

A Pathway for London to Become a Living City



How London can accelerate equitable, abundant, and thriving green infrastructure.





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Introduction

This document was created to illustrate a pathway for how London can become a Living City: a place with equitable, abundant and thriving green infrastructure. It is based on the [Framework for Living Cities](#) – a document that shows how cities across North America and Europe have successfully implemented green infrastructure (GI), and synthesizes key strategies and actions to help other cities do this, too. Based on an extensive scan of academic research, grey literature, and case studies, the *Framework for Living Cities* presents a number of practical strategies that local governments have used to integrate GI into city-building in ways that: (1) prioritize equity, (2) support abundant implementation across the landscape, and (3) ensure GI is thriving and delivering its full range of benefits. It also points practitioners to resources and tools to help them integrate these strategies into their own policy and operational contexts.

This document, a Living Cities Policy Pathway for London, applies the strategies laid out in the Framework to the policy and operational context of the City of London. It:

- 1 assesses how much progress the City of London has made toward implementing equitable, abundant, and thriving GI, and
- 2 provides an overview of recommendations that London can take to continue to make progress on green infrastructure.

The information contained here and the recommendations made in this Pathway is based on a review of existing policies and programs in London that relate to GI. We also interviewed nine individuals, including seven municipal staff, and requested feedback on the recommendations, which was provided by four individuals.

What is a Living City?

Living Cities are places where green infrastructure—parks and green spaces; green stormwater facilities like bioswales, rain gardens, and permeable pavements¹; urban forests and natural heritage systems; wetlands and meadows; green roofs and walls—is **equitable, abundant, and thriving**.

As cities grow and develop, we lose natural land cover to hardened surfaces like roads, buildings, and compacted soils. As a result, urbanized areas are less able to infiltrate rainwater and snowmelt, generating excess runoff that can result in increased flooding. When the land is less able to hold onto moisture, it also is less able to regulate temperature, since evapotranspiration has a cooling effect. Hard engineered surfaces like asphalt and concrete reflect heat back into the surrounding areas, compounding this problem. This is why cities are often warmer than the surrounding countryside during hot summer days— from 2 to 8°C warmer.²

Both flooding and heat waves are becoming more common as climate change takes hold, and the loss of natural land cover makes cities even more vulnerable to these weather extremes. Green infrastructure (GI)—both naturally existing GI and constructed GI—is critical to making cities more resilient to climate change. And, unlike grey infrastructure—engineered systems like stormwater sewers that serve a single purpose—GI also delivers a number of other social, economic, and environmental co-benefits, as shown on the following page.

¹ Also called Low Impact Development, or LIDs

² Heisler, G. M., & Brazel, A. J. (2010). The urban physical environment: Temperature and urban heat islands. *Urban ecosystem ecology*, 55, 29-56.



Equitable

GI is prioritized in locations with the greatest environmental and social need and underserved communities shape GI decision-making.



Abundant

GI is the new normal; it is implemented widely and championed by diverse stakeholders.



Thriving

GI is installed, maintained and functions well over the long-term.

There is ample research that speaks to the multiple benefits of green infrastructure. There are also many cities around the world that have successfully implemented GI to provide municipal services and solve a number of other problems. But despite the strong case for GI, it remains limited in implementation and poorly integrated into land-use planning and decision-making in most municipalities in Canada. A number of policy, technical, financial, and social barriers inhibit its uptake and success and prevent most Canadians from reaping the benefits of GI where we live. For the full benefits of GI to be felt in Canadian cities, it must be equitably implemented, abundant throughout the landscape, and thriving.

Living Cities are places where this is happening, or that are committed to making this happen. Living Cities are implementing or have plans to implement evidence-based approaches to mainstream GI and transform their communities into healthy, livable, vibrant places to live.

These are communities that are committed to:

1. Involving communities and prioritizing GI for environmental equity and reconciliation;
2. Setting requirements and standards in policies, plans, and bylaws for GI;
3. Laying the groundwork for systemic integration of GI throughout city operations;
4. Growing support for GI among members of the public and key stakeholders;
5. Ensuring GI can thrive over the long term by building partnerships and finding champions to maintain and steward GI.



