

2023

State of Finance for Nature in Cities

Time to Assess

Summary for local policymakers

Developed by



In cooperation with



As a contribution to



Acknowledgments

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Suggested Citation

United Nations Environment Programme (2023) *State of Finance in Nature in Cities: Time to Assess*. Report. Paris: United Nations.

Disclaimer

The authors would like to thank the experts who were interviewed as part of the landscape analysis, and reviewers for their valuable contributions. The content and positions expressed are, however, those of the authors and do not necessarily reflect the perspectives of those who provided input, nor the organisations to which they are affiliated.

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Key Messages

1. *The State of Finance for Nature 2022 (SFN 2022)* finds that a rapid doubling of finance flows to nature-based solution (NbS) can halt biodiversity loss, reduce emissions by 5 GtCO₂ per year by 2025, and help restore nearly 1 billion hectares of degraded land. **Policymakers are increasingly recognizing the role of cities in reaching these global environmental targets and are eager to expand funding at local level.** Target 12ⁱ of the Global Biodiversity Framework (GBF) adopted in December 2022 acknowledges the importance of the local level in mainstreaming the conservation and sustainable use of biodiversity for inclusive and sustainable urbanisation. Experts agree that while exemplary programs exist to support Target 12, overall funding of urban NbS is insufficient.
2. The SFN 2022 report estimates the annual finance gap as USD 230 billion in 2025, increasing to USD 520 billion by 2050. Urban NbS should form a significant component of this given that the Green Climate Fund asserts that “Seventy per cent of known climate solutions are located within the boundaries of subnational authorities.” **Data at city level is, however, difficult to track over time because NbS investments at the urban scale are nested in larger infrastructure projects and/or integrated into national or subnational budgets.** Since these investments are not disaggregated in global databases, thus presenting the need to develop dedicated global urban NbS databases and metrics to fill the information gap.
3. **National governments have become more willing to funnel sovereign funds and international loans to local governments for NbS** because of their growing awareness of how NbS is a cost-effective measure to achieve global and national climate and biodiversity goals. To take full advantage of increases in urban NbS financing, **cities need technical and financial support** to (1) restructure local governance to coordinate cross-departmental NbS efforts; (2) upscale existing programs; (3) improve alignment of national and sub-national priorities for NbS investment; and (4) develop project criteria that incorporate NbS from inception to implementation. **With additional capacity support, financial tools, and public advocacy, local governments can identify investment-ready projects, restructure administrative structures, reform regulations, and re-align budgets to better incorporate NbS in city planning and management.**

