for equity and justice.

1. GI Where it is Needed Most for Who Needs it Most
2. Equitable Planning for Planning Equitably
3. GI for a Just Transition and Environmental Justice

Foundations and Funders

As the Southwest's largest metropolitan area, Phoenix has numerous active foundations and funders working on a variety of racial and social justice initiatives. From addressing the legacies of redlining, to supporting area foundations and critical social services, funders play an important role in the shaping of social movements in the region. This vital work can support the development of an equitable city-wide GI network in the city. Based on our analysis of current plans, in addition to supporting intersectional organizing efforts seeking transformation, foundations and funders can influence ongoing planning processes in several key areas.

1. Neighborhood Planning Capacity, Coordination, and Oversight
2. Equitable Financing of Citywide GI for Restorative Justice
3. Improving the Knowledge Base for environmental Justice and Equitable GI

PORTLAND, OR

Green Infrastructure in Portland

Portland plans for GI use a wide array of planning instruments. GI is integrated into comprehensive, climate, sustainability, and transportation planning, alongside numerous watershed and stormwater planning efforts. These diverse plans reinforce one another by having a high degree of conceptual integration, with only a few instances of landscape and stormwater-specific concepts, and several plans that do not define GI.

Portland GI plans fall in the middle of the pack in terms of the diversity of elements formally considered GI. Plans focus on a number of defined facility types, including street trees, and bioretention and stormwater facilities, but omit parks, networks, corridors, and trails.

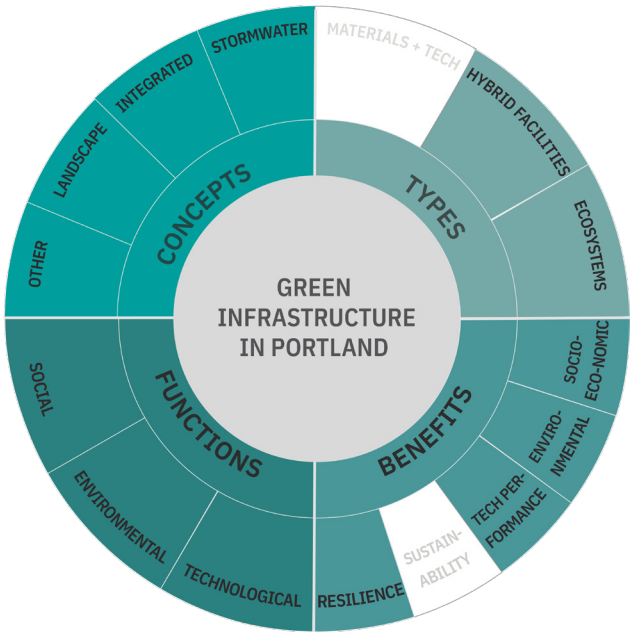
Portland plans seek to provide key social, environmental, and technological services with GI, despite the employment of a limited number of GI elements. Named functions include improving transportation, providing a sense of identity, regulating heat, improving air and water quality, alongside stormwater management.

Portland GI plans define a wide array of benefits related to urban quality of life, climate resilience, and improving environmental quality alongside the performance of grey infrastructure systems.

8 plans reviewed

Portland has numerous plans using diverse GI concepts and elements; plans include both integrated and watershed-focused planning approaches. Portland plans have some strong definitions, frameworks, participatory practices, and analysis, but are inconsistent with notable gaps.

- Incorporated 1845
- 145.0 sq. miles
- 639,387 Total population, 4,792 people per sq. mile
- Temperate broadleaf and mixed forests
- $65,740 Median household income
- 63.8% Estimated rent-burdened households
- 6.3% Housing units vacant
- 9.7% Housing units vacant



Defining Green Infrastructure in Portland

Key Findings

GI Plans in Portland attempt integrative city-wide planning, but functionally only focus on stormwater control measures. Some plans center equity and justice concerns with robust definitions, visions, and public participation processes. Many others do not and are problematic in their use of urban greening within extensive redevelopment proposals.

89% explicitly refer to equity, 100% have equity implications

89% seek to address climate and other hazards

56% define equity

88% claim engagement with affected communities in planning

56% mention Native peoples or relationships with land

56% attempt to integrate landscape and stormwater concepts

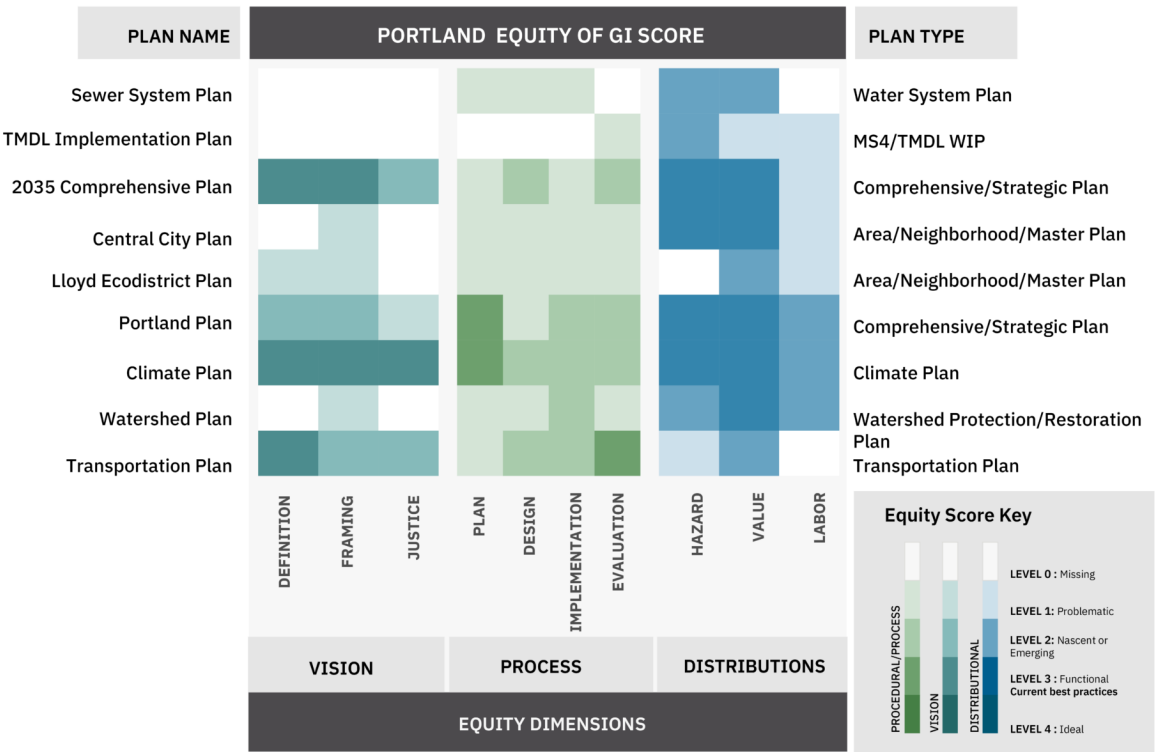
77% apply a lens of universal good to GI

44% explicitly refer to justice

22% recognize that some people are more vulnerable than others

How does Portland account for Equity in GI Planning?

Portland GI plans address equity idiosyncratically. While the Portland Plan, 2035 Comprehensive Plan, and Climate Plan address all 10 dimensions of equity, with the latter two offering best-in-class definitions and framings, sewer and stormwater system plans are essentially silent on equity issues. Methods of public engagement are similarly spotty. Despite several plans emphasizing and showcasing participatory planning practices, few mechanisms exist for substantive and binding public engagement through the rest of the planning life cycle. Portland GI plans display more consistency in addressing existing disparities in the distribution of hazards and with intentions to add value to the urban landscape. Plans weakly address labor issues, if at all.



Recommendations for Stakeholders

The City of Portland, like many others, has a dedicated Office of Equity and Human Rights charged with ensuring that city agency decisions address racial and social equity issues. Portland plans are also somewhat unique in the breadth and depth of discussions of equity issues in the city, and their much greater consistency in defining and naming equity and justice issues in comparison to other cities. However, notable gaps remain in how city plans conceptualize and operationalize equity and justice issues, despite decades of steadfast coalition-based community organizing.

Policy Makers and Planners

The City of Portland is internationally recognized for struggling with equity and racial justice issues. Progressive administrations and plans must go beyond the rhetoric of inclusion and address structural inequalities in the city affecting the equity of green infrastructure. The city has taken on massive cost burdens for Clean Water Act compliance and has undertaken numerous watershed planning and protection initiatives. It has also led the conceptual integration of green infrastructure into urban form. Despite all this progress, green infrastructure approaches remain siloed within a stormwater management focus. Below we offer several tangible recommendations for addressing gaps in current plans.

1. Genuinely Integrated Green Infrastructure

2. Get Serious about Transforming Systems that Cause Harm

3. Wealth Building through Redistributing Labor, Wages, and Expertise

4. From Exploration to Transparent Metrics, Data, and Processes

5. Consistency Across Plans for Housing Security

6. Embracing the Floodplain, but not Creepily

7. Don't Just 'Put an Equity Bird on It'

Community Groups

Numerous community groups have tirelessly advocated for environmental and social justice within the City of Portland. These same communities have faced displacement due to urban renewal and highway development that affected most if not all of the city's ethnic and racialized communities while sparing the city's predominantly white western downtown. The demands of community groups have in many ways created the progressive image and stance of Portland administrations. They will likely continue to be the primary force for positive change, given the city's ongoing rapid transformation as a global hub of speculative real estate investment, and significant conflicts of interest affecting those governing existing planning processes. Below we offer ways to address several key issues and gaps within current plans that may support community organizing efforts towards just GI systems.

1. Demanding Transformation in City Planning and Decision Making

2. From 'targeted investment' to reparations

Foundations and Funders

To address long-standing justice concerns, foundations and funders can play an important role in supporting the development of equitable processes. This includes demanding transformative change in how current GI plans are implemented and ensuring that the needs of marginalized communities are centered in future planning efforts. Below, we offer a recommendation to do so.

1. From Complete Streets to Whole Communities

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

SACRAMENTO, CA

Green Infrastructure in Sacramento

Sacramento plans for GI through its 2035 General Plan, The City Parks and Recreation Plan, and The Central City Specific Plan (CCSP). The latter plan does not define GI, the Parks and Recreation Plan focuses on a city-wide parks system using a landscape concept, and the General Plan defines both the need for a city-wide network of green spaces and a system of green stormwater infrastructure using landscape and stormwater concepts without integration.

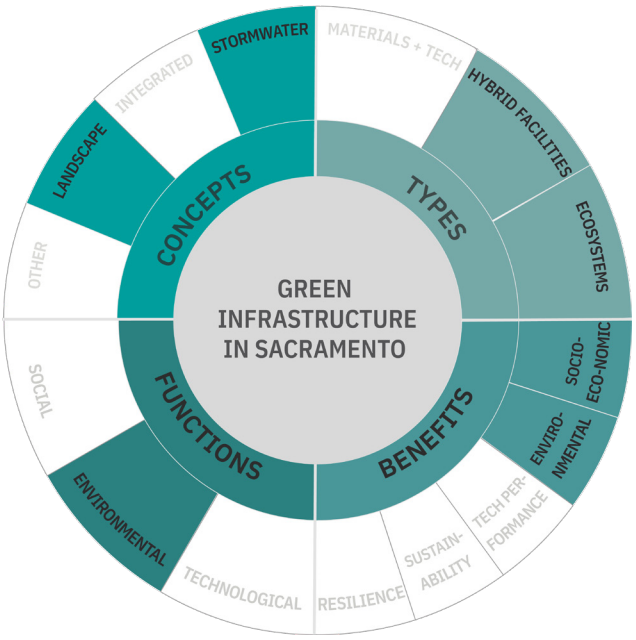
Since the Comprehensive Plan uses both stormwater and landscape concepts, it contains the majority of types of GI, consisting of hybrid facilities and ecosystem elements. It is notable that Sacramento does not explicitly refer to bioswales and green roofs but includes parks, trails, and blue-green networks in addition to general mentions of stormwater management features.

Sacramento GI is managed so that it provides environmental functions, focusing on general stormwater management. The benefits of GI in Sacramento planning are more diverse, focusing on the environmental and socio-economic advantages of good water quality, recreation, livability, community building, education opportunities, and psychological well-being among others.

3 plans reviewed

Sacramento GI plans address both stormwater management and the creation of a city-wide connected park system. Sacramento appears to include residents in GI planning to deliver many functions and benefits but has major gaps in conceptualization

- Incorporated 1859
- 99.9 sq. miles
- 495,011 Total population, 5,060 people per sq. mile
- Temperate grasslands, savannas, and shrublands
- $58,456 Median household income
- 64.7% Estimated rent-burdened households
- 6.5% Housing units vacant



Defining Green Infrastructure in Sacramento

Key Findings

Sacramento GI plans use the language of equity but rarely define it. They are also uniquely consistent, but not robust, in their public engagement. Plans should do more to address inequities in GI hazards and labor needs, and grapple with the contextual nature of GI's value.

100% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

33% define equity

100% claim engagement with affected communities in planning

33% mention Native peoples or relationships with land

0% attempt to integrate landscape and stormwater concepts

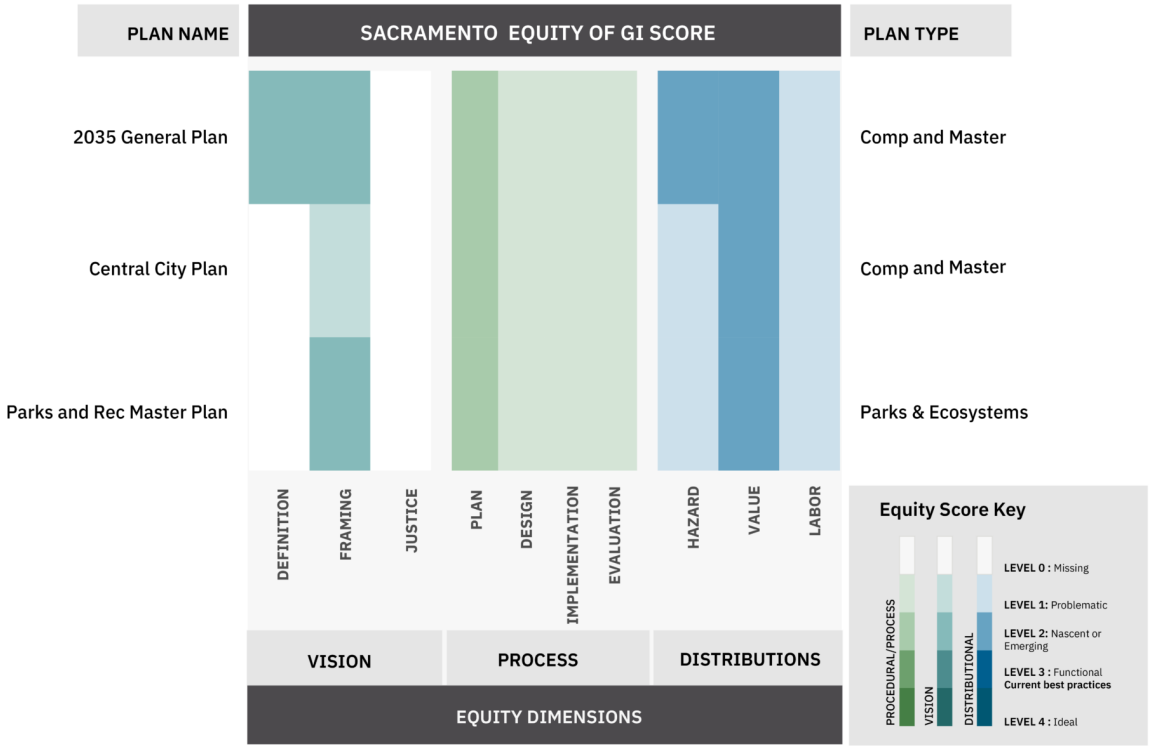
33% apply a lens of universal good to GI

0% explicitly refer to justice

0% recognize that some people are more vulnerable than others

How does Sacramento account for Equity in GI Planning?

GI plans in Sacramento consistently use the word equity in relation to the intended impacts of GI, yet only the 2035 General Plan defines it, using a universalist concept of fair access to goods and participation in public planning for the future. Framings of equity are more problematic as they do not address the historical causes of injustice or the needs of current residents; instead, they focus on attracting new residents. Plans are silent on justice. Procedurally, Sacramento GI plans are consistent about including residents in the early stages of planning. This inclusion appears to be driven by state-level regulations around public participation. Participatory mechanisms do not carry over into the design, implementation, or evaluation of GI policies and projects. To some extent, climate-related hazards are examined but are more weakly considered than the values of GI. GI labor needs and issues are barely discussed, with current allocations of city resources favoring developers.



Recommendations for Stakeholders

As a member of the Government Alliance on Race and Equity, Sacramento seeks to address equity issues through urban planning. However, the city's current GI plans, two of which have a much larger scope than only GI, appear to entrench the problems caused by prior planning efforts. They will likely replicate the atrocities of previous urban renewal efforts, accelerating displacement in minoritized and marginalized communities. While equity in planning must be defined by those impacted by plans, we provide several recommendations to improve the equity of current planning efforts.

Policy Makers and Planners

Current plans have made some attempts to address deep-seated equity and injustice issues in Sacramento. However, plans could go much further in defining equity and justice – beyond the minimum statewide standards of consultation. Plans should get serious about addressing climate hazards, and should focus on creating well-paying jobs to build community wealth.

1. Define Equity and Justice
2. Go Beyond Minimum Standards of Consultation - Embed Within the Lifecycle
3. Get Serious About Climate-related Hazards
4. Real jobs, wealth, and urban vitality

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

Community Groups

Many community groups working on racial and economic justice in Sacramento do not appear to be represented in current GI plans. This exclusion is concerning, given California mandates for public participation in planning. The early stages of more open participation often devolve to a model of advisory boards that are disproportionately staffed by development interests. In the long-term, these issues can only be addressed through structural transformation of city-level decision-making and policy. Community groups, however, appear to have several key areas where their influence could address inequities in current GI plans.

1. Embed Equity within City Planning
2. From Model Projects to Model Plans

Foundations and Funders

Foundations and funders can play an important role in improving the equity of green infrastructure planning in Sacramento. To address the massive omission of critical and community points of view in shaping Sacramento's GI planning processes, foundations and funders can support community organizations advocating for planning transformation and working on broadening participation in existing processes. Funders can also provide material support for initiatives that simultaneously address housing and environmental justice.

1. Broadening and Deepening Participation
2. Advocating for Transformation
3. Providing Material Support for Housing and Environmental Justice

SAN JUAN, PR

Green Infrastructure in San Juan, PR

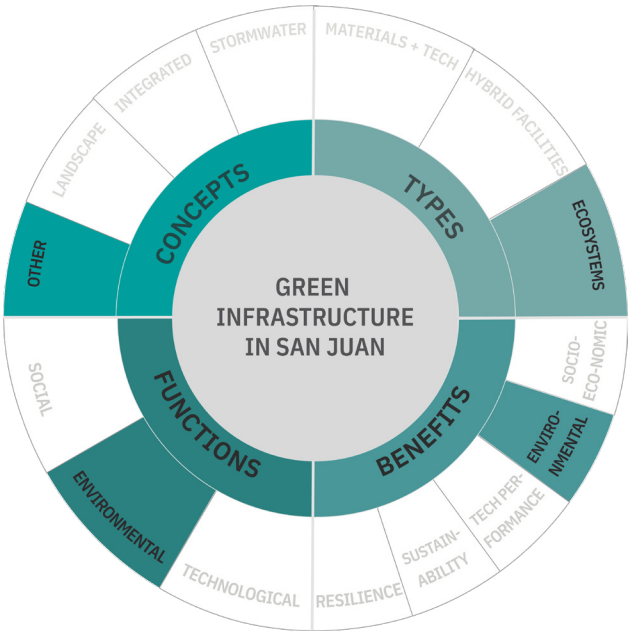
The only plan referencing green infrastructure (Infraestructura Verde in Spanish) was the Plan Ordenacion Territorial or the City Wide Master Plan. In it, the primary benefit of realizing GI functions was to provide ecological habitat.

The plan introduces the GI concept in reference to the Rio Piedras river corridor bisecting the city while connecting coastal and mountain ecosystems. The plan refers to the river corridor as an ecological system, but omits its terrestrial connections, focusing on the river channels themselves. The functions of the river corridor as GI are restricted to its role in improving water quality and ecological connectivity. This idea relates to the landscape concept but does not fit neatly within it.

3 plans reviewed

San Juan's comprehensive plan examines the city's riverine corridor as its GI, emphasizing its ecological characteristics and relationships with other infrastructure systems. San Juan appears to include residents in GI planning expected to deliver many functions and benefits, but has major gaps in conceptualizing equity.

- Incorporated 1521
- 46.4 sq. miles
- 331,165 Total population, 8,377 people per sq. mile
- Tropical and subtropical moist broadleaf forests
- $21,986 Median household income
- 68.1% Estimated rent-burdened



Defining Green Infrastructure in San Juan

Key Findings

San Juan's lone GI plan referenced the need to consider equity but did not define it and there were no mentions of justice. Public participation appeared limited to the initial planning stages with limited means of inclusion in design. Distributional equity was considered somewhat robustly for environmental hazards, quality of urban life, and the role of labor in shaping the urban fabric but these goals were not strongly linked to the city's green infrastructure system.

100% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

0% define equity

100% claim engagement with affected communities in planning

0% mention Native peoples or relationships with land

0% attempt to integrate landscape and stormwater concepts

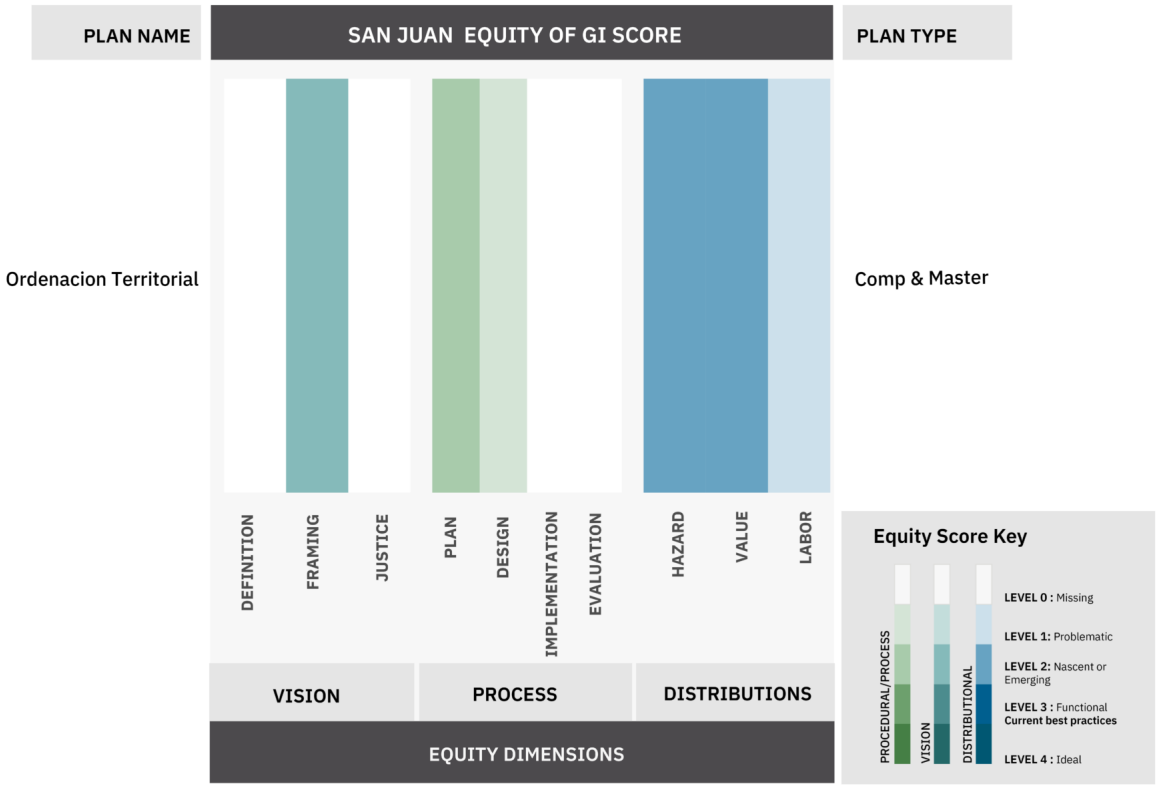
0% apply a lens of universal good to GI

0% explicitly refer to justice

0% recognize that some people are more vulnerable than others

How does San Juan account for Equity in GI Planning?

Equity and justice do not feature prominently in San Juan's Comprehensive Plan. While the plan frames several equity concerns around overall urban quality of life and labor market transitions, GI is not connected to these other equity-focused planning efforts. Procedures for involving communities are generally lacking.



Recommendations for Stakeholders

San Juan faces a number of structural political challenges to its self-determination as a city government. However, the country as a whole has maintained long-running movements for genuine political and economic independence. Despite being omitted from current plans in San Juan, a movement led by academics and researchers has been afoot to formalize and develop a city-wide green infrastructure system. To address these interdependent issues, we offer several recommendations on how the city could develop an equitable green infrastructure system.

Policy Makers and Planners

Green infrastructure planning in San Juan is relatively undeveloped despite the city's tradition of parks and open space planning, and more recent efforts to center climate resilience in the city's infrastructure systems. Policy makers and planners must elaborate the meaning of GI in ongoing city planning efforts and create real mechanisms for addressing community concerns around equity and justice.

1. Build GI as a System
2. GI as Part of the Infrastructure Economy

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

Community Groups

San Juan has several movements working to achieve climate justice which will require a deep transformation of existing grey infrastructure systems and the elaboration of a city-wide green infrastructure system. One organization within the larger movement, Estuario, focuses on a landscape-level ecological planning concept and has led afforestation and reforestation efforts within the city and beyond. Additionally, some researchers have found that GI has long been autonomously maintained and expanded by residents for aesthetics and food production. There remains a need to evolve GI so that it's treated as part of the city's critical infrastructure systems, and to center the needs of communities that have been made most vulnerable to climate-related hazards and extractive economic systems.

1. Develop Contextual Practices for Community-led Planning
2. Define Equity and Justice in the context of San Juan's planning

Foundations and Funders

Foundations and funders already play an important role in elaborating visions and data that shed insight on San Juan's climate challenges and emergent green infrastructure system. However, with the lack of a formal GI planning framework, ideas and information can only inspire voluntary and piecemeal efforts. There remains a need to invest in community-led planning efforts and to create working models for multi-scalar GI planning within the city. To that end, we provide one key recommendation for philanthropic organizations working in the city.

1. Supporting Community Organizing for Intersectional Environmental Justice

SEATTLE, WA

Green Infrastructure in Seattle

We scanned numerous documents pertaining to green infrastructure in Seattle, finding six current plans relevant to our analysis. These included the city's extensive stormwater management strategy written for compliance with Clean Water Act regulations. The city also has a dedicated GI Implementation Strategy, and the city's GI programs are supported by its 2035 Comprehensive Plan. All of these plans focus on stormwater management.

GI strategies in Seattle utilize a broad range of ecosystem elements, hybrid facilities, and materials and technologies. Green roofs, rain gardens, and cisterns are integrated into blue-green corridors of trees, bioretention, and other stormwater management features.

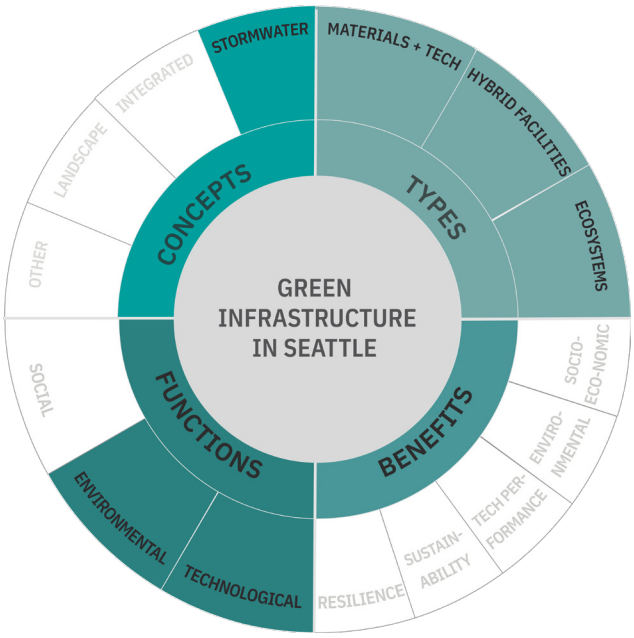
The functions of this nascent system focus on a range of environmental and technological services. Hydrological functions are preeminent, focusing on infiltration, retention, flow attenuation, and evapotranspiration, along with pollutant removal and combined sewer overflow reductions and general drainage system performance enhancement.

Seattle GI plans did not articulate the benefits of GI within their GI definitions.

3 plans reviewed

Seattle's GI planning focuses on stormwater management using a wide variety of GI types to provide environmental and technological functions. Seattle GI plans attempt a more inclusive process, but poorly conceptualize equity and inconsistently address the distribution of GI.

- Incorporated 1869
- 142.1 sq. miles
- 708,823 Total population, 8,452 people per sq. mile
- Temperate conifer forests
- $85,562 Median household income
- 58.1% Estimated rent-burdened households
- 6.1% Housing units vacant



Defining Green Infrastructure in Seattle

Key Findings

Seattle's Comprehensive Plan focuses on equity and addresses all ten dimensions within our equity screen, albeit inconsistently. The remaining 5 GI plans weakly address the concept, although they take some steps to be inclusive in their planning. The GI Strategy emphasizes addressing environmental justice issues through GI, but focuses on a 'value added' distributional approach that does not confront the underlying causes of inequity. Many opportunities exist to improve the equity of Seattle GI planning.

33% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

17% define equity

100% claim engagement with affected communities in planning

17% mention Native peoples or relationships with land

0% attempt to integrate landscape and stormwater concepts

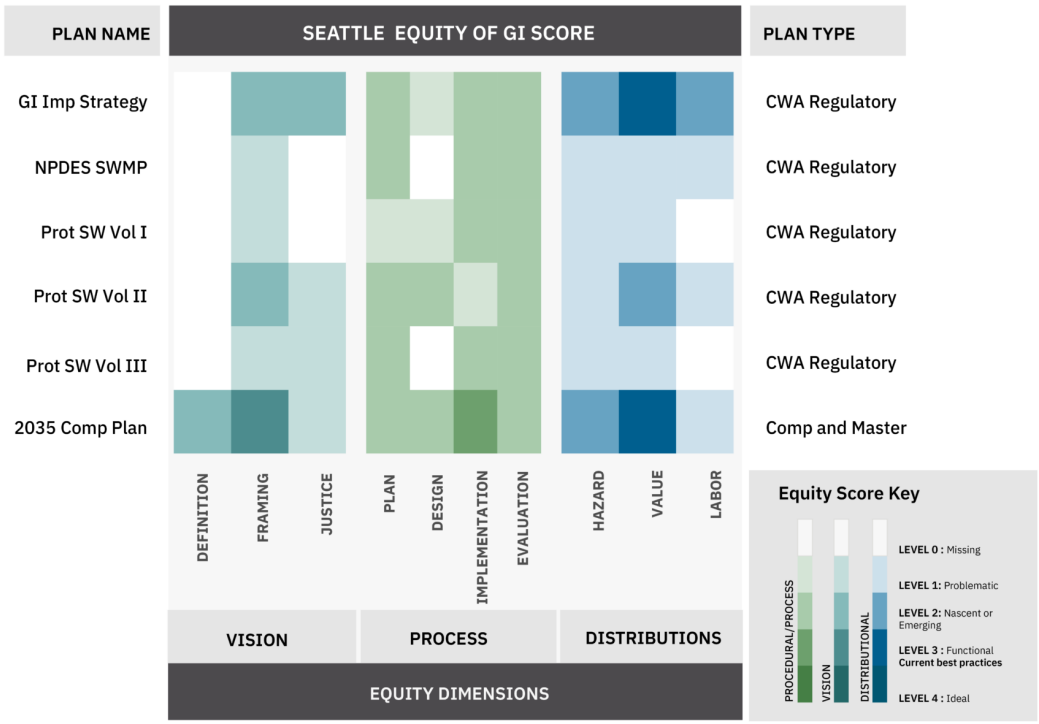
33% apply a lens of universal good to GI