Why We Need GI in London

If London were to commit to implementing equitable, abundant, and thriving green infrastructure, it would become an even more vibrant, beautiful, sustainable, and healthy place to live. It would also help to shield residents from some of the worst impacts of climate change, especially those residents who are disproportionately impacted. Below, we detail some challenges facing London and how GI could help to address these.



Intense rains fall on downtown London.
Photo Credit: Jofa2005

Climate Challenges: Increased Incidences of Extreme Weather Events

Southwestern Ontario is particularly vulnerable to climate-related extreme weather events. Exposure to flooding, ice and sleet storms, and heat waves, have been identified as the largest extreme weather concerns in London.³ GI can help mitigate the worst impacts of two of these three issues.

Flood risk is heightened during extreme rainfall events. The Great Lakes region is already subject to intense rainfall, and is projected to be a region that will experience some of the most intense short duration rainfalls in Canada.⁴ High intensity rain events in largely impermeable landscapes can lead to flooding, including flash flooding, because rain comes down faster than it can be absorbed

or outletted to conventional stormwater systems. Research has suggested that GI, especially when implemented in a decentralized, watershed-scale strategy, can reduce peak flood depths and duration, making flooding events less damaging to property and infrastructure and less hazardous to people.^{5,6}

Extreme heat is hazardous to human health. A growing number of studies around the world are noting a link between morbidity and heat waves, especially in urbanized areas. Between 1948 and 2008, the average annual temperature in Ontario has increased by approximately 1.5°C, and it is expected that temperatures will continue to climb over the next century, by as much as 3-8°C⁷. More bouts of intense heat waves are expected, and research has suggested that southwestern Ontario—in the corridor between Toronto and Windsor—are particularly susceptible to temperature extremes.⁸ As noted in the section above, heat waves are often felt more intensely in urban centers. Green infrastructure, especially trees and assets that enable as much water as possible to be retained in the landscape, are critical to helping keep cities cool during these heat events.



A new, low density development in London's southeast end.

Development Challenges: Land-Use Change in a Fast-Growing City

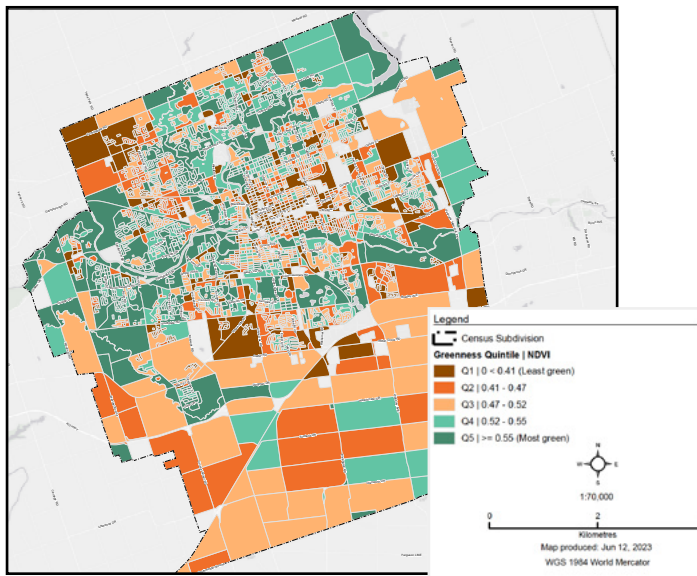
The impacts of climate-related extreme weather is likely to be felt more intensely on the ground due to London's growing urban footprint. For example, extreme precipitation in urbanized areas makes the likelihood of flooding higher, as the land is less able to absorb excess water. Pluvial flood hazard management is a particular challenge in southern Ontario, due to the densely built up areas.⁹ Urban heat also becomes more intense when there is less vegetation and ability for the land to hold onto water.

London is one of the fastest growing municipalities in Canada. Between 2016-2021, the city's population grew by 10%, compared to a national average of 6.2% for municipalities.¹⁰ This made London the fourth fastest growing municipality in Canada during this period. This population growth has resulted in a surge in demand for housing. To accommodate this demand, a number of new developments on the city's periphery have been approved in recent years, converting greenfield areas into housing developments. Infill housing in the built up area has also been approved, making London a more densely populated city. Between 2016-2021, the City of London issued 63% more permits for residential housing than they did, on average, in the 10-year period preceding that. Growth in industrial building permits (gross floor area) was also high in London in the 2016-2021 period¹¹, and commercial development was close to historic levels in 2022¹². As more and more land is developed in London - both at the urban periphery and as intensification - protecting existing GI and weaving into the urban fabric is a crucial part of building climate resilience in the city.

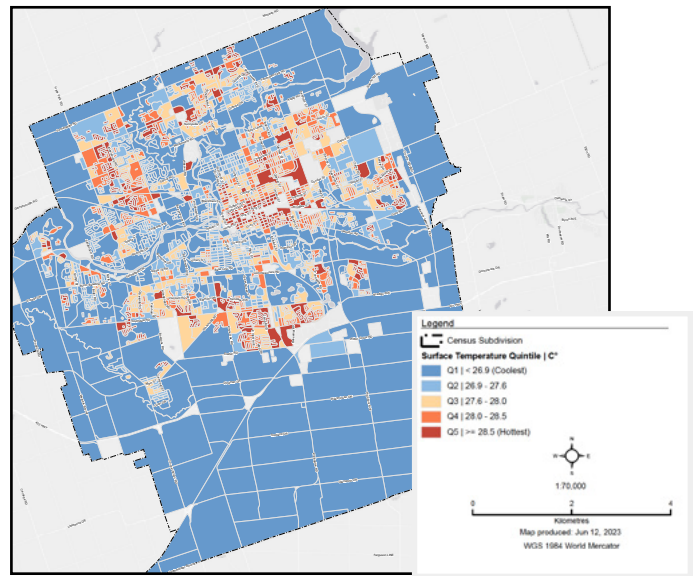


Social Challenges: Inequitable Distribution of GI and Climate Risks

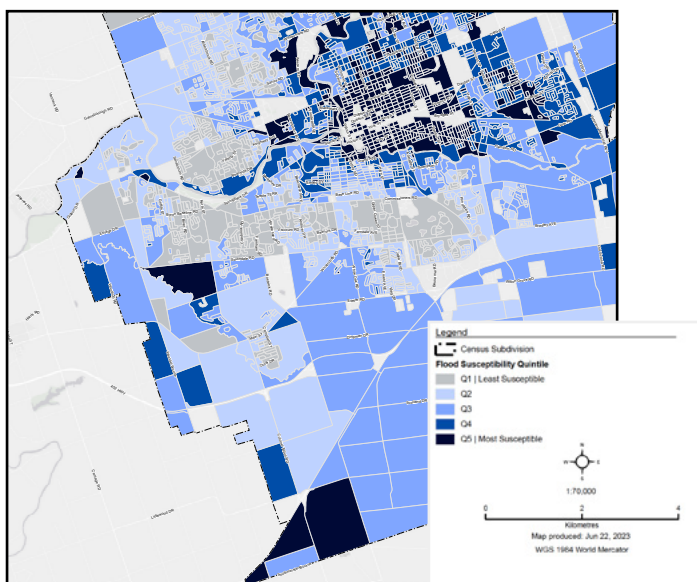
Green infrastructure is not evenly distributed in London, and the burden of climate risks are not shared equally among the population. In particular, the downtown area, east end, and some neighbourhoods in the southern part of the city are, on average, much less green than the rest of the city. These same neighbourhoods are more likely to be exposed to higher land surface temperatures, and some of them are at higher risk of flooding. Neighbourhoods with less greenness and higher surface temperatures tend to be more densely built out and populated than other neighbourhoods. Many of these neighbourhoods also have a higher proportion of low-income residents than the average of the city