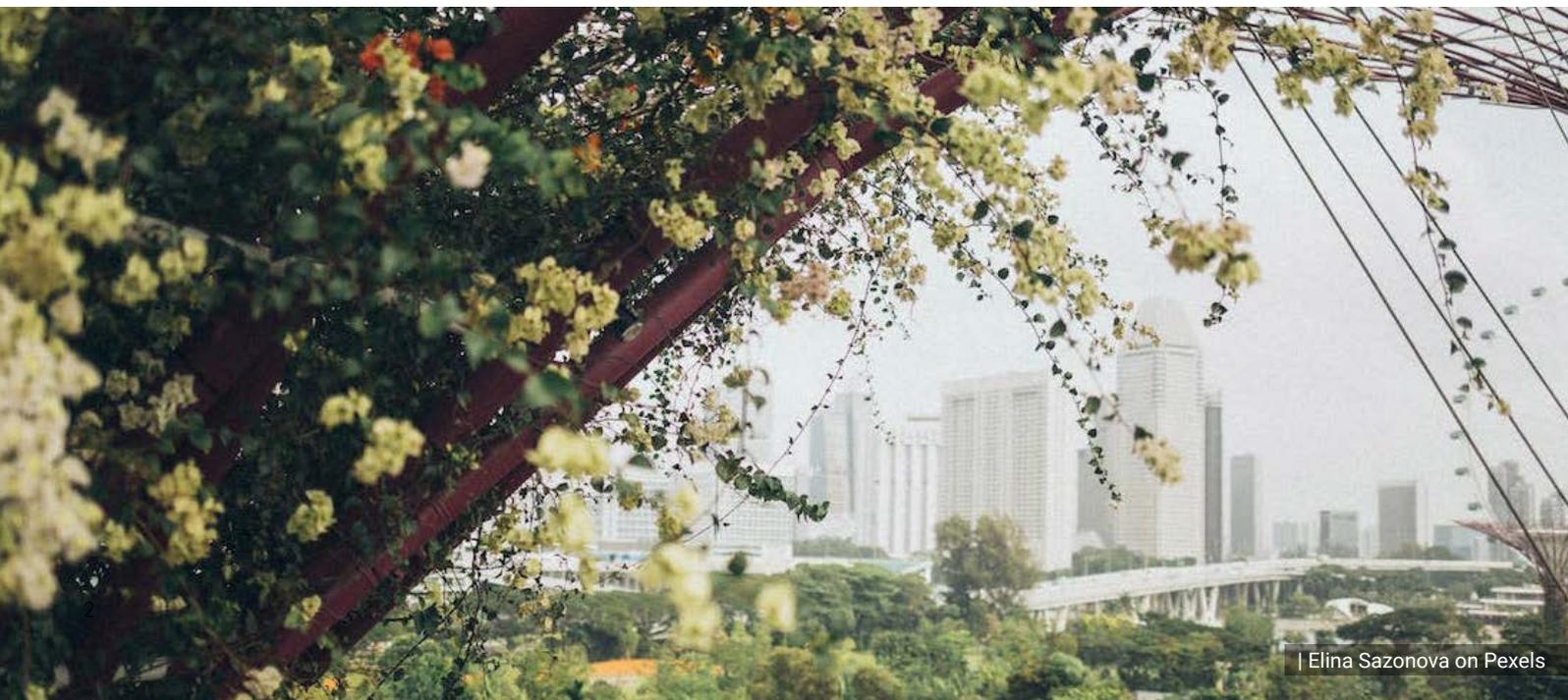
Background and Context

In 2021, in an effort to raise awareness and garner increased attention to the gap in funding for Nature-based Solutions (NbS), the United Nations Environment Program (UNEP) issued its inaugural report, *State of Finance for Nature: Tripling Investments in Nature-Based Solutions by 2030 (SFN 2021)*, that for the first time, quantified the gap in NbS funding needed to meet global goals.ⁱⁱ **The State of Finance for Nature: Time to Act, Doubling Investment by 2024 and Eliminating Negative Nature Financial Flows (SFN 2022) estimates cumulative investment needed until 2050 to be USD 11 trillion (to limit climate change to 1.5°C) and USD 9.5 trillion (in the 2°C scenario).** Public sector spending is dominant, supplying 83 per cent (or USD 126 billion) of the total, largely dedicated to biodiversity and landscapes. Of the total expenditures, 40 per cent supported biodiversity; 17 per cent, agriculture; 13 per cent, land management and water resources; and 8 per cent, air, and water pollution abatement. While it is well-understood that much of the public spending will impact cities, data on urban investments were difficult to disentangle from the bigger numbers. As a result, urban investments were not included in the overall analysis.

Nevertheless, **SFN 2022 recognizes that NbS in cities presents a fast-growing, time-sensitive opportunity to reshape the way investments are made in nature. Cities are responsible for 80 per cent of the world's GDP, making them critical players in the global economy.**ⁱⁱⁱ Population growth and the trend towards increasing urbanisation also

indicates that 60 per cent of the land anticipated to become urban by 2030 has yet to be developed.^{iv} This is independent of efforts of current adaptation investments by cities. Some 90 per cent of urban areas are flood prone because of their location on vulnerable coastlines or in riverine basins: losses accruable to global urban real estate—with its current asset valuation upwards of USD 300 trillion—due to rising sea levels and flooding alone could be more than USD 700 billion annually if cities are not made more resilient.^v

While the SFN-2022 does not account for Urban NbS as a separate category, experts and practitioners believe that urban characteristics of NbS are unique and set them apart from conventional NbS approaches and investment strategies, justifying the importance of conceptualising new ways of tracking and evaluating needs of urban areas.^{vi} Urban NbS projects incorporate elements of the large categories of biodiversity, ecosystems, agriculture, and land use considered in national assessments. However, in their conception and implementation, **city scaled nature-based investments are nested and integrated into cross-sector efforts to support such co-benefits in the urban built environment as infrastructure services and urban resilience.** Funders interviewed for this report generally expressed the view that in cities “It’s much harder to demonstrate the business case [for NbS] as a sole investment, but it can be a lot easier when they’re integrated into other types of projects like green roofs on buildings.”



Conceptualising Urban NbS

The UN’s operational definition of NbS delineates its urban elements.^{vii} Broadly, **urban NbS and investment in nature encompass the “principle of bringing nature into cities for the multiple benefits that it can deliver.”^{viii}** In 2021, UNEP co-developed with the G20 Italian Presidency a report on how NbS can be harnessed for cities. This G20 report, entitled *Smart Sustainable and Resilient Cities: the Power of Nature Based Solutions*, has three robust annexes: Annex I on multi-level governance; Annex II on financing NbS; and Annex III on natural capital accounting.^{ix}

Urban NbS approaches are commonly understood and measured in two ways. Each approach affects investment and financing models as well as stakeholder buy-in. The first approach is to categorize them in a system-based action typology. See Table 1.

Annex II entitled *Financing Nature-Based Solutions for Smart, Sustainable, and Resilient Cities* (UNEP 2021) is most relevant to the SFN 2022. It summarizes various documents on financing NbS in cities and focuses on large urban parks, street trees, river restoration, sustainable urban drainage systems, green roofs, and community gardens as key examples of NbS that have been popular around the world. It also provides detailed case studies to showcase examples.

Table 1. Typology of Urban NbS Actions

| System-level Action | Definition |
|------------------------|---|
| Urban Forests | Locating forests within cities or at the urban rural interface |
| Parks and Green Spaces | