

From Grey to Green

Better data to finance nature in cities



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Abbreviations

COFOG	Classification of the functions of government
GBF	Kunming-Montreal Global Biodiversity Framework
ICLEI	Local Governments for Sustainability
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
NbS	Nature-based Solutions
NDCs	Nationally Determined Contributions
OECD	Organisation for Economic Co-operation and Development
SDGs	Sustainable Development Goals
UN	United Nations
UNEA	United Nations Environment Assembly
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

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Key messages

- 1. Investments in nature and nature-based solutions (NbS) in cities are drastically underutilized and underfunded, in part because they lack supporting data.** The United Nations Environment Programme (UNEP) estimates that global annual NbS financing of US\$200 billion would need to increase to US\$542 billion by 2030 to meet climate, biodiversity and land degradation targets (UNEP 2023). Initiatives like the City Climate Finance Gap Fund and the European Bank for Reconstruction and Development's Green Cities, among others, target technical support and project preparation for cities. Without more enabling tools and data that can improve the integration of nature and NbS in local budget and programme planning, urban NbS will remain "fragmented, incremental, sector-specific and unequally distributed across regions" (United Nations Framework Convention on Climate Change Secretariat 2023, p.7).
- 2. Cities do not have budget tracking or data management frameworks that they can implement as part of "finance for nature in cities" stocktakes (Landry et al. 2024).**¹ The Urban NbS Framework outlined in this report offers cities, particularly those that have committed to the implementation of Target 12 of the Kunming-Montreal Global Biodiversity Framework (GBF), supported by Generation Restoration, a simple and transparent tool that adapts existing typologies for nature and NbS, readily enables easy programme budget tracking, builds an assessment baseline and operationalizes urban nature investment "stocktakes", which practitioners can combine with other whole-of-government planning efforts² to strengthen the integration of nature and nature-positive investments in local decision-making. **When cities have the tools to integrate nature in their development and budget strategies they become powerful agents of change for a nature-positive and climate resilient future.**
- 3. Cities need more context-specific implementation strategies and funding to increase the "natural dividend"³ of every peso, rand or dollar available in their local budgets.** Cities house 4.4 billion people (56 per cent of the world's population), accounting for more than 80 per cent of the global GDP (World Bank Group 2023), **70 per cent** of carbon dioxide emissions and **75 per cent of resource use globally**, making them major contributors to global environmental and climate crises. National and international policymakers and financiers need to consider cities in their top-down efforts to transform our ecosystems, transition our global financial flows and contribute to collective stocktakes, yet fiscal limitations often outweigh such ambitions. Efforts to engage, fund and implement NbS in cities remain a struggle. This report's framework presents supporting evidence for raising collective ambition and mainstreaming effective NbS by employing tools that prioritise and respect local context, capacity and community priorities.

Nature-based solutions (NbS) are "actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits..."

- Adopted Definition (United Nations Environment Assembly [UNEA] 2022, p.2)

In this report we use "nature" and "nature-based solutions" to be inclusive of all natural assets that go beyond the official UNEA definition.

¹ The Intergovernmental Panel on Climate Change (IPCC) Global Stocktake is the process established for countries to understand their progress towards meeting goals outlined in the 2016 Paris Agreement. Parallel efforts to track nature and biodiversity at appropriate scales are under development (Landry et al. 2024). As cities expand their leadership over such domains, they too need stocktakes.

² Examples include the [Singapore Biodiversity Index](#), London's [Natural Capital Accounts](#) and the [EU Biodiversity Strategy for 2030](#). The [International Institute for Sustainable Development](#), among other organizations, also offers resources for cost-benefit assessments of NbS in infrastructure projects.

³ Rather than following a strictly economic definition of "natural dividend", this report uses the term to refer to a continued increase of direct and indirect financial benefits as a result of transformational nature-based investment reforms.

Introduction

Globally, mainstreaming nature and scaling the use of nature-based solutions (NbS) in cities is critical for reaching the Paris Agreement's Nationally Determined Contributions (NDCs), the United Nations Sustainable Development Goals (SDGs), the Kunming-Montreal Global Biodiversity Framework (GBF)⁴ and the Rio Conventions. However, lack of data and local capacity is slowing down implementation in cities around the world. The primary method of cities to implement strategic priorities is their control over local operating and capital budgets. Whole-of-government objectives like investing in nature and NbS, which act as linchpins connecting multiple city-wide and cross-sector goals, need to be comprehensively tracked across local budget processes and programme planning to demonstrate the value of their numerous co-benefits.

The framework introduced over the following sections considers scholarly literature (Frantzeskaki *et al.* 2019) and builds on UNEP's 2023 report *State of Finance for Nature in Cities: Time to Assess* which concludes that there are four major gaps slowing down the integration of nature and NbS into city budget policies and programme planning:

- **Data and knowledge gaps:** There is a need to develop standardized global databases and metrics for urban NbS to fill the information gap on spending, at all levels of government. At the local level, cities need more data to integrate NbS into municipal planning and budget processes. To complement environmental planning efforts, cities and city funders need baseline data on urban NbS for their budgets.
- **Capacity gap:** Most cities need capacity support, budget and investment tools, and public advocacy to fund and implement NbS. Without comprehensive support cities cannot identify or develop investment-ready projects or integrate NbS into local development planning and budget frameworks
- **Mainstreaming gap:** The unique features and co-benefits of nature and urban NbS for resilience, conservation and biodiversity remain relatively

unknown to investors and decision-makers. Widening that gap is that many countries and cities cannot account for the value of "natural capital" and therefore NbS within their boundaries.

- **Funding gap:** Urban NbS need to be included in the estimated global investment gap for NbS. Current public and private spending on NbS globally is estimated at US\$200 billion per year, less than a third of the estimated need in 2030.

Framework value proposition for cities: Practitioners implementing a city-wide vision or plan that addresses nature, climate change and other environmental risks face enormous financial and implementation challenges. Cities do not regularly specify nature-based programme objectives, budget performance measurements or other policy guidelines as part of their city-wide budgeting processes despite implementing many eligible activities. To accurately track such contributions and improve the effectiveness of limited existing funds, cities need to justify new policies and governance that allow their teams to adopt NbS as effective strategies.

The Urban NbS Framework, which takes the form of an activity budget survey with education components and simplified typologies, builds a baseline for tracking NbS and nature expenditures over time and therefore offers evidence for new programme-level budget planning objectives. Currently, public administration and budget frameworks for local governments value efficiency and effectiveness as they relate to human health and economic development. These practices often neither consider the external costs to ecosystems nor the impact of degraded ecosystems on the cost of providing municipal services. Public financial standards and systems that ignore, undercount and therefore undervalue nature reduce the incentives for relevant stakeholders to change how they account for, and invest in, nature.

This tendency is particularly problematic on the local scale because cities act as direct providers of services to their communities. Administrators often track the investment and benefits of NbS in budget categories that do not indicate the nature-based character and significance of such programme activities.

⁴ The Kunming-Montreal Global Biodiversity Framework, which first included cities in its 2023 targets, does not yet provide comprehensive guidance or targets for nature in cities (World Economic Forum 2024).

For example, a local recreation department tasked with an environmental restoration programme may budget preserved wetlands on school property as “education” expenditures rather than nature. Communities may account for a youth forest planting programme in their annual budget as “community development”, not biodiversity protection. Urban gardens in empty spaces around cities managed by women or Indigenous people that provide food and livelihoods to vulnerable or informal communities might not even be on the radar of local governments.

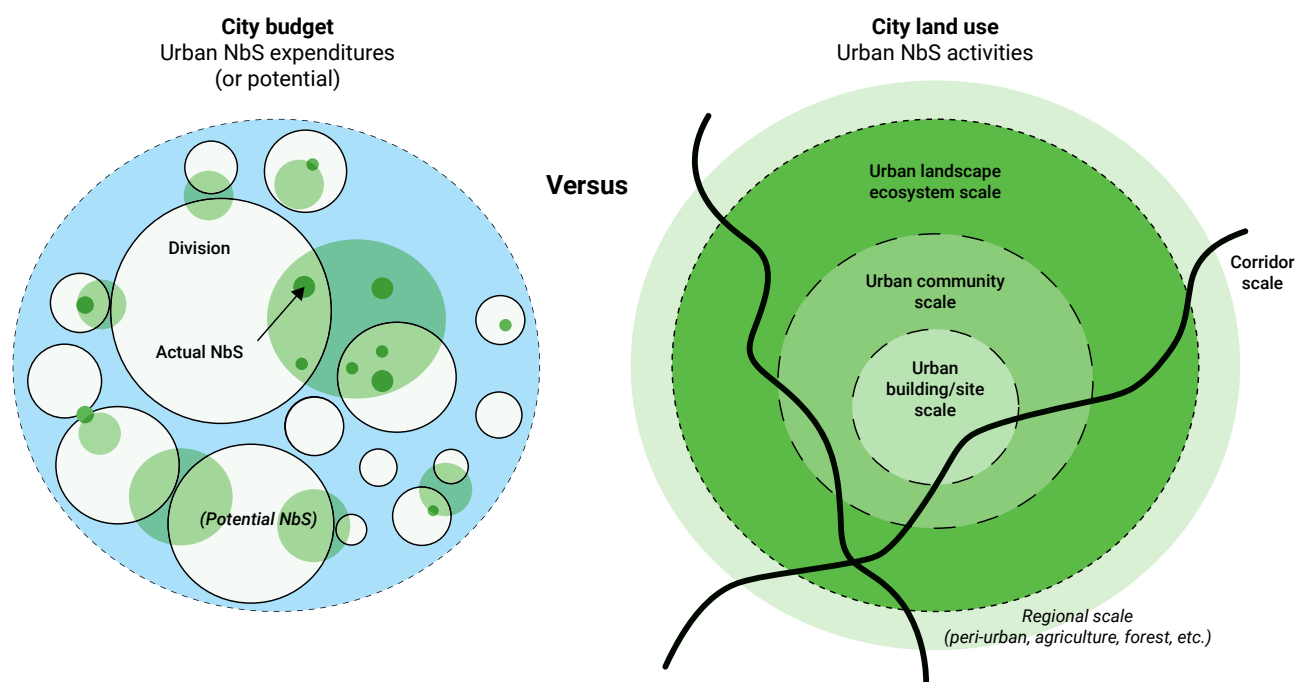
Local governments with a high level of decentralized power can go further, consolidating multiple public services into one department (e.g., “Parks, Forestry and Recreation” in Toronto, Canada) or creating entirely new administrative functions (e.g., “Department of Neighborhoods” in Seattle, United States of America). Yet any departmental silos will inevitably compartmentalize cross-cutting nature-based solutions, effectively acting like proverbial oil on water (see Figure 1). This makes transparent expenditure-tracking activities essential.

To address the capacity and mainstreaming gaps, the framework builds in educational components, non-sector-specific terminology and flexibility to encourage stakeholder participation in the data gathering effort. The integrated education component serves as a tool

to address the mainstreaming gap by highlighting how nature and NbS are integral to basic municipal government functions and responsibilities. For budget programming, simplified NbS impact evaluation approaches encourage whole-of-government budget baseline development while maintaining transparency for future improvements. Cities can also choose to combine the framework with other policy and planning processes to strengthen the integration of nature and nature-positive investments into existing targets like resilience or climate change mitigation.

Framework value proposition for city finance stakeholders: The framework also supports efforts by urban finance stakeholders globally to improve “reliable, timely and disaggregated data” (United Nations Department of Economic and Social Affairs 2022) at the city-level without automatically asking cities to direct resources towards tracking global indicators. Existing standards and taxonomies relevant to the urban, nature and finance domains were considered, and linked where it was feasible to incorporate and maintain accessibility for city managers. This includes the **Classification of the functions of government** (COFOG) developed by the Organisation for Economic Co-operation and Development (OECD) and adopted by the United Nations and currently under revision to address cross-sector themes such as climate adaptation; the GBF, including **Target 12** for cities; the **SDGs**; and United Nations Environment Programme (UNEP) Generation Restoration objectives for financing

Figure 1. Comparison of urban NbS in city budgets versus city land use categories (authors’ own). Note the uncaptured NbS (potentially or accurately reflected) across administrative department budgets (left) and across spatial scales (right). Many department activities transcend spatial scales.



nature in cities under their vision of “understand[ing], valu[ing] and track[ing]” the multiple benefits of NbS and integrating “the definition of NbS criteria in sustainable finance taxonomies and [their] interoperability across geographies and sectors” (United Nations Environment Programme Finance Initiative 2024, p.2). UNEP’s **Generation Restoration Cities** programme, with its focus on building an urban community of practice around nature and NbS, also afforded this team a unique opportunity to work directly with cities at the conceptual development stage of the framework (for eventual pilot testing) to ensure that the tool works with a variety of urban contexts across ecosystems, structures and management capacities.

This report has four parts. Part 1 introduces the framework and discusses its methodology and analysis. Part 2 outlines the proposed framework and Part 3 provides five case studies illustrating the application of the framework. Finally, Part 4 offers conclusions, next steps and emerging research questions.

Part 1. Framework methodology and development

The framework’s methodology included a landscape literature review, proof-of- concept development stage, draft feedback with cities from Generation Restoration, and, finally, draft feedback from external reviewers. The extensive literature review built on the work of *Time to Assess* and explored existing conditions, drivers, barriers and opportunities (see below) across three overlapping domains: “Finance” (global and local), “Nature” (ecosystems and biodiversity), and “Urban” (governance, capacity, built environment). The review phase looked deeply at identifying conceptual conflicts, structural and taxonomic misalignments and local data barriers between these three domains. The review emphasized the common challenge and underlying foundation of this framework— world socioeconomic systems, particularly as they relate to nature, are in transition. Generation Restoration cities⁵ underscored the importance of clarity and simplicity to address the fiscal stresses of these economic and ecosystem changes.

Key concerns included the need to address limited city resources for learning a new set of criteria and the need to establish a set of flexible categories on a user-friendly interface. Therefore, this framework attempted to

simultaneously make conceptual advances, maintain links to existing reference frames and arm cities with data to advocate for their needs during this transition.

The framework is limited to local government public expenditures, as direct public expenditures continue to provide the bulk (UNEP 2023) of finance for NbS that local capital budgets often must incorporate. Due to the complexity of public finance and limited data on subnational spending, other financial flows including global development financing, philanthropic and private sector investments, and nature-negative subsidies discussed in UNEP’s **2023 State of Finance for Nature** report are beyond the scope of this effort. Despite known limitations for cross-cutting thematic areas like biodiversity and resilience, the framework leverages internationally established standards (OECD 2022)⁶ for tracking public revenue/expenditures that can be consistently applied at the subnational level. Linking to international taxonomies and conventions such as the Rio Conventions and the GBF supports transparency and catalyses public pressure to direct resources to cities for biodiversity, nature and infrastructure. However, it is up to cities to connect local activity aims with global frameworks. Goals and objectives are framed around municipal functions and broad thematic goals to reduce silos and the costs of specialized administrative capacity building.

Drivers and considerations

The Urban NbS Framework aims to balance trade-offs between a large number of ambitious drivers, barriers and obstacles from the finance, nature and urban domains. These trade-offs are particularly difficult to manage at the local level for three overarching reasons. First, national or global public expenditure tracking standards for nature have very low data resolution. Data is limited to the category of “environmental protection” and does not consistently track subnational spending or cross-sector spending in other categories. This leaves cities with limited criteria and guidance on tracking nature and NbS. Second, this low resolution cannot capture the finer mosaic of urban infrastructure and ecosystems in cities. Finally, that mosaic quickly creates substantial structural barriers including management silos that prevent investments in nature and NbS from being captured in standard budget and procurement practices. The framework addresses thirteen framework development drivers detailed in Table 1 with key guiding considerations.

⁵ The research team consulted with Generation Restoration members in Toronto, Canada; Seattle, United States of America; and Curitiba, Brazil during and after the proof-of-concept development stage.

⁶ For example, see the [EU Taxonomy](#) for sustainable economic activities and the [IUCN Global Ecosystem Typology](#).

Table 1. Proof-of-concept framework drivers (authors' own).

Framework development drivers	Description of guiding considerations
Finance domain	
1. Financial standards and typologies	Maintain a connection to globally recognized typologies where possible that influence urban NbS: adaptation and mitigation, cost-benefit analysis, ecosystem and nature capital models, environmental economic accounting, and green budget tagging. Standards include data obsolescence, transparency, disaggregation and data granularity.
2. Expenditure tracking classification	Global use of COFOG to track public expenditures for traditional sectors as well as cross-cutting domains like adaptation, mitigation and biodiversity
3. Investment priorities	Health and well-being, economy, society (including Indigenous communities and women), infrastructure, environment, leadership and strategy, resilience, adaptation, mitigation and others
4. Local criteria, functionality factors	Ease-of-use and format; availability of data; decentralized responsibilities; management and data capacity; general budget processes; Monitoring, Reporting and Verification processes; evaluation and outcome reports; relevance; thresholds and weighting factors; protection against greenwashing; impact (flexibility, simplicity, robustness, transparency); commonly available data for most cities with minimal effort
Nature domain	
5. NbS, ecosystem and ecosystem services typologies⁷	Connection to frameworks found in the GBF, nature and climate SDGs, assessment framework for NbS; other concepts like natural capital, ecosystem services (supporting, provisioning, cultural, regulating services) and ecosystem accounting
6. Ecosystem and biodiversity goals	Integrating urban development with goals for nature-positive, NbS; National Biodiversity Strategy and Action Plans; alignment with Rio Conventions and GBF targets
7. UNEP Generation Restoration goals	Mobilising international environmental funding; mainstreaming awareness and knowledge of NbS; integrating urban stakeholder interests into investment funding priorities for nature-positive, NbS; supporting evidence for impact of urban NbS; community-building and education, establishing international evaluation and Monitoring and Evaluation processes
8. Urban nature	Urban as a biome or ecosystem (IUCN ecosystem typologies, T7.4 urban and industrial biome [Keith et al. 2020]). Boundaries and relationships with underlying ecosystems, existing communities, ecosystem risk assessments and biodiversity targets
Urban domain	
9. Functions of government	Capacity and structure: decentralised power and existing silos; use of COFOG ⁸ as management tool: variability in how cities finance and manage economic affairs, environment protection, community amenities, public health, etc.
10. Local socioeconomic context	Physical geography, climate and political boundaries; ecological risks, vulnerability and assets; existing accessibility of NbS; urban growth statistics, socioeconomic data (proxy for technical capacity) including Indigenous communities and women; local autonomy over budget decision-making; resilience and adaptation plans (see Annex for examples)
11. Value propositions – budget and planning	Clear value proposition for cities and stakeholders; mainstreaming and local engagement; United Nations Decade on Ecosystem Restoration goal to promote restoration at scale, particularly in urban areas
12. Global taxonomy harmonization/coherence	Coherence across domains (nature, climate, cities, finance, government expenditures, policy); vertical and horizontal governance integration; global indicators such as GBF (Target 12), SDGs (SDG 11) and Paris Agreement; ongoing global harmonisation initiatives
13. Political will/ commitment	Clear and strong support from leadership to invest in nature-positive, NbS (e.g. implementing Paris Agreement, SDGs, GBF); reliable consistency across changing political administrations over time

⁷ A standard ecology approach used in climate and environmental policy, including IPCC reports. Popularised by the Millennium Development Goals (MDGs), which were superseded by the Sustainable Development Goals (SDGs) in 2015.

⁸ Adapted from OECD's COFOG, published by the United Nations to reflect most common local government functions and responsibilities.

Implications for framework development

NbS, as a set of strategies that integrate human and ecosystem health, face not only a lack of technical knowledge but also not-fit-for-purpose government policy, management and budget systems. Instead of a holistic management approach that recognizes and tracks the overlapping co-benefits of department-level investments in and implementation of NbS and nature, functional silos compartmentalise them like oil droplets on water (see Figure 1). These silos (“oil”) disincentivize the development of financial Monitoring, Reporting and Verification frameworks (a situation not limited to subnational governments) and help explain the existing lack of ex-ante assessments and targeted investment planning for NbS (proverbial “water droplets”). Comparing this “oil and water” silo problem to city land use and ecosystems opens some deep conceptual barriers about how cities and nature should be managed.

The Urban NbS Framework presents an opportunity to begin re-conceptualizing budgeted investments in urban NbS as part of a holistic (and largely cross-sector) strategy to transform management coordination and budget planning practices. Today, geographic information systems are used for tracking sectors ranging from ecology to transportation, and communities are increasingly able to integrate spatial, administrative and fiscal data, reducing old silos. The framework emphasises this holistic approach to nature and NbS in cities and comprises ten elements (see Part 2) that de-emphasize administrative silos and guides administrators to focus on a common yearly budget-tracking baseline for stocktaking purposes.

City-level tracking efforts are in such early stages that incentivizing even small improvements in local budget management and implementation with the Urban NbS Framework tool can help transform cities’ budget planning processes and increase their investment in nature and NbS. Self-reported data always carries some risk of greenwashing because city-level implementers and public administration officials can potentially misrepresent or overstate budgeted activities containing NbS without stringent data transparency standards and technically rigorous, enforceable eligibility criteria. However, upon the establishment of more widespread baseline city-level data collection over time, the authors expect further refinement of framework criteria and mechanisms for local enforcement and accountability.