Greenness in London



Average Surface Temperatures in London



Flood Susceptibility in London

Work that has been done

London has made significant strides in recent years toward becoming a more environmentally sustainable, resilient, and equitable city. The London Plan—the city’s official plan that was consolidated in 2022—sets a direction for London to become “one of the greenest cities in Canada”, by taking a number of actions that would protect existing green infrastructure and encourage the creation of new GI. The plan also includes a number of other strategic directions that would be supported by equitable, abundant and thriving GI (e.g., “build strong, healthy and attractive neighbourhoods for everyone”; “make wise planning decisions”). The recent approval of the London Plan by the Ontario Land Tribunal has allowed the City to move forward with implementing this plan. The City is currently preparing a new comprehensive Zoning By-Law that will shape how development and redevelopment take place within the city’s boundaries. The Zoning bylaw will help to guide development that helps the City to meet the intensification target of 45% laid out in the London Plan (i.e., 45% of new residential developments should be situated within the existing build up area). The intensification target will help direct development away from greenfield areas with existing GI, and encourage a denser community, more amenable to transit and active transportation.

The City’s Climate Emergency Action Plan (CEAP) was also approved in 2022, and includes a number of ambitious actions to help London mitigate emissions and adapt to the impacts of climate change. The plan highlights how climate impacts are suffered disproportionately by disadvantaged groups, and includes a number of actions that promote a community-engaged approach that centers equity-deserving groups in this work. Green infrastructure is explicitly named as a strategy in the CEAP, and many of the expected outcomes of the plan would be supported by a GI implementation strategy. Since developing the CEAP, the city has created and implemented its “Climate Lens Framework”, a tool that has been applied internally to assist staff to assess how different city initiatives are aligned with a climate lens.

The introduction of the CEAP and Climate Lens Framework has helped to drive more collaboration within the city, helping to integrate an environment and climate lens into how other departments make decisions and conduct business, especially engineering and infrastructure and land-use planning.

Other noteworthy initiatives that have helped to support the integration of green infrastructure into functional city-building and decision-making include:

- ▶ **Corporate Asset Management Plan (2019)** (“the AMP”). London’s 2019 AMP is among the first in Ontario to integrate green infrastructure assets. Specifically, the plan includes an inventory of all urban forests on public lands and how much it would cost to replace these assets, as well as stormwater management green infrastructure (e.g. bioretention cells, engineered wetlands). It also has a short section on land that encompasses parklands, wetlands, and natural areas. Replacement value for the latter category is calculated at the price of land per hectare.

- ▶ **Complete Streets Design Manual.** London’s Complete Streets Design Manual was released in August 2018. It supports an approach that seeks to meet the needs of multiple users (motorists, pedestrians, cyclists, transit riders) and utilities, as well as contribute to healthy ecosystems, social inclusion, and vibrant business. The Manual includes a section on how to integrate green infrastructure into place-making through street design.
- ▶ **Urban Forestry programs and plans.** In 2019, London’s city council adopted a fairly ambitious target of growing its tree canopy cover to 34% by 2065 (over a 2019 baseline of 27%). Staff are currently working on an updated Urban Forest Strategy and Tree Planting Strategy to support the City in meeting this target.
- ▶ **Sub-watershed planning and projects.** The City has been working with the Upper Thames River Conservation Authority and other partners to promote the use of land and natural assets, along with LID techniques, to promote flood and erosion mitigation, stormwater management and to restore ecological functions among the city’s waterways (“Complete Corridor Approach”). Recent projects include the Dingman Creek Master Plan (includes constructed wetland and creek rehabilitation), Mud Creek rehabilitation project, purchasing areas along the Thames River/Deshkan Ziibi for floodplain lands.
- ▶ The City’s revised (2021) **Environmental Management Guidelines** provide technical guidance in implementing the policies of the London Plan as they relate to identifying, delineating and protecting London’s Natural Heritage System (NHS). They outline requirements for new developments that could affect the NHS, including when an Environmental Impact Study is required.
- ▶ **The Stormwater Management Requirements (chapter 6) of the Design Specifications and Requirements Manual** provides guidance beyond legislative and standard design practices for use in the City (City-led development and best practices for private development). The manual proposes a “Stormwater Management Control Hierarchy” to meet water balance and water quality requirements that prioritizes stormwater be managed in the following priority order: 1) infiltration / retention by native soils; 2) filtration (i.e. volume capture and release); 3) volume detention and release.