66% explicitly refer to justice

17% recognize that some people are more vulnerable than others

How does Seattle account for Equity in GI Planning?

Seattle's Comprehensive Plan provides a working definition of equity and attempts to address the concept in each of our ten equity categories. However, other stormwater and GI-specific plans inconsistently address equity issues. A welcome emphasis on justice does not meaningfully translate into strategies to protect residents from housing displacement, or have non-property owners capture the value of GI investments.



Recommendations for Stakeholders

Seattle has large-scale and well-developed green stormwater infrastructure programs that have significant potential to address the city's numerous social equity and climate change challenges. Concurrently, the city has an existing environmental justice committee and agenda but those priorities are not effectively embedded in its current GI plans. Evolving existing EJ approaches to maximize their effectiveness will require a targeted transformation in existing planning processes and embracing a more integrative city-wide GI planning concept. To that end, we offer several concrete recommendations below.

Policy Makers and Planners

Seattle policy makers and planners acknowledge the need for GI to equitably address multiple challenges while considering long-standing environmental justice issues. These admirable goals may not be achievable with the concepts and strategies outlined in current GI plans. To support the equitable and sustainable management of Seattle's ongoing growth, we offer several concrete recommendations to policymakers and planners below.

1. Genuinely Inclusive Planning
2. Linking Housing and Environmental Justice
3. GI beyond the Stormwater System

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

Community Groups

Seattle has many community groups working on environmental justice issues. The city has also served as an inspirational center for labor organizing. Current plans expect community groups and NGOs to apply for competitive grants to implement community-scale green infrastructure. However, community groups and NGOs did not appear to be included in shaping current GI planning efforts. Opportunities exist for the city government to support these community groups in fulfilling the city's regulatory obligations. Yet doing so respectfully, and in a manner that meets diverse community needs, requires care. Below we highlight several areas where community groups could advocate for transformations in current planning processes and outcomes.

1. GI Labor as Wealth Building Strategy
2. Demand Operationalization of Equity and EJ Principles in City Planning
3. Securing Dedicated Long Term Support for Community Greening and Housing

Foundations and Funders

Seattle GI plans have established a process for community groups to apply for GI project funding. Foundations and funders can support community organizations in building capacity to plan for cohesive, intersectoral GI projects that address the entwined concerns of housing and a healthy urban environment.

Supporting Community Organizing for Intersectoral Environmental Justice

ST. LOUIS, MO

Green Infrastructure in St. Louis

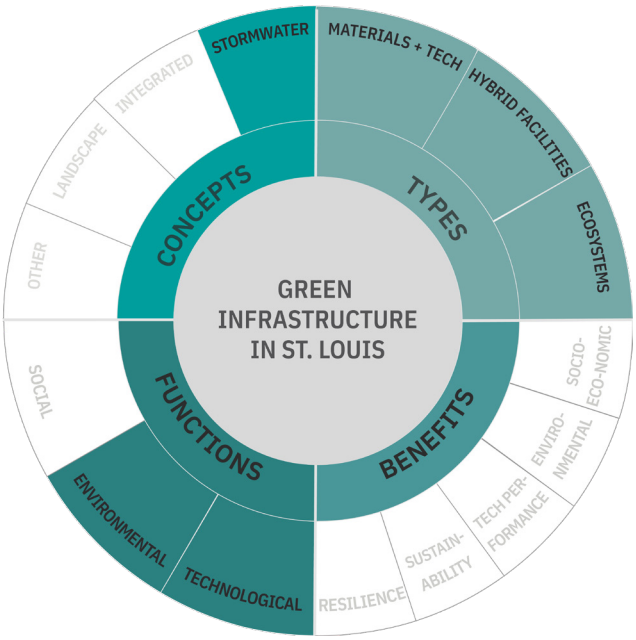
We scanned ten documents that potentially dealt with GI planning in the City of St. Louis. Of these, we excluded several that addressed GI but were not led by the City itself, including the collaboratively written OneSTL regional comprehensive plan and stormwater compliance planning led by the Metropolitan St. Louis Sewer District (MSD). City plans we did examine included the City of St. Louis Sustainability Plan and the North Riverfront Commerce Corridor Land Use Plan. While the NRCCLUP did not define GI, the Sustainability Plan explicitly used a stormwater concept of GI. Both plans seek to support regional initiatives in implementing GI focused on stormwater management.

GI Plans sought to manage stormwater using a range of facility types across all categories of ecosystem elements, hybrid facilities, and green materials and technologies. Despite a diversity of elements, including trees, bioretention, blue-green corridors, green roofs, and rain gardens, plans omitted discussion of trails, networks, agricultural areas, and floodplains. Functionally, GI plans focused on a range of hydrological functions seeking to manage stormwater flows (e.g. infiltration, retention, flow attenuation) along with improving water quality and the performance of the stormwater system.

3 plans reviewed

The City of St. Louis's GI planning focuses on stormwater management using diverse types of GI to provide environmental and technological functions. St. Louis GI plans require clearer conceptualizations of equity and justice, mechanisms of inclusion, and must transform to support a just transition.

- Incorporated 1869
- 142.1 sq. miles
- 708,823 Total population, 8,452 people per sq. mile
- Temperate conifer forests
- $85,562 Median household income
- 58.1% Estimated rent-burdened households
- 6.1% Housing units vacant



Defining Green Infrastructure in St. Louis

Key Findings

St. Louis's Sustainability Plan focuses on equity and sought an inclusive process of plan creation, yet does not address all ten dimensions we evaluated. The North Riverfront Commerce Corridor Plan mentions equity but does not address equity issues other than a general focus on supporting future economic development. Many opportunities exist to improve the equity of St. Louis GI Planning, but these will likely require changes in metropolitan planning systems.

100% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

0% define equity

100% claim engagement with affected communities in planning

0% mention Native peoples or relationships with land

0% attempt to integrate landscape and stormwater concepts

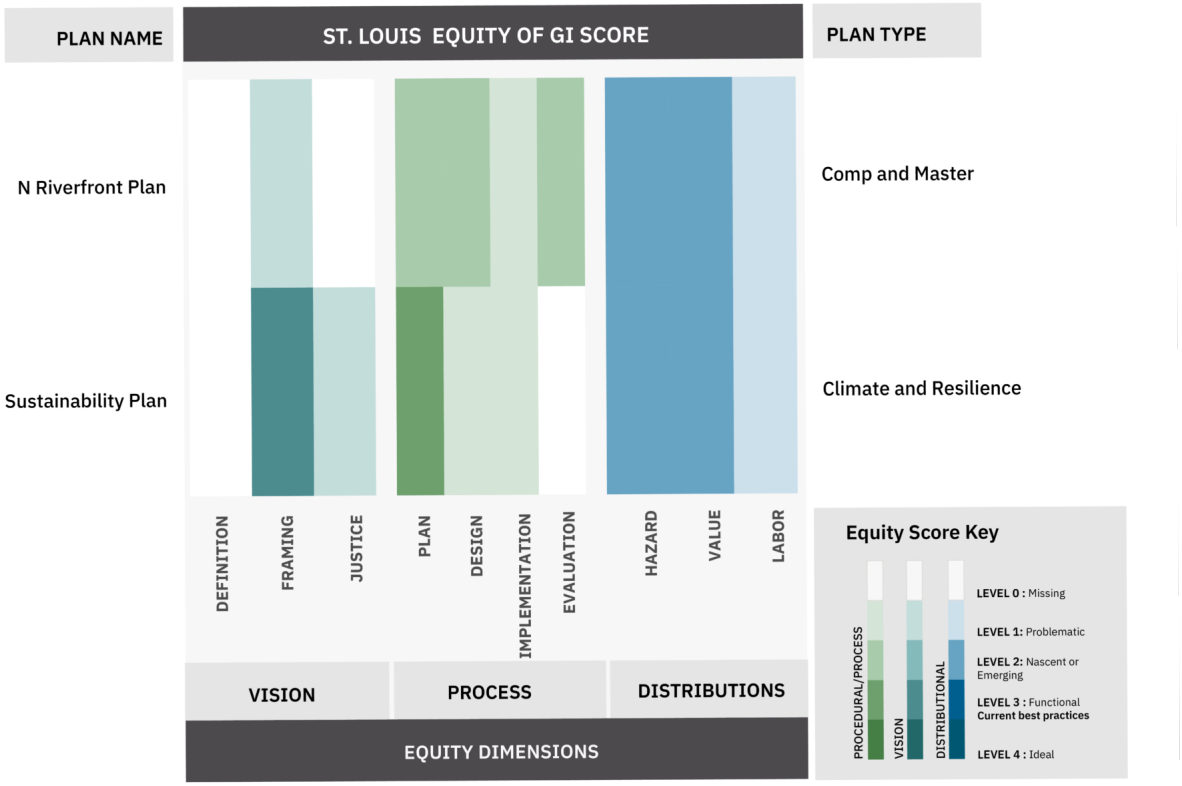
50% apply a lens of universal good to GI

50% explicitly refer to justice

0% recognize that some people are more vulnerable than others

How does St. Louis account for Equity in GI Planning?

No plan in St. Louis defines equity. The Sustainability Plan does draw upon equity as a core concept, and provides a basic framework for equitably planning for GI, but falls far short of sustainability planning efforts in other cities. GI is primarily seen as a tool for cost-effectively managing stormwater while fostering redevelopment.



Recommendations for Stakeholders

St. Louis is another midwestern city with extensive stormwater-focused GI programs that seeks to use GI as part of larger-scale redevelopment efforts. These programs, however, are run by the metropolitan St. Louis Sewer District, which has been a leader in the implementation of Green Stormwater infrastructure. Thus, there remain many opportunities to improve GI planning equity at the city-scale, even with more than a decade of GSI implementation in the region.

Foundations and Funders

Environmental organizations in St. Louis continue to grapple with internal racial equity issues. These struggles, including a lack of inclusion and an absence of major commitments to transforming current city planning systems, indicate a need to foster deep-seated change in the city's environmental organizations and center issues of equity and justice in city planning. Foundations and funders can support the above-identified initiatives directly by supporting grassroots efforts for neighborhood and city-wide integrative green infrastructure planning. Ultimately, they must invest in community capacity to create lasting and meaningful institutional and structural change in the city's decision making systems. Like in other cities, these types of initiatives can be unified under a just transition umbrella, which is being pursued by several area funding organizations.

Supporting Community Organizing and Planning for a Just Transition

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

Community Groups

St. Louis has large coalitions of community groups working on environmental justice issues, many of whom have been deeply involved in other ongoing struggles for racial and social justice. The city's rich organizing history and culture have survived numerous eradication attempts and continue to be involved in local, national, and international movements for social justice. Yet, the vision and determination of these groups are not reflected in current city GI planning, despite the existence of community-created plans that seek to address environmental justice through commitments of public resources and democratic planning. Central issues of existing justice coalitions, including worker's rights and health disparities, can be partially addressed through just transition-focused GI planning and development.

1. Supporting Just Transition through integrative Green Infrastructure

Policy Makers and Planners

St. Louis City policy makers and planners have not engaged with issues of equity in their current GI plans. In contrast, St. Louis County has committed to an equity planning process. but it is not yet clear what influence it will have on the city. Suburban St. Louis, especially in the wake of the Ferguson uprising, has been a pivotal arena for how equity planning can positively influence deeply fragmented cities dealing with systemic injustice. Policy makers and planners could greatly assist grassroots-led efforts to achieve social and racial justice in the city through two related avenues.

1. Integrative City-Wide GI
2. Transforming Planning to Address Equity and Injustice

SYRACUSE, NY

Green Infrastructure in Syracuse

Syracuse GI plans examined included its current Comprehensive, Land Use, and Sustainability Plans. Like several other cities examined, Syracuse GI deals only with stormwater management, and the city itself has limited influence on the Onondaga County Department of Water Environment Protection's regulated storm and sewer programs (which fall outside the scope of this analysis). The city has long supported the County's 'Save the Rain Program' with its Sustainability, Comprehensive, and Land Use Plans which we examined for this project.

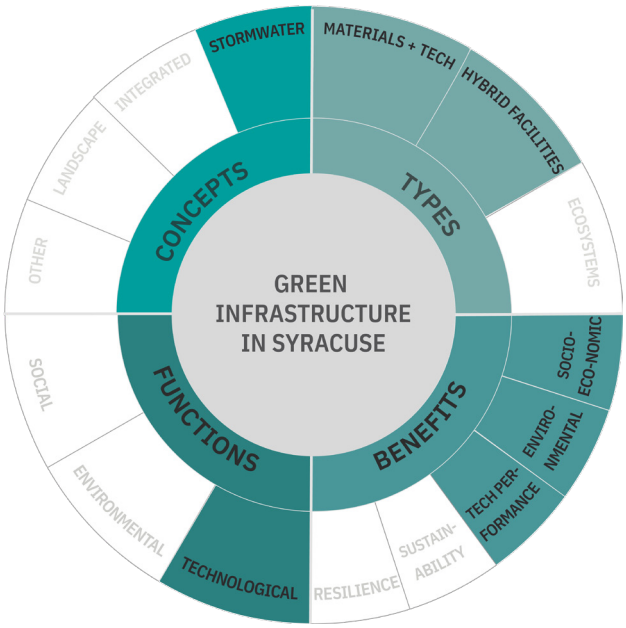
These GI plans focus on disconnecting impervious cover from the city's combined sewer system using a limited set of hybrid facilities and green technologies, including rain barrels, pervious pavers, bioswales, and green roofs.

Syracuse GI plans describe the benefits of addressing these persistent issues primarily as improving water quality, recreation opportunities, reducing the cost of infrastructure, and improving urban aesthetics.

3 plans reviewed

GI planning in Syracuse focuses on stormwater management with technologies and hybrid facilities to realize a diverse set of benefits. Syracuse plans do not define equity, and weakly frame equity issues despite aspirations towards inclusion and intentions of equitable distributions.

- Incorporated 1825
- 25.6 sq. miles
- 143,293 Total population, 5,725 people per sq. mile
- Temperate broadleaf and mixed forests
- $36,308 Median household income
- 64% Estimated rent-burdened households
- 17.8% Housing units vacant



Defining Green Infrastructure in Syracuse

Key Findings

Only Syracuse's Sustainability Plan explicitly refers to equity, and even that plan does not define it. All plans examined had some basic mechanisms of inclusion in place, but did not thoroughly consider the causes of inequity and injustice, nor do they make detailed plans to address inequalities in the distribution of hazards and benefits of GI.

33% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

0% define equity

100% claim engagement with affected communities in planning

33% mention Native peoples or relationships with land

0% attempt to integrate landscape and stormwater concepts

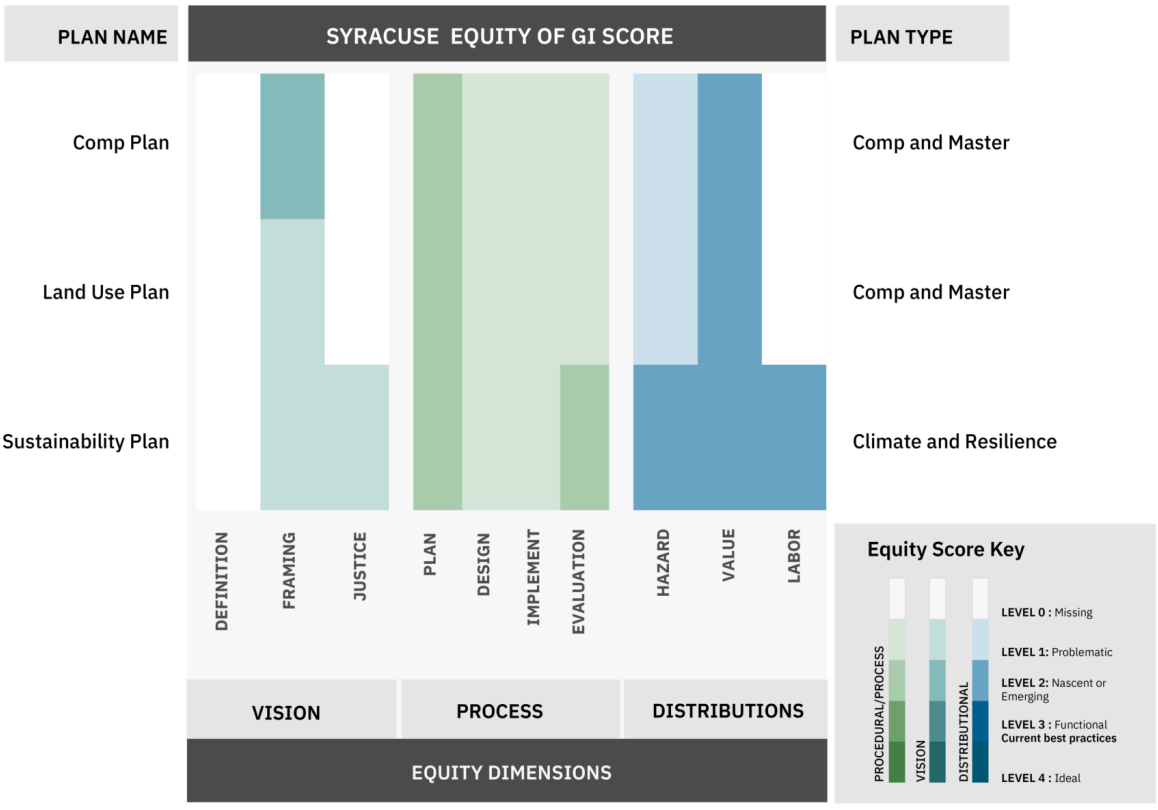
67% apply a lens of universal good to GI

33% explicitly refer to justice

0% recognize that some people are more vulnerable than others

How does Syracuse account for Equity in GI Planning?

Syracuse GI plans are largely silent on equity and justice issues. GI is generally framed as a universal good and as part of a larger program of urban improvement that emphasizes a need for new real estate development. No plan in Syracuse addressed all ten dimensions of equity in our evaluation tool.



Recommendations for Stakeholders

GI planning in Syracuse has a long way to go to address the city's issues of entrenched poverty, segregation, and environmental injustice. While GI may partially address longer-running environmental justice concerns of the city's combined sewer overflows, ongoing work seeks to understand how the benefits of GI intersect with uneven social vulnerability in the city. As the city seeks to reinvent itself through highway removal and ongoing ecological restoration programs, debate continues about how to prevent housing displacement during the current wave of reinvestment. Here we provide several concrete recommendations for how future GI planning can evolve to address equity issues.

Foundations and Funders

Syracuse's GI programs already benefit from several foundations and funders undertaking work in the city. These institutions can improve the equity impact of their work in one important way in the city.

1. From Funding Distribution Gaps to Building Community Power

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

Community Groups

Syracuse's grassroots community groups have been fighting for racial and environmental justice for a long time. These groups have the place-based knowledge to determine the current and potential meanings of equity and justice and their experiences must be centered in the evolution of urban planning in the city. Based on our reading of current plans, community experiences can inform two large necessary evolutions of urban planning. These are:

1. The Meaning of Equity and Justice
2. Transforming City Planning to achieve Procedural Equity

Policy Makers and Planners

Syracuse GI plans are primarily focused on stormwater management despite the city being poised for a major redevelopment project. The city has a historic opportunity to not only address the environmental injustice of I-81 but to restructure the fabric of the city core to meet the needs of residents. To achieve these twin goals, we have three major recommendations for policy makers and planners in the city.

1. Embrace a More Integrative Concept of Green Infrastructure
2. From Professionalization to Participation
3. Urban Redevelopment That Supports Current Residents

WASHINGTON D.C.

Green Infrastructure in Washington D.C.

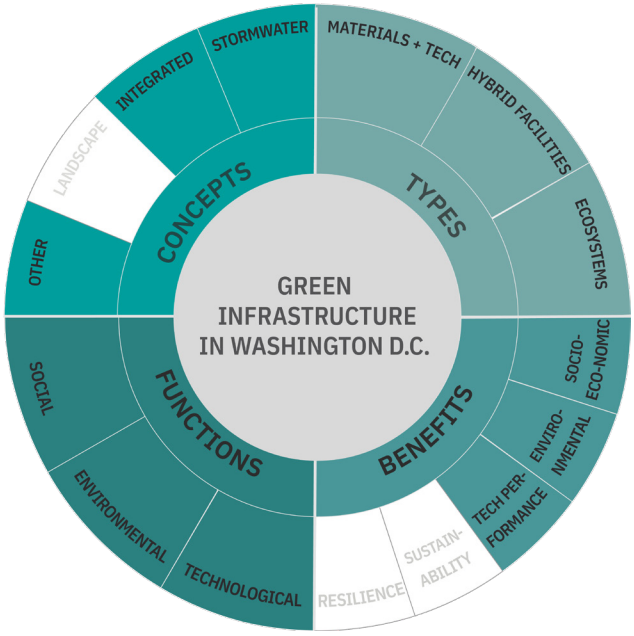
The majority of GI plans in Washington DC deal with stormwater management, although the city's combined sewer overflow plan seeks to integrate natural processes into the urban environment. The Anacostia Watershed Restoration Plan focuses on climate resilience with a green infrastructure concept. The city was unique among those examined in having a wildlife-focused plan, which used the terminology of GI without defining it.

Reflecting this range of plans, the city defines a diverse set of GI types spanning ecological elements, hybrid systems, and green technologies. Similarly, plans focus on providing numerous social, environmental, and infrastructural functions with GI. Benefit-wise, city GI plans seek to deliver a diverse range of environmental, socio-economic, and infrastructure system benefits.

9 plans reviewed

Washington D.C. GI plans focus on stormwater, with some integration of diverse habitats into a city-wide network. D.C. GI plans do not define equity, have limited inclusion, and inconsistently address distributions of goods, hazards, and labor.

- Incorporated 1825
- 25.6 sq. miles
- 143,293 Total population, 5,725 people per sq. mile
- Temperate broadleaf and mixed forests
- $36,308 Median household income
- 64% Estimated rent-burdened households
- 17.8% Housing units vacant



Defining Green Infrastructure in D.C.

Key Findings

GI Plans in Washington DC commonly refer to the need to address equity and justice concerns, and yet equity was defined in only one plan. Procedurally, city plans have few binding mechanisms for equitable design, implementation, and evaluation. The city's GI programs, however, are widespread and within city-supported redevelopment programs.