The administrative burden of breaking down budgets not designed (yet) to capture and estimate nature-related

costs is a significant challenge. Municipal managers perceive NbS, if they know about them at all, as belonging to certain city functions or budget categories like parks and recreation. This led to a number of framework decisions including consideration of an education component, simplified budget data elements and leadership and ownership by a single point of contact, ideally a sustainability or resilience office, to encourage city-wide division participation. The framework also assists bottom-up participatory capacity-building so that NbS becomes part of the budget process discussion (see Part 3 Case study 2: Curitiba). Most importantly, the framework criteria take an “intended impact” approach (World Bank Group 2021) so that managers can track project and programme design intent, rather than waiting to track long-range impacts and outcomes. This makes a year-to-year fiscal baseline possible, which can be used in later years as supporting evidence for outcome impact analysis.

City managers generally prefer to define their own funding and investment priorities to connect examples of NbS more easily to programmes and budgets, rather than comply with specific national or global directives to track local goals. The framework considers how connections to priorities like climate adaptation should be made clear to those unfamiliar with NbS and how to connect their functions with citywide nature and biodiversity planning efforts (see Part 3 Case study 1: Quezon City). Given the general lack of awareness of NbS and other divisions’ operations and responsibilities, the framework educates stakeholders on intuitive classification options rather than academic or technical knowledge. That means the selected typologies borrow from the goals listed in assessment frameworks from organizations like the **International Union for Conservation of Nature (IUCN)**, **Local Governments for Sustainability (ICLEI)** and the 100 Resilient Cities (Resilient Cities Network 2023)⁹ “City Resilience Framework”, while removing references that could be considered sector or functional silos.

The time, resources and difficulty separating spatially organized, nature-related elements from standard budget categories and project estimates (see Part 3 Case study 5: Toronto) disincentivized their mandatory inclusion as budget validation criteria in the framework.

9 The Resilient Cities Network (2023) defines urban resilience as “the capacity of a city’s systems, businesses, institutions, communities, and individuals to survive, adapt, and thrive, no matter what chronic stresses and acute shocks they experience.”



Image: Unsplash

Organizations¹⁰ such as the Intergovernmental Panel on Climate Change (IPCC) and IUCN widely use the concept of ecosystem services to connect biodiversity and nature with development. However, practitioners outside of environmental management divisions would benefit from seeing examples of how their budget data and project financial data connect to local ecosystems and what projects should qualify as NbS (see Part 3 Case study 3: Dakar). For those reasons, the spatial function and organization of NbS was prioritised in the framework. In response, the framework includes a list of project types rather than criteria (recognizing users will “know them when they see them”) to raise awareness and encourage building on existing efforts; multi-choice responses instead of priority-ranking; and a simple guidance document to answer user questions and link to resources (see Annex). This also means criteria must trade off accuracy for the margin of error of a significant learning curve in early budget estimates.

Filling in global finance data gaps does not alone offer a value proposition for city framework implementers. To build a baseline linkage to global models (a consideration usually unfamiliar to municipal administrators), the connection should therefore be as simple as possible and underscore actions satisfying international funding prerequisites. The framework employs a statistical standard called COFOG¹¹ for tracking national government expenditures (see Part 3 Case study 4: Seattle) and a simplified “menu” of NbS that adapts elements from existing frameworks.¹²

The importance of city profiles for investing in urban NbS cannot be overstated since the types of NbS, policy approaches, available sources of financing and stakeholder goals often differ vastly by geography or country. City profiles are beyond the scope of this framework. However, this report’s Annex displays a small sample of relevant socio-spatial indicators, or “layers”, to illustrate how preparation of city profiles can inform contextually appropriate investment in NbS and improve the framework’s usability. For instance, the indicator

“Expenditure decentralization” (according to data collected by the International Monetary Fund [2022]) demonstrates how decentralized government spending authority can enhance or constrain local investment priorities and planning for urban NbS. City network profile efforts, such as those carried out by the [Global Covenant of Mayors](#) and multi-partner [Urban Nature Atlas](#), provide critical information about local-level adaptation and mitigation planning, project case studies and information monitoring systems that inform how cities invest in nature. The Urban NbS Framework lays the groundwork for further exploration of appropriate city profile indicators for NbS investment, which practitioners can tie to strategic city efforts such as vulnerability assessments.

Part 2: Proposed Urban NbS framework

The proposed framework (see Table 2) outlines ten elements to serve as a city expenditure baseline tool, providing an initial inventory of urban NbS, a reference year for measuring changes in expenditures related to NbS, and the potential to improve local and funder decision-making over time. If the survey is conducted regularly, the data series can be used to spot patterns and trends in the adoption of urban NbS across cities and provide data to support cost-benefit analyses. More testing is needed, but the format appears promising. City feedback also emphasized that the value and benefits of urban NbS are highly contextual within cities. As a result, the baseline can also offer data to measure local perceptions about nature over time, in addition to expenditures.

To address ownership, education, flexibility and simplicity, the framework’s format changed from a spreadsheet to a Google Form tested with Generation Restoration cities. Form questions can be easily modified and new or city-specific examples of NbS, educational components, guidance links and resources can be added directly into the framework. The form structure allows for city administrators to control the content and simply share web links with division managers, whose answers are automatically consolidated in a single spreadsheet.

Summary of elements

The framework is divided into ten elements split into two parts.

- Part A (#1–3) “City-wide mapping urban NbS” is an organizational mapping exercise with an educational component. It introduces urban NbS and asks municipal divisions to evaluate their roles and responsibilities as they relate to objectives and

¹⁰ See also work by organizations supporting this linkage such as ICLEI’s [INTERACT-Bio](#), the [Global Covenant of Mayors](#) and the United Nations Human Settlements Programme’s [Innovate4Cities](#) and the C40 Cities Climate Leadership Group’s [Urban Nature Accelerator](#).

¹¹ According to the OECD, COFOG can categorize subnational government spending with reasonable confidence. To address its unsuitability to capture cross-functional budget categories like urban NbS, OECD and the United Nations are revising the classification.

¹² These referenced the GBF, the EU Green New Deal, IPCC, ICLEI, World Bank Group, IUCN, GEF and others.

typology of urban NbS (the organization level is local choice). This mapping activity helps city planners create a comprehensive map of capacity for NbS across city government and serves as an awareness and education tool for NbS.

- Part B (#4–10) “Activity expenditure tracking database for urban NbS” is a classic expenditure tracking database where users can capture and validate costs of activities which have a “substantial contribution” of NbS. The framework is formatted in a Google Form for ease of use, the flexibility to include visuals, guidance notes and criteria, and enabling centrally managed responsibility for the form (preferably in a city sustainability or resilience department).

Although this framework links to existing global taxonomies and definitions for transparency and alignment, the success of the effort relies on local experts to provide the finer-resolution data needed to fill out information about municipal activities, programmes and projects. At this early stage of tracking urban NbS, local mislabelling can be mitigated by using simple and transparent criteria and easy-to-use guidance. Accountability for greenwashing and mis-applied green labels¹³ are ongoing national and global challenges.

¹³ An example of misapplied criteria would be a solar subsidy program. Despite being considered nature-positive (mitigates pollution and greenhouse gas emissions), it has no ecosystem-based components.



Image: Unsplash

Table 2: Ten proposed framework elements (authors' own).

Elements	Description
Part A. City-wide mapping urban NbS. <i>Form questions map opportunities for NbS across city divisions while helping managers understand how NbS support their division responsibilities.</i>	
1. Division's Classification of the functions of government (COFOG)	<p>Links to searchable COFOG list¹⁴. Divisions may choose one or more. Supports subnational coordination with national and Paris Agreement NDC stocktakes. Builds a dataset for how local governments are funding nature-related projects with minimal local effort (see Part 3 Case study 4: Seattle).</p> <p>Form question: Using the COFOG list (a keyword searchable list is accessible HERE), under which categories do you think your municipal management responsibilities lie? (you can select multiple)</p>
2. Division's objectives and responsibilities related to NbS	<p>Seven key objectives of NbS centred on municipal functions and responsibilities that span sectoral operations and city planning:</p> <ol style="list-style-type: none"> 1. Water 2. Public health 3. Built environment 4. Climate change 5. Ecosystems 6. Culture and well-being 7. Food security <p>Form question: Does your division have management responsibilities for the following objectives (see above list)? If you check yes or maybe, you could be using nature-based solutions</p>
3. Intro to the typology of urban NbS	<p>A review of the revised typology of urban NbS, helping managers learn about local types of urban NbS. The typology frames NbS around urban land use scales and NbS strategies as they relate to objectives and common municipal funding priorities for NbS. It avoids operational and sector responsibilities to reduce repetition and avoid assumptions about where NbS "belong" (see Part 3 Case study 5: Toronto).</p> <p>Form question: Does your division fund or support programmes or projects like the ones below (see typology below)?</p>
Part B. Activity expenditure tracking database for urban NbS. This activity tracker creates a baseline that can track expenditures for NbS over time, considering trade-offs between functionality and robustness, against ease of use and local capacity, budget and governance practices.	
4. Budget activity name	An activity can be a programme, a project or part of a project. The guidance requests budget activities from the most recent available annual expenditure budget report. The level of detail is up to the city, as it can vary significantly with size and bureaucratic organization.
5. Validation of NbS' "substantial contribution"	<p>The framework borrows the concept of 'substantial contribution' from definitions in the EU taxonomy for sustainable economic activities. To meet that, cut-off activities must demonstrate an intent to provide substantial contribution to human health and well-being, and the intent to provide a substantial contribution to environmental and biosphere health under one of four impact categories (detailed in text under "Typologies and validation").</p> <p>Question: This activity has been reviewed for substantial contribution of NbS and meets the following criteria (see below for criteria).</p>
6. Activity cost (current year)	Using current year budgets allows the city to compare investment changes over time. This framework accepts that at this early stage, the data on cost will be rough-order-of-magnitude from the activity scope or description. To reduce initial burden on city resources, if an activity's use of NbS meets the "substantial contribution" threshold, the captured cost of the activity is 100 per cent.
7. Activity budget classification	This breaks down activities by the three most common government budget categories: "General/operational", "Capital programmes", and "Special/other". Capital costs are associated with physical construction, and "General/operational" for on-going staffing and resources ¹⁵ . Special costs capture a range of activities including restricted funds, special revenue funds or earmarks.
8. Activity funding partners	Breaking down budgets by partnership agreements can be very complex. Instead, this element asks the city to identify the types of partners associated with the activity: "Public", "Private", "Civic/NGO", "None" or "Multiple". This links spending on NbS to funding patterns, helping local planners and policymakers identify new partners, and supporting efforts by UNEP and others to understand how to better support cities.
9. Intended benefits of activity	Managers can select multiple benefits of NbS from the "Objectives" list (see "Activity city-wide goals" below). This helps to track how divisions relate NbS to benefits that are tied to the nature-based components of the activity. It also helps "tag" perceptions of co-benefits for future cost-benefit review.
10. Activity city-wide goals	Separate but parallel from "Objectives", this element tracks how divisions connect NbS to co-benefits that may not be directly tied to nature-based components of the activity. It can also help "tag" perceptions of co-benefits for future cost-benefit review. Goals include adaptation, resilience, education, reduced inequalities/poverty, sustainable consumption/production and energy efficiency.