The City’s TreeME program provides funding for community-initiated tree plantings on private property, and financial support for residents to care for “distinctive trees” (trees larger than 50cm in diameter) on their properties. The City has also expanded its partnership with the London Environmental Network to engage and offer resources to private landowners to install rain gardens on their properties.

Challenges and Gaps

Municipal GI Implementation

The City of London has done a great deal of work, especially in the past five years, that will support the integration of equitable, abundant, and thriving GI into how the city continues to develop and grow into the future. Despite this good work, GI has not been made a policy priority, and is instead supported in a more ancillary way through other initiatives (with the exception of urban forestry, which does have specific targets, associated strategies, and funding). There is no explicit public mandate for GI—i.e., there is not a GI or stormwater strategy or overarching policy direction. Other than the urban canopy cover target, there are no specific policy targets in place that guide the protection and/or implementation of green infrastructure. The city has not developed a business case for GI, or conducted analysis on the social and financial benefits of the multiple services provided by GI or integrated this into decision-making.

There are a number of “best practices” with which the City encourages GI (i.e., GI is encouraged as a best practice in the Stormwater Management Requirements section of the Design Specifications and Requirements Manual) but GI is not required in developments or re-developments.¹³ Within city operations, there are many missed opportunities to include green stormwater infrastructure in street construction and reconstruction. Adequate resourcing of maintenance and operations of GI has been a challenge, both for stormwater infrastructure and urban forestry. The Asset Management Plan identifies a nearly \$23M infrastructure gap in urban forestry.

Encouraging Industry to Implement GI

There are currently no requirements or incentives in place (e.g. fast-tracked approvals, reduced restriction limits, etc.) or programs that encourage the uptake of practices that protect and integrate GI in new developments. There is a rebate program for Institutional, Industrial, and Commercial users to integrate green infrastructure practices on their properties, but uptake of this opportunity has been extremely low. Residential housing permitting continues to encourage more low-density housing in the urban periphery than is desirable, and many of these housing developments do not preserve any existing natural features, except where it is required because they are part of the natural heritage system. Despite the marked increase in high- and medium-density housing stock compared to prior years, London’s intensification rate in 2022 was only 20.8%, and in the five year period between 2017-2022, the average intensification rate was 39.2%—nearly 6% shy of its intensification target of 45%.¹⁴ The City’s site alteration by-law does not encourage best practices in soil management practices or green infrastructure preservation.

Equity and Encouraging Residents to Implement GI

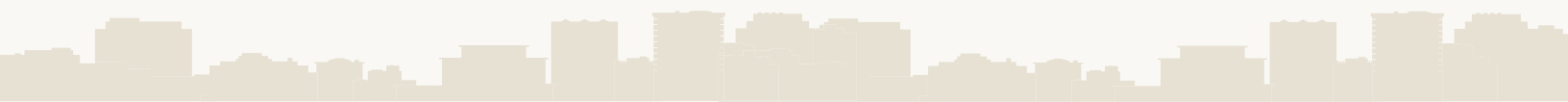
The City does not currently have any programs or initiatives to prioritize equity in green infrastructure implementation. Existing incentive programs for community members are limited (e.g. TreeME, Rain Garden rebate program), and are targeted toward property owners, which are more likely to exclude lower-income residents. The City’s property standards bylaw discourages naturalized vegetation on boulevards, and residents have had pollinator gardens removed by bylaw officers. There are no broad engagement or communication initiatives to educate and encourage residents to implement GI.

Living Cities Assessment: How Are We Doing?

This table offers an assessment of how London has or is working toward implementing evidence-based strategies that support equitable, abundant, and thriving green infrastructure. The strategies are taken from the Pathways to Living Cities Framework—and are based on extensive research and case studies from across North America and Europe.