33% explicitly refer to equity, 100% have equity implications

100% seek to address climate and other hazards

11% define equity

100% claim engagement with affected communities in planning

11% mention Native peoples or relationships with land

11% attempt to integrate landscape and stormwater concepts

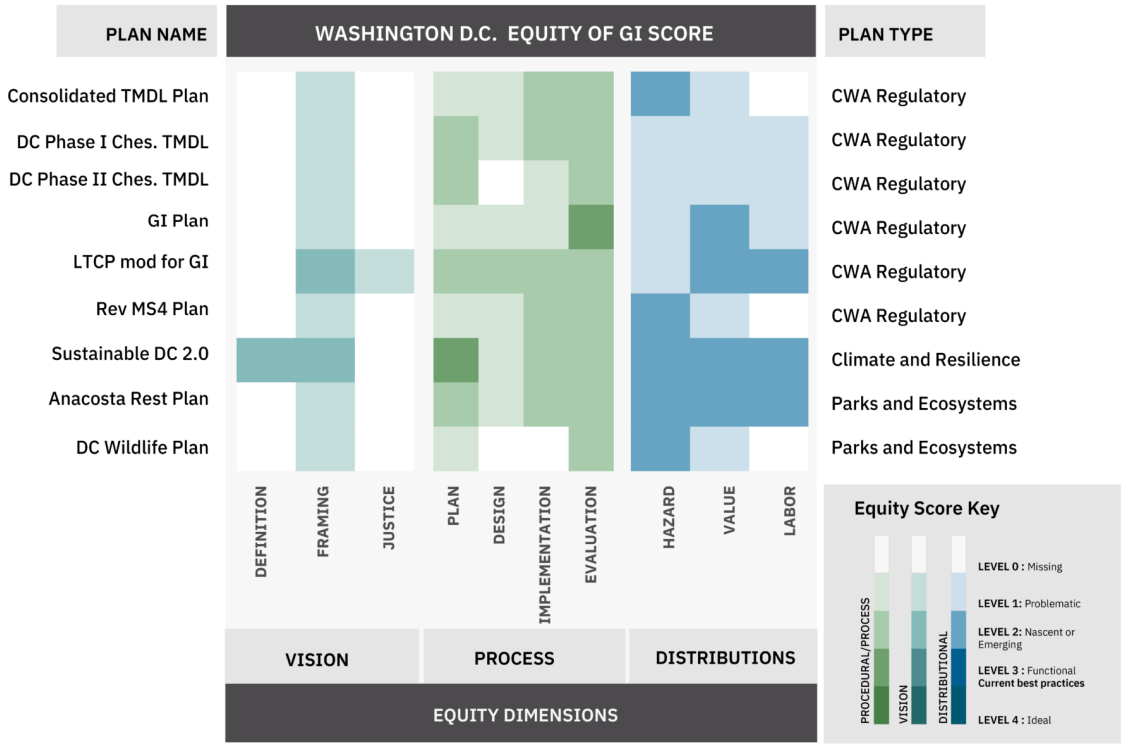
33% apply a lens of universal good to GI

0% explicitly refer to justice

0% recognize that some people are more vulnerable than others

How does Washington D.C. account for Equity in GI Planning?

GI plans in Washington DC weakly frame and define the relationships between green infrastructure, equity, and justice, with only one plan containing a definition of equity. The plans only perfunctorily include communities aside from the most recent Sustainability Plan which appeared to make an effort for widespread outreach. The city's GI Plan discusses the need for community-based evaluation of city GI programs but does not provide robust mechanisms to do so. While GI plans seek to mitigate stormwater and flooding hazards, they fail to robustly address multi-dimensional and intersecting issues of climate hazard management with changing property values. While the relationship between evolving GI programs and some forms of labor are explored, they require significant elaboration.



Recommendations for Stakeholders

Despite a number of initiatives that have the potential for integration, GI planning remains fragmented with poorly articulated mechanisms for community engagement. DC is one of the fastest gentrifying cities in the country and has finally started growing its population again after decades of decline. World-famous congestion and burgeoning demand for alternative transit, walkable neighborhoods, high quality of urban life, and mounting climate risks all demand an expansion and improvement of a city-wide multifunctional green space network. Without community leadership and mechanisms for marginalized communities to have ownership over planning, it is unlikely current efforts will address the concerns of those facing housing displacement and dealing with systemic inequality caused by previous planning.

Foundations and Funders

Washington DC is the nonprofit capital of the world. And yet, extreme disparities in life expectancy, housing affordability, and incomes are remarkably persistent despite a vigorous and public culture of organizing in the city. A city-wide GI system utilizing a just transition framework can address some aspects of systemic racism by creating high-paying jobs, improving environmental health equitably, and reducing cost burdens for infrastructure.

1. Good Green Jobs Instead of Nonprofit Precarity

Learn More Online

To view a complete list of recommendations for stakeholders visit www.giequity.org.

Community Groups

Numerous national organizations are based in DC and focus on large-scale policy change. However, these organizations are not grounded in local issues facing current and long-term residents. A host of community groups have been working on economic justice and housing advocacy, such as DC Jobs with Justice and others supported by the DC Childcare Collective. However, these broad coalitions do not appear to be focused on climate resilience or GI. Other environmental justice initiatives focus largely on ongoing toxic waste issues but intersect with the Long-Term Control Plan to some degree because they include the city's Blue Plains Sewage Treatment Plant. Opportunities exist for these organizations to coalesce around a just transition framework.

1. From Increasing Value to Restorative and Transformative Justice

2. Equitable Equity Evaluation

Policy Makers and Planners

Planners currently have an outsized role in shaping the city's GI programs. Despite related planning around habitat, environmental quality, and parks and recreation, these plans have no underlying conceptual unity for linking multi-functional green spaces with built infrastructure systems. Simultaneously, plans are largely silent on the social equity concerns of transformative environmental planning. To address these twin gaps, policymakers and planners can undertake three related projects: broadening the scope of current GI concepts, integrating existing planning efforts into a more cohesive city-wide vision responsive to the needs and demands of diverse residents, and embracing the idea of a just transition to go beyond GI when addressing GI's social impacts.

ABOUT THE PROJECT

ABOUT

Is Green Infrastructure a Universal Good? is a research project housed at Cary Institute of Ecosystem Studies and co-led by the Urban Systems Lab, The New School to understand how green infrastructure (GI) urban planning in US cities consider issues of equity and environmental and social justice. This web resource presents findings from an examination of 122 GI plans in 20 diverse US cities. The research team utilized content analysis methods to identify how plans conceive of GI, its social impacts, and its relationship with equity and justice, in addition to evaluating the equity of the GI planning process itself. Initiated in 2018 with an analysis of GI planning in Baltimore, Maryland, the project is part of a larger effort led by Cary Institute to bring together urban ecologists, social scientists, GIS analysts, and environmental historians to discover how to best improve the equity of GI through policy and practice.

Project Team

Our project team includes social and ecological scientists, planners, and designers working together to conduct research communicated through meaningful narratives and visualizations. We seek to produce new knowledge and communicate it in ways that can serve diverse needs of community activists, city planners, researchers, and others interested in advancing more just and equitable investments in urban green infrastructure in the US and beyond.

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Urban Ecologist focused on improving equity, resilience and sustainability in complex urban systems. (Urban Systems Lab)

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Supporting Organizations

This project is led by Cary Institute of Ecosystem Studies, supported by the Urban Systems Lab, with additional input from the UC Davis CLUE Lab and the US Forest Service. Support for "Is Green Infrastructure a Universal Good?" provided by the JPB Foundation.

Cary Institute of Ecosystem Studies

A leading independent research organization focused on actionable ecological science for environmental solutions. Its scientists are global experts in the ecology of freshwater, forests, disease, and cities. Through collaborative efforts, they produce science for use within policy and management processes protecting the environment and improving human wellbeing. Learn more about Cary Institute.
www.caryinstitute.org

THE NEW SCHOOL URBAN SYSTEMS LAB

The Urban Systems Lab is an interdisciplinary research, design and practice space at The New School that provides new insight into developing more equitable, resilient, and sustainable cities. The Lab's work advances cutting edge science, data visualization, and computation to develop systemic solutions to social and environmental challenges driving inequity and injustice in urban areas. Learn more about the Urban Systems Lab.
www.urbansystemslab.com

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