14 COFOG list can be found here: [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Classification_of_the_functions_of_government_\(COFOG\)](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Classification_of_the_functions_of_government_(COFOG)). Adopted in 1999 and currently under revision, but new categories are not expected until 2027.

15 Operations and maintenance costs remain challenges in the framework to generalize across diverse city contexts and therefore require practitioners to employ appropriate local approaches with transparency and consistency.

Typologies and validation

The most crucial components in the framework are the proposed typologies and criteria for the validation of activities with urban NbS. The contextual nature of and imperfect coordination between public management, finance and nature/biodiversity typologies results from multi-level governance issues, and they can be particularly challenging at the urban scale. Any typology of and criteria for NbS will face resistance until policies and laws adopt and integrate the concept of natural capital and ecosystems into development processes. Too few cities have access to new tools and methods like ecosystem accounting (United Nations System of Environmental Economic Accounting 2021) that can demonstrate their value.

Objective typology of urban NbS

A primary objective of the framework, divided into two parts, is to help city managers learn about NbS and illustrate how urban NbS integrate with their responsibilities. The goal was an objective typology of NbS that connects to city management functions while avoiding operational silos. The typology is ideally sector-neutral and factors in concerns about changing political alignments, shifting perceptions of definitions, evolving criteria and the broadness of NbS' "co-benefits". The framework focuses on public service responsibilities that NbS can directly address, including:

1. Water: drinking water, stormwater, flooding, erosion, scarcity/drought, sanitation
2. Public health: Heat, pollution, air quality, communicable diseases, chemical safety, sanitation
3. Built environment: Capital programmes—housing, government buildings, utility infrastructure, streets and transportation, energy
4. Climate change: Greenhouse gas mitigation activities, adaptation activities
5. Ecosystems: Conservation, protection and restoration activities, biodiversity and habitat management
6. Culture and well-being: Public spaces that offer physical, psychological, spiritual and social benefits (natural or paved) including for women, Indigenous people, youth and vulnerable communities
7. Food security: Food production and food security programmes within urban administrative boundaries

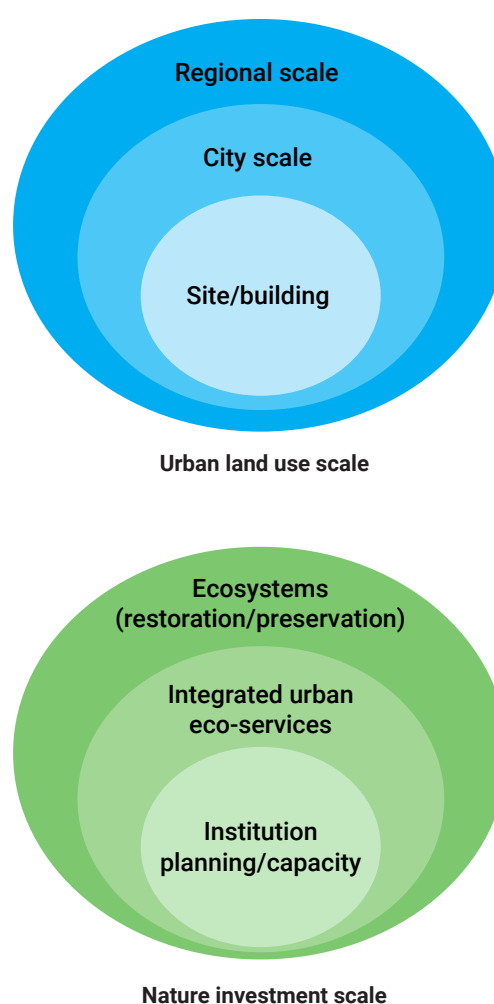
Activity typology of urban NbS

Based on city feedback, the research team re-evaluated and radically simplified the original framework concept (which included components from each driver domain in Table 1). Feedback demonstrated that the complexity

and lag in co-benefit assessment of NbS, along with the number of requested data points, would discourage programme and finance staff from using the framework for budget analysis. As previously mentioned, co-benefits are lagging indicators that measure outcomes and value. However, expenditure tracking needs leading data that tracks funding inputs. That data can become a baseline for measuring outcomes or value in the future.

The framework focuses on two domains—urban land use and nature investments. Combined, they create nine categories (see Figure 2). The land use scale creates a spectrum connecting site or building-scale NbS (for example green roofs) to regional-scaled NbS (for example rivers). The nature investment scale captures nature investments as they relate broadly to urban development, rather than sectors or government divisions. "Institutional planning/capacity" captures critical capacity investments, while "Integrated urban eco-services" encompasses all hybrid blue-green-grey infrastructure, and "Ecosystems" captures conservation investments.

Figure 2. Typology scales for activity classification of NbS (authors' own). Nine categories depicted outlined in text below.



This typology is introduced in Part A of the framework form with examples (also in Annex), creating a user-friendly “know-it-when-I-see-it” learning opportunity. The following gives a partial project list from the form:

Site/building scale

1. Ecosystems (restoration/preservation): Pollinator gardens, constructed stormwater basins
2. Integrated urban eco-services: Green roofs, green walls, rainwater gardens, pocket parks
3. Institution planning/capacity: Community stormwater partnerships, maintenance training, Restoration Generation grants

City scale

1. Ecosystems (restoration/preservation): River/riparian restoration programmes, small ‘Miyawaki’ forests
2. Integrated urban eco-services: Green transit corridor programmes, food garden allotments, public green spaces
3. Institution planning/capacity: Pilot projects, urban natural asset plans, urban resilience training

Regional scale

1. Ecosystem restoration: Coastal marsh/swamp/tidal restoration; floodplain re-naturing, removal of invasive species
2. Integrated urban eco-services: Integrated stormwater retention systems, low-impact recreational design (biking, pedestrian), ecotourism district programming
3. Planning/capacity: Biodiversity action plans, watershed planning

Validation criteria for urban NbS

With the goals of flexibility, ease-of-use and eventual harmonization in mind, the framework borrows the concept of “substantial contribution” from the EU taxonomy¹⁶ for sustainable economic activities. For purposes of this framework, this means that the “activity either has a substantial positive environmental impact or substantially reduces negative impacts of the activity on the environment” (European Commission Directorate General for Financial Stability, Financial Services, and Capital Markets Union 2024). Specifically, the criteria are adapted from EU **screening criteria** for water restoration, preservation and conservation activities and the GBF targets, reflecting the UNEA-5 2022 adopted definition of NbS (UNEA 2022). The criteria, therefore, offers a refereed yet non-binding and voluntary template to track activities that demonstrate an intent to simultaneously benefit

human well-being (Criteria 1) and nature (Criteria 2).

The trade-off for context and flexibility is precision. Rather than using complex weighting factors or co-benefit estimates (lagging indicators), the framework uses an “all or nothing” approach. If a manager cannot reasonably say an activity’s NbS meet the substantial contribution criteria, the activity should not be counted. However, the activity budget can be broken down into smaller components to justify “substantial contribution”¹⁷. This also has the benefit of improving the data.

Criteria 1: Substantial contribution to human health and well-being

The activity should demonstrate intent to contribute positively to healthy communities and socioeconomic well-being and “address societal challenges effectively” including the needs and aspirations of Indigenous communities, youth, women and vulnerable communities. Demonstration of the financial value or the cost-benefit ratio of the activity is not required. However, this criterion is a minimal threshold and can be tied directly to local government performance criteria or policies.

AND

Criteria 2: Substantial contribution to environmental and biosphere health

The framework borrows criteria from the EU Green Taxonomy technical criteria for water management and demonstrates that NbS are designed to offer a substantial contribution towards the intent “to protect, sustainably manage, and restore ecosystems.” The activity must show substantial contributions to at least one of the three criteria:

- Provides a direct positive impact on ecosystem health, as a service:
 - The activity is designed to “enhance native biodiversity, ecological connectivity and integrity” (Kunming-Montreal Global Biodiversity Framework 2022, p.11) or meet other GBF **targets**.
- Provides environmental performance improvements to or mitigates environmental pressures of human activities:
 - This category supports urban infrastructure eco service integration but may not rise to the level of restoration/preservation impact of category one.

¹⁶ The green EU taxonomy attempts to establish standards for sustainable economic activities and has extensive technical review criteria vetted by experts, offering a starting point for urban NbS.

¹⁷ The responsibility is on the city to determine its data precision, similar to parties reporting Nationally Determined Contributions (NDCs) for the Paris Agreement.

- The category supports common “low hanging fruit” activities like street tree programmes that use nature primarily to mitigate human risks like heat or improve quality of life.
- Supports efforts to enable urban NbS:
 - Activities designed to enable and support uptake of projects featuring NbS including but not limited to project environmental reviews, biodiversity or ecosystem-based adaptation planning, training and research.



Image: Unsplash

Part 3: Generation Restoration city case studies No. 1–6

The following six case studies showcase the efforts of cities participating in UNEP’s Generation Restoration programme (Quezon City, Curitiba, Dakar, Seattle Toronto and Mexico City). These case studies exemplify and reinforce the implications for framework development discussed in Part 1 and further illustrate the framework elements presented in Part 2.

Case study 1: Aligning NbS with local planning context in Quezon City, Philippines

Across the Philippines, local governments assess climate mitigation and disaster risk reduction contributions of ecosystems as part of their development planning activities (Quezon City Disaster Risk Reduction and Management Council 2021), in line with national mandates¹⁸. Such local-level NbS (United Nations Office for Disaster Risk Reduction and United Nations University – Institute for Environment and Human Security 2023) include ecosystem and biodiversity stocktaking efforts, urban greening and integrated river basin management planning. Coordinated planning efforts centred around NbS are guideposts for directing interconnected city agendas and organizing budgeted programmes, projects and activities, which can then inform the building blocks behind the Urban NbS Framework.

In the model local government of Quezon City, NbS are perhaps most clearly mainstreamed in planning directives through the local disaster risk reduction and management plan (LDRRMP), which supports **ecosystem-based adaptation**. With programme and project-level goals at the department level across objectives such as air quality, sanitation, food security, biodiversity and resilience (Quezon City 2023), Quezon City’s LDRRMP¹⁹ also aligns with international visions including the Sendai Framework for Disaster Risk Reduction, the SDGs and the Paris Climate Agreement, in addition to national-level mandates.