The more “grey” is the shade, the more London is at the start of its journey; the more “green” is the shade, the more London has made progress on the strategies to advance the respective pillars of equity, abundance, and thriving. The table below provides a high-level summary of the progress London has made and some notable gaps. A more comprehensive and detailed assessment and recommendations are [available here](#).



Equitable

Not everyone has the same access to GI and its benefits. Research has shown that neighbourhoods with higher proportions of marginalized residents—e.g. low-income people, BIPOC groups, etc.—tend to have less GI compared to other neighbourhoods. Living Cities actively work to address this inequity by prioritizing GI in areas of high environmental and social need. Six key strategies can help to achieve this, broken down into two overarching categories, as detailed below.

Prioritize GI for Environmental Equity

How is London doing?



What does this mean?

1. Identify under-natured areas;
2. Understand the distribution of social and environmental challenges in these neighbourhoods;
3. Engage people in GI planning and decision-making;
4. Employ policy tools to enhance accessibility and avoid displacement.

Work done: The City has done some work to integrate equity into its environmental programs and services, and this work is being ramped up as new policies and programs are developed. In particular, the Climate Emergency Action Plan (CEAP) has the objective to “improve equity” in a number of different areas. It notes that its rollout will be informed by community engagement and input, and will prioritize representation from equity-deserving groups in that process.

Gaps: The City has not undertaken substantive work to understand where climate risks fall relative to social vulnerabilities, or developed plans to address these inequities with GI. There are currently no inclusionary zoning policies at the City of London. Some members of equity-deserving groups have reported that engagement with the City is difficult.

Advance Reconciliation with GI

How is London doing?



What does this mean?

1. Support Indigenous-led green infrastructure;
2. Build municipal-indigenous partnerships to advance GI.

Work done: The City often goes over and above its ‘duty to consult’ obligations, e.g. by seeking feedback and providing support for First Nations to provide detailed comments on plans, policies, and development proposals. The City has also done collaborative watershed management work with local First Nations.

Gaps: The City has not undertaken any projects or initiative to advance reconciliation by supporting Indigenous-led GI in London.



Abundant

GI is most effective at delivering services and its multiple co-benefits when it is implemented widely across the landscape: a few street trees provide some stormwater management and cooling benefits; an urban forest provides much more. Living Cities work to make GI “the new normal”, using it as an infrastructural default whenever and wherever possible. Eight key strategies to do this are listed below, in three overarching categories.

Set Requirements and Standards for GI

How is London doing?



What does that mean?

1. Provide a public mandate for GI through policy instruments;
2. Align GI implementation with other strategic priorities (e.g. public health, climate change adaptation).

Work done: The London Plan, sets the direction to become “one of the greenest cities in Canada,” and calls directly for the City to “implement green infrastructure and low impact development strategies.” The CEAP also commits to “Implementing Natural and Engineered Climate Solutions and Carbon Capture.” In 2019, City Council passed a motion to adopt a tree canopy target of 34% by 2065. And, as is outlined in greater detail in the section above, The Work That Has Been Done, there are a number of other plans, initiatives, and guidelines, that help embed GI in city-led work.

Gaps: A commitment to GI exists in high-level plans, but there are no GI-focussed plans or specific or measurable targets that operationalize those commitments (other than for urban forestry)--“mid-level” policy triggers are missing. A number of documents promote best practices, but do not require developers to preserve or implement GI (with the exception of woodlands deemed ‘significant’), and some GI-related bylaws can be bypassed through other processes. On-the-ground change is happening more slowly than if there were a cohesive strategy with targets, requirements, and associated by-laws.

Lay the Groundwork for Systemic Integration

What does this mean?

1. Build knowledge and technical capacity among practitioners involved in urban development;
2. Use valuation approaches and asset management to integrate GI into city-wide decision-making;
3. Introduce and expanding funding mechanisms (e.g. stormwater fees);
4. Collect and improving GI data and monitoring;

How is London doing?



Work done: London has been a leader in Canada in incorporating GI (specifically, forestry) into the asset management process. The city has a number of GI facilities to manage stormwater, and has done some monitoring and measuring work to understand performance. London has a stormwater fee in place that provides full funding for stormwater services. There are also some financial incentives for developers to integrate GI.

Gaps: The City does not have good data on the ecosystem services offered by GI, or a process that considers this in financial planning, or land-use and infrastructural decision-making. Urban forestry has a large funding gap, and operations and enforcement are also under-resourced. Incentives, supports, and requirements for industry to advance green infrastructure are limited. Of the incentives that do exist (DC subsidy and ICI rebate), uptake is very low. The residential stormwater fee is not structured to encourage GI on private property.

Grow Support for GI

What does this mean?

1. Seek support from higher levels of government;
2. Facilitate community-based action.

How is London doing?



Work done: London has some programs to support community members to implement GI. It supports the London Environmental Network to deliver a residential rain garden rebate program. Urban forestry has programs that support tree planting and care on private lands, and will plant trees on city-owned boulevards at the request of residents. The City's Community Garden program has enabled the creation of over 450 plots across the city.

Gaps: The City's community programs are modest, can be difficult to access, and favour home-owning residents. They are by request (or complaint), instead of proactive. The Property Standards Bylaw does not encourage resident-led GI or naturalization, and residents have had vegetation removed by bylaw officers. London has not sought out significant support from higher levels of government to advance GI projects.





Thriving

If GI is not properly protected, planned for, designed, constructed, maintained, and monitored, it will not be able to deliver its full range of benefits (or, the benefits it provides will not be given due consideration in city decision-making processes, and opportunities to implement GI may be missed). Living Cities work to ensure GI can thrive over the long term by setting GI up for success. Three key strategies can help accomplish this, as detailed below.

Create GI that Flourishes Over the Long Term

What does this mean?

1. Build partnerships and finding champions to bring GI goals and operations into alignment;
2. Pick indicators and monitoring over time to understand how GI is delivering services;
3. Support and adequately funding GI maintenance and operations.

How is London doing?



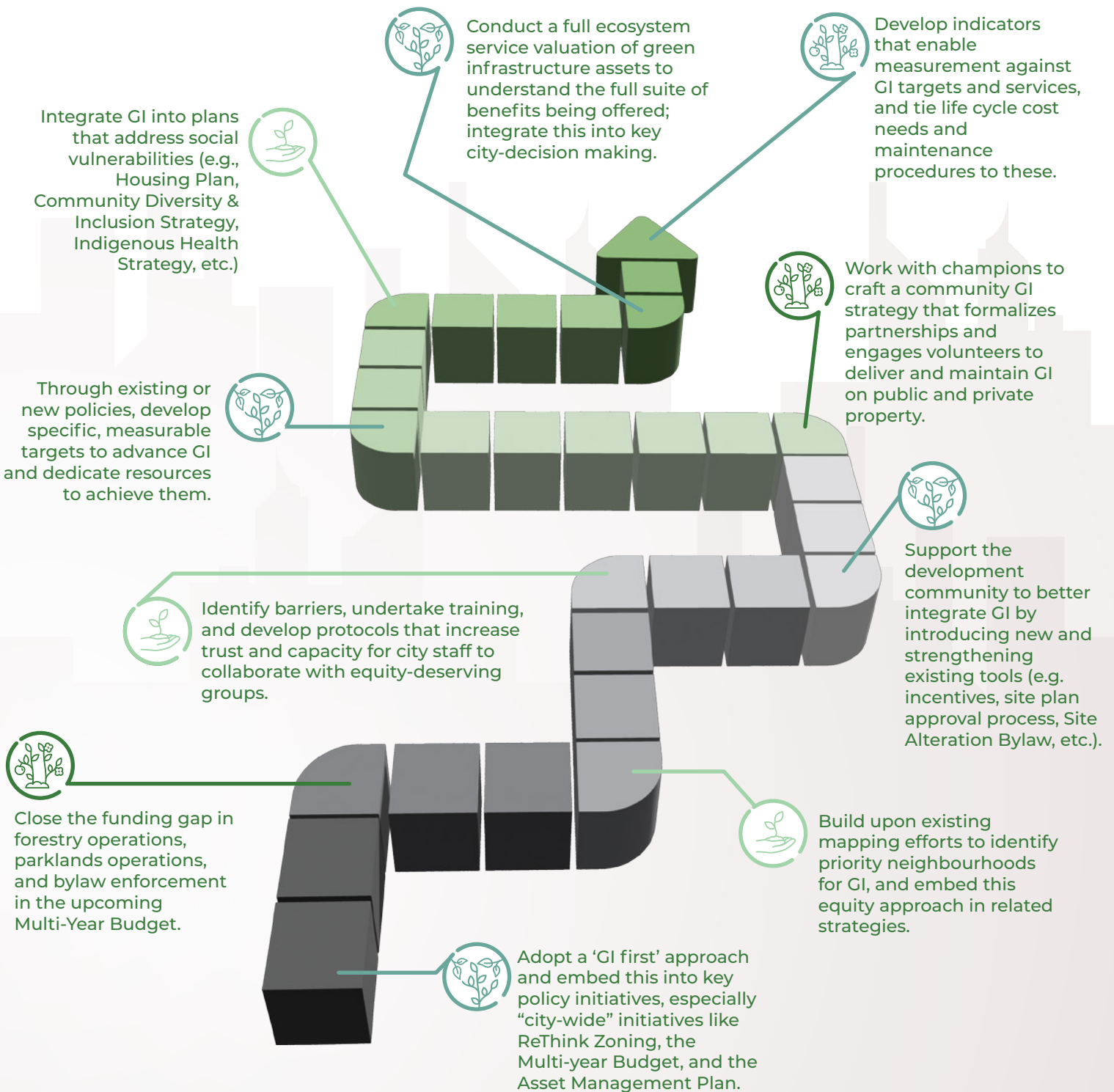
Work done: The City has supported the London Environment Network, the Upper Thames Watershed Conservation Authority, and other community organizations to implement GI programs. Some monitoring and measuring work on urban forestry and stormwater has been done, and the CEAP lays out more actions to develop GI-related metrics and a monitoring program.