Many other budgeted activities align with NbS (Quezon City Disaster Risk Reduction and Management Council 2021). For example, some of Quezon City’s most recent notable activities support watershed restoration around the La Mesa Reservoir, prioritize NbS in a revised Green Building Code, and facilitate citizen engagement around urban greening (“Lunti-ang Kyusi”, inspired by other model city initiatives in Toronto, Seattle and Istanbul). However, accounting for resources to support overlapping policy visions reinforces the need behind tracking and inventorying expenditures for NbS.

18 Of note, these mandates include the national-level Climate Change Act of 2009 and Disaster Risk Reduction and Management Act of 2010.

19 The city pursued transit-oriented development strategies to modulate its urban growth in the late 20th century, and among other actions, preserved parklands through strategies such as transfer of development rights to reduce flood, heat and air pollution risks while improving access to low-income groups.



Case study 2: Application of framework functionality and enhanced capacity for community-level governance in Curitiba, Brazil

An important extension of the Urban NbS Framework tool's function is its potential for public education, awareness-raising and general capacity-building in participatory governance processes. This local procedural context is particularly relevant in cities such as Curitiba in Brazil (Suzuki et al. 2010), which possesses a long legacy¹⁹ of sustainable planning (including PlanClima, the city's Mitigation and Adaptation Plan) and community-based governance (2017 **Fala** ("Speaks") Curitiba programme).

Democratic governance reforms nationally expanded opportunities for community-level input and local control over various programmes and projects, including activities supporting NbS. These reforms (Afonso and Araújo 2006) specifically included the establishment of community councils, which determine resource allocation for project funding on issues such as sustainable urban policies and protecting the democratic rights of marginalized groups. They also included participatory budgeting, a model for increasing local deliberative power over resource allocation and distribution.

Given the importance of community-level governance in determining local needs and preferences and establishing budget priorities, the Urban NbS Framework offers strategic benefit, making transparent spending items and options for NbS across the city. By extending framework steps to include community stakeholders—such as in the process of identifying baseline coverage of NbS, clarifying local agendas and priority areas, and tracking activity overlaps in budget allocation—the framework can assist governments in building and maintaining effective, collaborative relationships compliant with local laws and policies.



Case study 3: Establishing baseline typologies of urban NbS in Dakar, Senegal

This report's typology of NbS activities spans biomes but relies on cities and their stakeholders to collectively identify and determine baseline conditions and potential opportunities. Dakar, Senegal exemplifies the importance of establishing an appropriate baseline for urban NbS amidst shifting government objectives. As part of Generation Restoration, the cities of Dakar and Thiès (in Dakar's metropolitan region) are in the process of engaging local stakeholders through a series of co-design workshops to develop a large-scale greenbelt²⁰ designed to limit urban sprawl and protect biodiversity (among other co-benefits) in the face of desertification pressures (Goffner et al. 2019). As a complementary effort, the World Bank Group (2024) conducted a geospatial "opportunity scan" of NbS and suitability across Dakar's urban landscape to assist local officials in identifying strategic entry points. This exercise mapped terrestrial spatial risk patterns to target heat reduction, and public health and recreation benefits. Using the World Bank Group's own typology, recommendations included green roofs and rain barrels at the building-level scale in high-density neighbourhoods, and larger-scale interventions for urban forests, green corridors, open green space and bioretention areas.

However, state plans for constructing a major nearby jetty, Port du Futur (Friend et al. 2022), boosted the importance of identifying and integrating a network of blue-green (i.e. coastal and marine) infrastructure solutions, in addition to the World Bank Group's opportunity scan's terrestrial analysis. Amidst external financing opportunities for building coastal resilience and implementing NbS to protect against shoreline degradation, city officials now seek baseline data on "blue" NbS (e.g. dune and habitat restoration) to aid project financing and connect with terrestrial efforts on water resource management. In short, the Urban NbS Framework tool considers the entire range of budget opportunities across ecosystems (i.e. terrestrial and marine) and scales to comprehensively plan for future multipurpose projects and attract targeted investments for NbS. City-level stakeholders hold the power to coordinate both "green" and "blue" NbS across sectors and scales using the objective and activity typologies presented in Part 2.

20 This effort draws on and contributes to efforts for establishing a "green wall" across Africa's Sahel region.



Case study 4: Division function classifications in Seattle, United States of America

Organization of the city of Seattle's departments developed around serving local stakeholder needs (Seattle Department of Finance 2023), but like many cities, do not neatly align with international standards for tracking departmental budget-related responsibilities. For example, Seattle's Department of Neighbourhoods (2023) broadly serves community interests, including through matching grants programmes for neighbourhood improvement projects relevant to NbS (US\$3.3 million in proposed 2023 expenditures) and P-Patch community garden activities (US\$0.8 million in proposed 2023 expenditures). But these institutional functions do not comport well with the Classification of the functions of government (COFOG) international standardization format (European Union Statistical Office 2023).

Under COFOG's numerical categorization of institutional responsibilities, Seattle's Department of Neighbourhoods comprises activities characteristic of Economic affairs (#4.0), Housing and community amenities (#6.0), and Recreation, culture and religion (#8.0). However, this classification conceals activities relevant to NbS. The system's purpose of rigidly segmenting multidisciplinary activities by economic and non-economic sectors reflects the reality that many municipal department activities globally span multiple COFOG functions, especially if they expect to achieve multiple overlapping co-benefits at once. The Urban NbS Framework tool is designed to highlight functional programme, project and activity overlaps, rather than shoehorn them into a single compartmentalized skeleton.



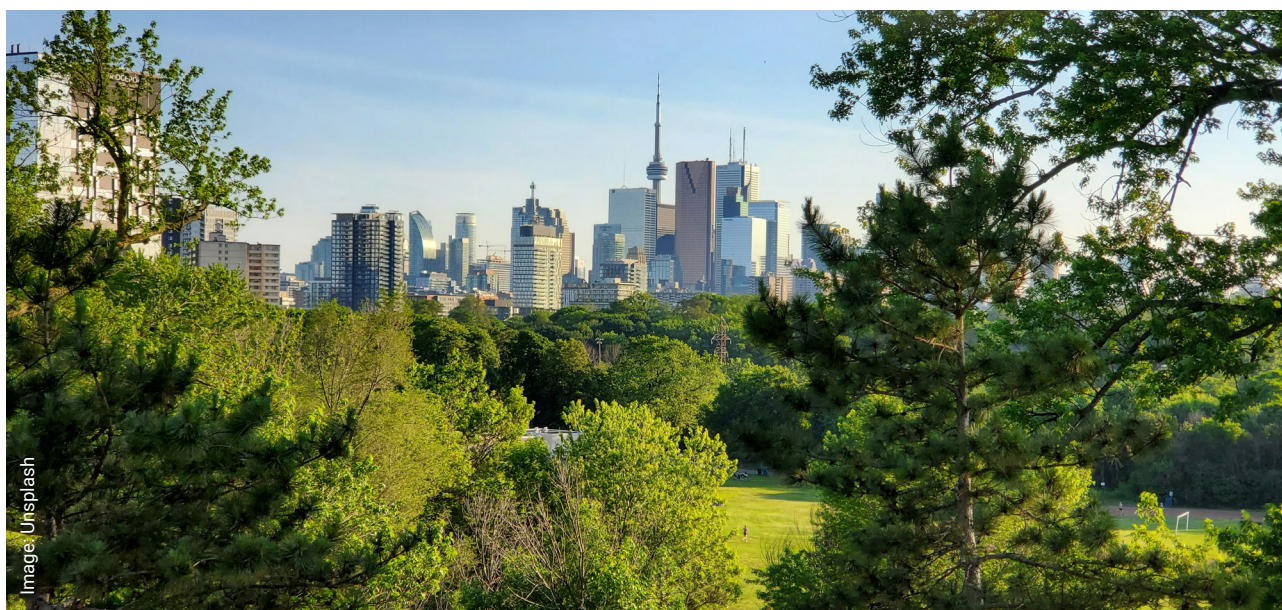
Case study 5: Bridging spatial planning and business models for NbS in Toronto, Canada

Toronto's years of planning and investments centred around NbS have significantly contributed to the city's progress across a range of agendas. For example, the city's Ravine Strategy (City of Toronto 2017) reflects a collaborative effort involving many city agencies and external partners (i.e., Parks, Forestry and Recreation; City Planning; Toronto Water; Toronto and Region Conservation Authority) for guiding decision-making in environmentally sensitive areas surrounding the region's unique ravine system.²¹ Toronto's Ravine and Natural Feature Protection Bylaw protects roughly 11,000 hectares of land or 17 per cent of Toronto's area, split between public (60 per cent) and private (40 per cent) land ownership (Toronto and Region Conservation Authority 2020). Not only does the Ravine Strategy tie into many other strategic plans related to NbS²², but it also informs site-specific management plans for contextually driven natural resource protection. For example, a Nature-Based Climate Solutions Siting Tool (Toronto and Region Conservation Authority 2024) provides detailed region-wide layers on data such as stormwater, carbon storage, residential access to green space, and habitat suitability. However, budget models are not as suited to cross-cutting divisions and spatial boundaries traversed by ravine categories.

Ravine-related budget elements span many departmental silos, as illustrated by the Urban NbS Framework tool. For example, in the year 2022, the city's Capital Budget (City of Toronto 2024) marked CAD\$105.5 million for these elements across city divisions (i.e., Transportation Services, Toronto Water, Toronto and Region Conservation Authority), compared to CAD\$12.6 million for the Parks, Forestry and Recreation's (PFR's) Operating Budget, as well as CAD\$38.1 million committed by federal and provincial governments for implementation support. This breakdown partly reflects the fact that ravines contain grey infrastructure, such as utilities, sewers and busy roadways, with potential for incorporation of NbS but outside a pertinent agency's (PFR's) budget responsibility. The Urban NbS Framework tool tracks objectives and responsible implementers of NbS across budget types so they can be transparent to stakeholders, and potentially rethought if insufficient.

21 This effort draws on and contributes to efforts for establishing a "green wall" across Africa's Sahel region.

22 This effort draws on and contributes to efforts for establishing a "green wall" across Africa's Sahel region.



Case study 6: Catalysing economic empowerment for women and food security through the Pollinator Gardens project, Mexico City

The **Pollinator Gardens** project creates green spaces in Mexico City that benefit key animal species involved in pollination (birds, insects and mammals), supporting biodiversity conservation and food production in rural areas. The project responds to the loss of pollinator habitats caused by urban expansion and pesticide use in agriculture and green areas.