Gaps: Partnering with others to advance GI is done on an ad hoc, program-specific basis, and not part of a broader strategy. There is no volunteer engagement or workforce training to support GI maintenance. GI on private property often falls into disrepair. There is a knowledge gap in the lifecycle cost needs of GI, and large funding gaps in forestry operations, parklands operations, and bylaw enforcement, which undercuts the City's ability to adequately protect and maintain GI. Other than for urban forestry, GI monitoring and measurement is not done systematically or to measure performance vis a vis established indicators

Summary of Key Recommendations Along Pathway

The graphic below provides some key short, medium, and long-term actions that London can take to embed equitable, abundant, and thriving green infrastructure into its city-building strategy.

For a more fulsome and detailed list of recommendations, [see the full assessment](#).



Citations

³ City of London. (2022). Climate Emergency Action Plan.

⁴ Silva, D. F., Simonovic, S. P., Schardong, A., & Goldenfum, J. A. (2021). Assessment of non-stationary IDF curves under a changing climate: Case study of different climatic zones in Canada. *Journal of Hydrology: Regional Studies*, 36, 100870.

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⁶ Giese, E., Rockler, A., Shirmohammadi, A., & Pavao-Zuckerman, M. A. (2019). Assessing watershed-scale stormwater green infrastructure response to climate change in Clarksburg, Maryland. *Journal of Water Resources Planning and Management*, 145(10), 05019015.

⁷ Ontario Ministry of Health and Long-Term Care (2016). Ontario Climate Change and Health Modelling Study. https://www.health.gov.on.ca/en/common/ministry/publications/reports/climate_change_toolkit/climate_change_health_modelling_study.pdf

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¹⁰ <https://www150.statcan.gc.ca/n1/daily-quotidien/220209/t002a-eng.htm>

¹¹ Watson & Associates Economists Ltd. (October 2022) Population, Housing and Employment Growth Projection Study, 2021-2051 for the City of London. Final Draft Report.