Additionally, the project promotes the training of women as pollination gardeners, opening new job opportunities while strengthening their role in community biodiversity conservation efforts. Native plants from the Valley of Mexico are propagated in Mexico City's government nurseries, and women are trained in pollination gardening. Together, they design and create pollinator gardens and corridors with native species that have never before been reproduced or planted in the city.

The project is backed by the Government of Mexico City, which provides technical and financial support for the propagation of native plants in city nurseries. These nurseries use treated wastewater for irrigation and grow 30 native species. Through partnerships with public institutions, the project promotes sustainable gardening practices, which in turn contribute to environmental services such as cleaner air, temperature regulation and water retention—offering a financial advantage by reducing urban cooling and flood risks.

Additionally, by enabling women to enter the workforce as specialized pollinator gardeners, the project opens new income streams for participants. It promotes “green jobs”, which are aligned with environmental sustainability goals and provide long-term economic benefits to marginalized groups, particularly women.

The project places a strong emphasis on gender equality by training women as gardeners specializing in pollination. Over 500 women have been trained in pollination gardening, with an aim to train 2,500 by 2024. This not only provides them with skills and employment opportunities but also positions them as leaders in community-driven environmental conservation efforts. The project incorporates human rights and gender equality into its curriculum, empowering women to achieve economic autonomy and exercise their rights.

By 2024, the project aims to establish over 3,000 pollinator gardens and plant 100,000 native plants, benefiting both the environment and the economy. The initiative also promotes public engagement in environmental stewardship through educational programmes, community events and partnerships with local governments, schools and businesses.

Ensuring sustained financing for NbS in cities is crucial to fostering initiatives like the Pollinator Gardens project, which not only transforms local economies and promotes gender equality but also creates self-sustaining systems that enhance urban resilience and biodiversity for generations to come.

Part 4: Conclusions and next steps

In *Time to Assess*, the authors identified much work still to be done to drive attention to and investments in nature for cities, including developing baseline metrics, engaging champion cities, aligning cities with global biodiversity goals and increasing funding for urban NbS. While the authors developed a baseline framework to track relevant metrics and progress over time, Generation Restoration cities have become stronger champions of NbS. UNEP and its global partners hosted the UNEA-6 Cities and Regions Summit to strengthen multi-level governance and expanded funding to **fourteen cities for pilot projects and capacity building**.

The baseline data produced by this report's Urban NbS Framework can continue to support cities by integrating NbS into budget processes and strengthening resilience and biodiversity action plans. Stronger urban baseline data can also help funders identify and promote new business cases for urban NbS and increase the impact of their funding for cities. By collecting better and more granular data, cities would be able to conduct a diverse range of analyses on the impact of NbS on both urban communities and the environment, including distribution of investments and their benefits for specific segments of society such as Indigenous people, women, migrants, youth and more. Cities' capacity to invest in NbS reinforces the capacity of city champions for NbS to connect other local governments to global adaptation and resilience finance and increase their countries' ability to reach their GBF, NDC and SDG targets.

However, there is still much to do to reconnect cities with nature and mainstream urban nature-based solutions. Cities are working to integrate nature and NbS without a full understanding of their existing investments in NbS. With a broader application of this framework in more cities, the authors hope that policy makers will better quantify the investment gap in NbS and identify possible solutions to shift local budgets towards more nature sensitive local investments. Efforts to restructure global finance in response to the triple planetary crisis of climate change, nature and biodiversity loss, and pollution and waste must substantively engage cities and subnational governments, recognizing their pivotal role in implementing solutions.

Cost-benefit models and political mainstreaming of NbS need supporting evidence and relevant indicators²³. For baseline data to make a meaningful impact, governments need to integrate new concepts of natural capital and

biodiversity value (for example UNEP's **Inclusive Wealth Index** or **Ecosystem Accounting**) into policies, financial management practice and resilience planning. Among the many issues for future research and testing phases to consider include environmental inequalities and injustices, remote sensing and geospatial technological applications, and best practices in education, training and capacity-building.

Looking ahead

1. Pilot the framework with other cities. This report outlines a first-level effort to identify and propose an expenditure tracking framework for establishing a meaningful budget tracking baseline for urban NbS. Additional validation and verification are required from city stakeholders and experts, especially concerning the "Citywide mapping urban NbS exercise", "Typologies of urban NbS" and validation process, and the overall functionality of the framework. The authors envision this framework and methodology as one that will continue to evolve and undergo refinement, starting with the full Generation Restoration cohort.

Emerging questions:

- How can practitioners improve data outreach and ownership to enhance cross-sector coordination of urban NbS?
- What other objectives (for example tracking funding sources of NbS) can modified versions of the Urban NbS Framework and methodology pursue?
- How can practitioners flag and prevent "greenwashing" in validation of NbS?
- How can better and more granular data contribute to a fair and just transition and inclusive implementation of NbS for all segments of society, including Indigenous people, women, migrants and youth?

2. Promote co-benefits of NbS. City champions can expand advocacy efforts demonstrating that urban NbS offer better benefits for city investments than traditional investment strategies. This means calling for increased capacity support and research demonstrating how the economics of biodiversity and nature (Dasgupta 2021) and inclusive wealth is essential for healthy and vibrant cities.

Emerging questions:

- How should cities embed and reflect activities and values related to NbS in existing budget priorities?
- How can budget tracking processes for NbS address gaps in awareness, capacity and political buy-in?

²³ According to UN DESA (2022), the average observable data for SDG 13 (Climate change) is 2016 and for SDG 11 (Sustainable cities) is 2017.

- How can practitioners support city NbS that account for the opportunity costs of local-level monitoring, reporting and verification of data?

3. Integrate NbS in city resilience portfolios and national investment platforms. Practitioners can leverage the framework to support efforts for integrating NbS and nature capital into resilience portfolios for cities and by cities. This constitutes a new approach that moves away from ad hoc project-by-project funding pipelines toward more cohesive urban financing in multilateral development banks, development finance institutions, national investment portfolios and local action plans.

Emerging questions:

- What budget strategies can local governments use to make the most of limited funding resources, using the Urban NbS Framework for expenditure tracking?
- What additional information and messaging do cities need to make the case for greater targeted funding of urban NbS nationally and globally?
- How can government and nongovernment stakeholders scale up comprehensive approaches to portfolio investment in NbS?



Image: Getty/Unsplash

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Annex: Framework criteria guidance note

Practitioners implementing a city-wide vision or plan that addresses nature, climate change and other environmental risks face enormous financial and implementation challenges. Cities do not regularly specify nature-based programme objectives, budget performance measurements or other policy guidelines as part of their city-wide budgeting processes despite implementing many eligible activities. To accurately track such contributions and improve the effectiveness of limited existing funds, cities need to justify new policies and governance that allow their divisions to adopt nature-based solutions (NbS) as effective strategies.

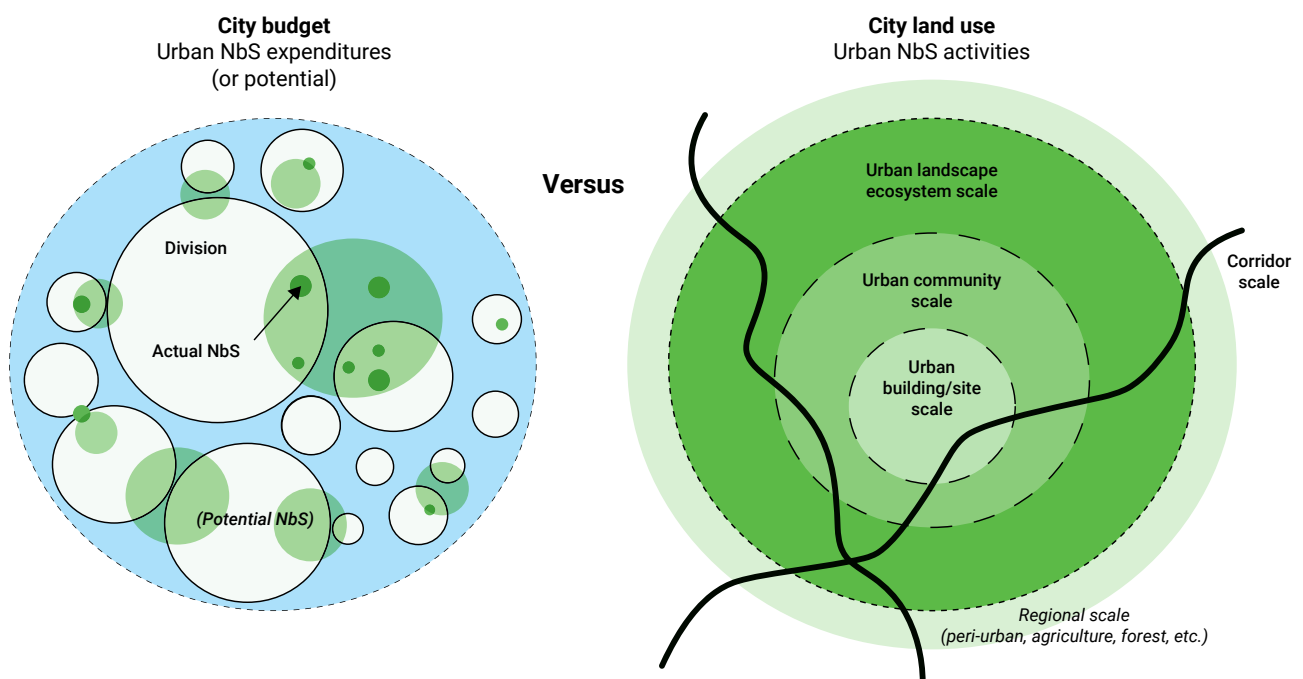
The Urban NbS Framework, which takes the form of an activity budget survey with education components and simplified typologies, builds a baseline for tracking NbS and nature expenditures over time and therefore offers evidence for new programme-level budget planning objectives. Currently, public administration and budget frameworks for local governments value efficiency

and effectiveness as they relate to human health and economic development. These practices do not consider the external costs to ecosystems nor the impact of degraded ecosystems on the cost of providing municipal services. Public financial standards and systems that ignore, undercount and therefore undervalue nature reduce the incentives for relevant stakeholders to change how they account for, and invest in, nature.

This tendency is particularly problematic at the local scale because cities act as direct providers of services to their communities. Administrators often track the investment and benefits of NbS in budget categories that do not indicate the nature-based character and significance of such programme activities.

For example, a local recreation department tasked with an environmental restoration programme may budget preserved wetlands on school property as “education” expenditures or “climate adaptation” more broadly, rather

Figure 1. Comparison of urban NbS in city budgets versus city land use categories (authors’ own). Note the uncaptured NbS (potentially or accurately reflected) across administrative department budgets (left) and across spatial scales (right). Many department activities transcend spatial scales.



than nature. Communities may account for a youth forest planting programme in their annual budget as “community development”, not biodiversity protection. Urban gardens in empty spaces around cities managed by women or Indigenous people that provide food and livelihoods to vulnerable or informal communities might not even be on the radar of local governments.

Local governments with a high level of decentralized power can go further, consolidating multiple public services into one department (for example “Parks, Forestry and Recreation” in Toronto, Canada) or creating entirely new administrative functions (for example “Department of Neighborhoods” in Seattle). Yet any departmental silos will inevitably compartmentalize cross-cutting NbS, effectively acting like proverbial oil on water (see Figure 1). This makes transparent expenditure-tracking activities essential.

Mapping and baselining expenditures for NbS offer cities multiple benefits. First, the framework aims to be simple enough for cities with a centralized sustainability office or staff to use without intensive technical training. Second, the framework offers an education component for familiarizing users with the concept of NbS and features elements that help cities identify new opportunities for applying NbS. Third, the tracking information strengthens long-range budget and programme planning processes, helping cities attract funding by integrating nature into budget decisions and informing ideas for investment-ready projects.

User guidance

Framework elements, parts A and B

This framework tracks current year expenditures in annual operating and capital budget plans. Your city-level point-of-contact will provide guidance on identifying the appropriate baseline year. For multi-year programmes, please adhere to local financial practices for determining what should be included in a single representative year. To support consistency and learning, please add notes with activity-specific details where appropriate.

Format: This framework is intended for city departments to use as an online form or survey with multiple questions, dropdown menus, notes and graphics, all contributing to a common database for analysis. Google Forms serves as the most easily usable format, but practitioners could use other survey platforms such as **Qualtrics** or **Kobo**. To simplify citywide administrative responsibility and streamline compliance, the framework designers recommend that a centralized point of contact send out a survey link and collect data to analyze and share with users across departments.

Greenwashing: The lack of preexisting data, standards and programme measurements related to nature requires that the baseline survey rely on local managers to understand and accurately categorize programme objectives and budgets to the best of their ability, and with basic training. To address the hazards of “greenwashing”, the baseline is as simple and transparent as possible while maintaining links to established and/or emerging standards. As cities adopt criteria and standards and increase their technical capacity for nature investments, this framework can be integrated into other performance or budget-tracking frameworks.



Element	Overview and description																			
<p>Part A. City-wide mapping. The first component is designed to educate city managers about urban NbS while mapping actual or potential nature and NbS across city budgets.</p>																				
<p>1. Division/ business unit name</p>	<p>Form question: Please include the division/business unit name for which you're answering the following questions.</p> <p>< input > _____</p> <p>Instruction: The level of budget mapping by administration level is up to the city. Larger bureaucracies may prefer to ask sub-level business units to fill in the baseline because they have more knowledge about budget spending.</p>																			
<p>2. Division's Classification of the functions of government (COFOG)</p>	<p>Form question: Using the Classification of the functions of government (COFOG) list (a keyword searchable list is accessible here), under which categories do you think your municipal management responsibilities are best described?</p> <p><input > _____</p> <p>Instructions: City division responsibilities often overlap COFOG functional categories. Therefore, please include as many COFOG functions as relevant to your division.</p> <hr/> <p>Background: This element supports subnational coordination with national-level and Paris Agreement Nationally Determined Contribution stocktakes. Investments in nature and NbS are not limited to environmental protection divisions, and it is important to understand where the city spends money on these activities. COFOG is used internationally to collect data on national and subnational public expenditures. Data collected about this issue can help improve subnational expenditure tracking with minimal local effort.</p> <p>Note: COFOG is under revision as of September 2024.</p> <p>First level COFOG functional groups:</p> <ul style="list-style-type: none"> • General public services • Defense • Public order and safety • Economic affairs • Environmental protection • Housing and community amenities • Health • Recreation, culture and religion • Education • Social protection 																			
<p>3. Division's objectives and responsibilities related to NbS</p>	<p>Form question: Does your division have management responsibilities for the following objectives (see list below)?</p> <p>Instruction: Please check all that apply.</p> <ul style="list-style-type: none"> • Water – drinking water, stormwater, flooding, erosion, scarcity/drought, sanitation • Public health – heat, pollution, air quality, chemical safety, sanitation • Built environment – capital programmes, buildings, public spaces, utilities, streets, energy use • Climate change – greenhouse gas mitigation activities, adaptation activities • Ecosystems – conservation, protection, restoration, biodiversity, habitats • Culture and well-being – public spaces that offer physical, psychological, spiritual and social benefits, including for women, Indigenous people, youth and vulnerable communities. • Food security – urban food production and food security programmes <hr/> <p>Background: If you check yes or maybe, you could use NbS to support your division's responsibilities. Seven objectives (listed above) are not sector specific. Nature and NbS may be an effective strategy for all these issues, regardless of your sector or division. Checking all that apply helps city managers discuss the use of NbS comprehensively and strategically.</p>																			
<p>4. Understanding urban NbS – typology</p>	<p>Form question: Does your division fund support programmes or projects like the ones below? (See typologies below)</p> <p>Instruction: Review the following detailed tables with your management team. Each type of NbS is described using examples to improve education and awareness, helping managers learn about local types of urban NbS. Please check all that apply (or might apply) to your division.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2" style="background-color: #D9E1F2;">Urban land use scale</th> <th colspan="3" style="background-color: #D9E1F2;">Nature investment</th> </tr> <tr> <th style="background-color: #D9E1F2;">Ecosystem</th> <th style="background-color: #D9E1F2;">Integrated urban/eco services</th> <th style="background-color: #D9E1F2;">Institutional planning, capacity</th> </tr> </thead> <tbody> <tr> <td style="background-color: #D9E1F2;">Regional</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td style="background-color: #D9E1F2;">City</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td style="background-color: #D9E1F2;">Site/building</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </tbody> </table> <hr/> <p>Background: NbS cover a very broad set of activities and strategies across cities, environmental management activities and management silos. They are not common urban management practices (yet) so many managers do not have a strong understanding of them. The typology frames NbS around urban land use scales and nature investment strategies. It avoids operational and sector functions to reduce repetition, highlight benefits and avoid assumptions about where NbS "belong". Most of these investment strategies can be used by multiple divisions, either independently or in coordination with other local, subnational or national agencies. In fact, NbS work most effectively when they are managed cross-functionally. For example, managing flooding risk with NbS is most effective when integrated across multiple city functions including building and site design, stormwater utilities and transportation divisions.</p> <p>Note: Examples can be added or removed to support local ecology, context and innovation, or linked to catalogs of NbS for more detail such as the Urban Nature Atlas, IUCN Urban Nature Indexes and others.</p>	Urban land use scale	Nature investment			Ecosystem	Integrated urban/eco services	Institutional planning, capacity	Regional	✓	✓	✓	City	✓	✓	✓	Site/building	✓	✓	✓
Urban land use scale	Nature investment																			
	Ecosystem	Integrated urban/eco services	Institutional planning, capacity																	
Regional	✓	✓	✓																	
City	✓	✓	✓																	
Site/building	✓	✓	✓																	

Urban NbS typology				
Urban land use scale Three spatial scales of NbS as they relate to urban management Note: Nature is a spectrum from "green" to "grey" and strategies may work at multiple scales	Nature investment Refers to three types of nature and NbS in city budgets (examples below)			
	Ecosystems Protection, restoration, preservation activities with a dominant design and management focus on ecosystem health	Integrated urban/eco services Hybrid grey/green/blue activities with a dominant design and management focus on human well-being	Institution planning/capacity Many cities have few or no NbS but are investing in capacity and education – both critical for nature in cities	
	Regional scale Refers to municipal programmes and investments that cross urban political, social or spatial boundaries	Coastal marsh/swamp/tidal restoration, floodplain renaturing, removal of invasive species, watershed preservation	Integrated stormwater retention basins, low-impact recreation design (biking/pedestrian), ecotourism district programming	Biodiversity Action Plans, regional watershed planning, green job training programmes
	City-wide scale Refers to city-run programmes and investments impacting the design and function of neighborhoods, communities and public spaces	River/riparian restoration programmes, Miyawaki forests, city-wide native tree planting/forestry restoration, invasive species removal, mangrove restoration	Green street programmes, food garden allotments, public green spaces, soil and slope planted stabilization, cooling street tree programmes, natural stormwater and flood management, biofiltered freshwater collection	Pilot projects, online programmes, conferences, professional training courses
	Site/building scale Refers to design and management strategies that impact buildings and the land associated with them	Pollinator and insect gardens, native species planting, beehives, bird habitats, site remediation	Green roofs, green walls, rainwater gardens, small community parks, on-site stormwater retention	Community education, maintenance training and support, subsidy or grant programmes for homeowners or business owners, volunteer programmes

Part B. Activity expenditure tracking database for urban NbS. This activity tracker creates a baseline for expenditures related to NbS over time, using basic criteria that can be improved with time as NbS become more common.

4. Budget activity name	<p>Question: Please include activity name here:</p> <p><input>_____</p> <p>Instructions: An activity can be a municipal programme, a project, special fund or partnership. Please use the most recent available annual operating and capital budget plans available for your division. The term "activity" is borrowed from global finance taxonomies, which use "economic activity" or "environment activity" as a broad unit of analysis for tracking government finances. As a best practice, please ensure that listed activities and their relevant components align with local administrative guidelines.</p> <p>Background. NbS and nature are not well captured across municipal functions, programme objectives and guidelines, or performance measurements. Therefore, determining the appropriate scale of budget evaluation will be difficult, and will differ for each city or city division. Division managers are encouraged to consider the narrowest (most granular) scope of budget expenditure detail that can reasonably describe the component contributions of urban NbS. If, upon review of activities' "substantial contribution" criteria (Element 5), managers want to increase the level of budget breakdown to capture nature or NbS, it is at their discretion. In the absence of standards or guidelines related to NbS, this framework anticipates that initial activity numbers will be broadly estimated.</p> <p>Example: Consider a large transportation programme. For a small pilot project, managers might consider a budget item component like subcontracted landscaping or civil engineering services better suitable to the substantial contribution. On the other hand, if NbS are being incorporated along an entire transportation corridor, NbS may have a substantial impact on the performance of the whole programme.</p> <p>If you lack official working knowledge of an activity's outputs and budget items, inform or consult a member with more direct knowledge.</p>
5. Validation of NbS' "substantial contribution"	<p>Question: Has this activity been reviewed for substantial contribution of NbS? Does it meet the criteria for substantial contribution of NbS?</p> <ul style="list-style-type: none"> • Yes • No <p>Instructions: See "Validation criteria for urban NbS" validation for details on meeting substantial contribution criteria.</p> <p>Background: The framework borrows the concept of "substantial contribution" from definitions in the EU taxonomy for sustainable economic activities. To meet that cut-off, activities must:</p> <ol style="list-style-type: none"> 1. Show intent to provide substantial contribution to human health and well-being, and 2. Show intent to provide a substantial contribution to environmental and biosphere health under 1 of 3 impact categories (see "Validation criteria for urban NbS").
6. Activity cost (current year)	<p>Question: Please include total activity cost, as justified by the substantial contribution criteria for NbS, here (use local currency).</p> <p><input>_____</p> <p>Instructions: If an activity's use of NbS meets the "substantial contribution" threshold, the captured cost of the activity is 100 per cent. If it does not meet the criteria, the captured cost is zero. Over time, as NbS and other nature-positive objectives are incorporated into programme budgeting, weighted criteria can be introduced to increase accuracy.</p>

<p>7. Activity budget classification</p>	<p>Question: Please select the programme budget category under which the activity is coded. Add details for the categories "Special" and "Other", if available.</p> <ul style="list-style-type: none"> • General operations • Capital programmes • Special • Other <hr/> <p>Background:</p> <p>Capturing the budget classification code helps track NbS and nature across programme budget objectives and will support performance measurements used to gauge nature-based solution contributions to activity objectives over time.</p> <p>This framework uses three of the most common government expenditure categories for goods, services and programmes: "General/operational", "Capital programmes", and "Special" and "Other". Capital costs are associated with physical construction, and "General/operational" for ongoing staffing and resources. Special costs can capture a range of activities including restricted funds, special revenue funds or earmarks. "Other" can include a range of government endorsed programmes that cannot go through the budget, but divisions would like included.</p> <p><i>Example:</i> UNEP Generation Restoration grants that must be endorsed and coordinated with city government but go through an NGO for legal reasons.</p> <p>The framework excludes non-expenditure government finance such as revenues, debt or interest payments, and subsidies. It currently does not capture government investments that are transferred to the municipal government, with the expectation that they can or will be counted in other subnational or national level accounting.</p>
<p>8. Activity funding partners</p>	<p>Question: Please specify if the activity with NbS includes one or more of the following partners: public, private, civic/NGO, none. If known, please list them in the text box.</p> <ul style="list-style-type: none"> • Public • Private • Civic/NGO • None <p><input_____</p> <p>Instruction: This element asks the city to identify the types of partners associated with the activity. This links spending on NbS to important spending patterns, helping local planners and policymakers identify opportunities to encourage or support coordination.</p> <p>This element does NOT require divisions to break down activity budgets by partner financial contributions.</p>
<p>9. Intended benefits of activity</p>	<p>Question: Based on the intended outcomes and objectives of the activity, which of the following are expected benefits of the activity?</p> <ul style="list-style-type: none"> • Water – drinking water, stormwater, flooding, erosion, scarcity/drought, sanitation • Public health – heat, pollution, air quality, chemical safety, sanitation • Built environment – capital programmes, buildings, public spaces, utilities, streets, energy use • Climate change – greenhouse gas mitigation activities, adaptation activities • Ecosystems – conservation, protection, restoration, biodiversity, habitats • Culture and well-being – public spaces that offer physical, psychological, spiritual and social benefits, including for women, Indigenous people, youth and vulnerable communities. • Food security – urban food production and food security programmes <p>Instructions: This is the same list as Part A. Managers can select multiple benefits from the list. This helps to track how divisions relate NbS to division objectives. This does not require ranking or prioritization, nor is there a requirement that benefits have an associated performance measure. However, divisions are expected to select benefits that they can defend based on activity objectives.</p>
<p>10. City-wide goals</p>	<p>Question: How do you think this activity contributes to citywide planning goals?</p> <ul style="list-style-type: none"> • Protect ecosystems on land • Protect ecosystems in the oceans • Greenhouse gas mitigation targets • Urban resilience and adaptation • Reduce socioeconomic, gender-based and other inequalities • Reduce poverty • Create jobs and prosperity • Green energy <p>Background: Separate but parallel from Element 9 (benefits), this element tracks how divisions connect NbS to broad national and city-wide goals to support city planning objectives. It may also help "tag" perceptions of co-benefits for future cost-benefit review. Many of these are also Sustainable Development Goals (SDGs), allowing policymakers to connect local NbS to global goals.</p>

Validation criteria for urban NbS

Substantial contribution

The framework asks that stakeholders validate an intended “substantial contribution” of urban NbS to the design or scope of an activity. The term “substantial contribution” is borrowed directly from the [EU Green Taxonomy](#) and states that an activity should make a substantial contribution to objectives, at the same time “not significantly harming any of these objectives” in order to help make informed decisions about investments. Using this term provides transparency and alignment with a highly refereed green standard public review process. It asks cities to meet the intent and spirit of a refereed term without any obligation to meet technical review or regulatory processes.

As a “first step” framework, validation does not require detailed documentation. It is designed to support education and mainstreaming goals, urging division managers to consider these criteria when making programme planning and budget proposals. It is expected that managers can reasonably demonstrate the inclusion of activities in this framework, if asked. To meet this criterion, an activity should show intent to meet two substantial contributions:

Criteria 1: Substantial contribution to human health and well-being

Nature-based components of urban activities should be designed to improve human health and well-being, using a leaving no one behind and inclusive approach to cater to the needs and aspirations of all sections of society. The activity should demonstrate intent to contribute positively to healthy communities and socioeconomic well-being and address societal challenges effectively. It should not be considered neutral. Demonstration of the financial value or the cost-benefit ratio of the activity is not required.

However, this criterion is a minimal threshold and can be tied directly to local government performance criteria or policies.

Criteria 2: Substantial contribution to environmental and biosphere health

The framework borrows the criteria from the EU Green Taxonomy technical criteria for water management and demonstrate that NbS are designed to offer a substantial contribution towards the intent to protect, sustainably manage, and restore ecosystems. The activity must show substantial contributions to at least one of the three criteria:

- Provides a direct positive impact on ecosystem health
 - The activity is designed to “enhance native biodiversity, ecological connectivity and integrity” or meets other Kunming-Montreal Global Biodiversity Framework (GBF) [targets](#).
- Provides environmental performance improvements to or mitigates environmental pressures of human activities
 - This category supports urban infrastructure-eco service integration but may not rise to the level of restoration/preservation impact of GBF targets.
 - The category supports common “low hanging fruit” activities like street tree programmes that use nature primarily to mitigate human risks like heat or improve quality of life, as well as NbS that support green infrastructure.
- Supports enablers of urban NbS
 - Activities designed to enable and support uptake of projects featuring NbS including but not limited to project environmental reviews; biodiversity or ecosystem-based adaptation planning; training; and research.

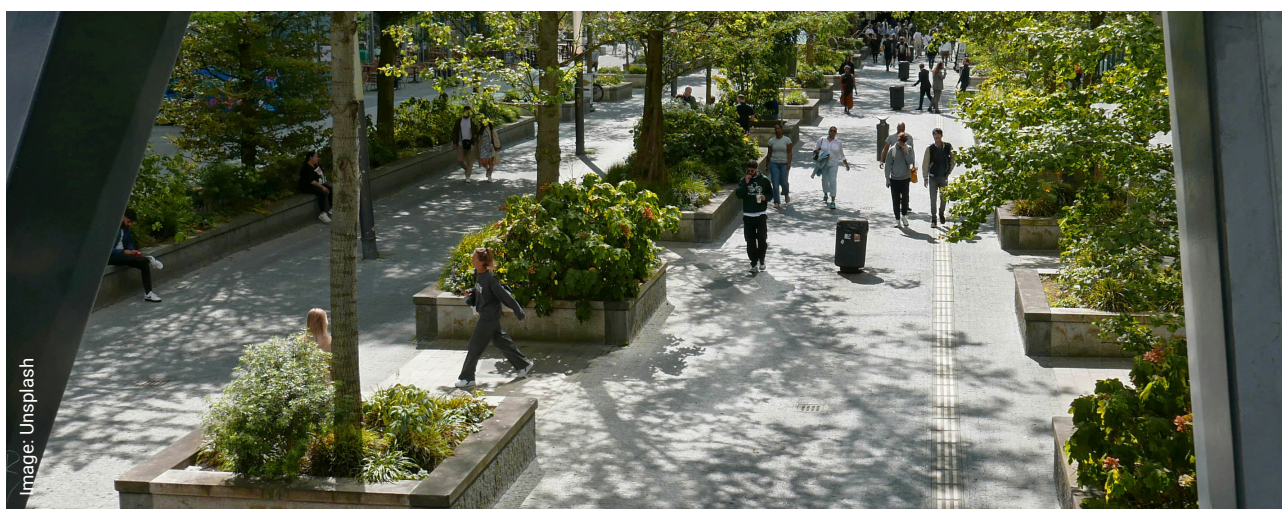


Table 3. Sample socio-spatial data profiles for select Generation Restoration cities. See Implications for framework development in Part 1 for analysis.

City	Population density ²⁴ (pop./km ²)	GDP per capita (US\$, 2020) (Harvard University Growth Lab 2024)	Ecosystem types ²⁵	Tree canopy per capita (m ² per person) (Data-Driven EnviroLab 2020)	Expenditure decentralization ²⁶ (2020) (IMF 2022)
Case study 1: Quezon City, Philippines	19,000	\$11,300	Tropical moist urban areas	12.6	Local: 15-20% (Diokno-Sicat and Maddawin 2018)
Case study 2: Curitiba, Brazil	4,000	\$9,700	Warm temperate moist forest and urban areas	73.6	State: 20% Local: 19%
Case study 3: Dakar-Plateau-Thiès, Senegal	13,000	\$300 ³⁵	Tropical dry forest, grassland, farmland, urban area, peatland and wetlands, freshwater, ocean and coastal	1.5	Local: 4%
Case study 4: Seattle, United States of America	9,400	\$75,700	Cool temperate rainforest, shrub steppe, grassland, prairies, wetlands, estuaries, marine	191.4	State: 38%
Case study 5: Toronto, Canada	9,400	\$50,700	Cool temperate forest, meadows, savannas, urban areas, wetlands, freshwater beaches, bluffs	104.7	Province: 39% Local: 18%

²⁴ Population figures identified by Generation Restoration Cities in program applications, municipal area figures reported by the C40 Cities Climate Leadership Group.

²⁵ Ecosystem types identified by Generation Restoration Cities in program applications. Terrestrial ecosystems are highlighted green, while aquatic ecosystems are highlighted blue.

²⁶ The IMF defines 'Expenditure decentralization' as the ratio of subnational to general government spending (excluding intergovernmental transfers), displayed as a percentage. The IMF Fiscal Decentralization Database does not have data available for the Philippines, but evidence points to fiscal expenditures equivalent to other listed countries, except for Senegal. Data range corresponds to the period 2009–2016.



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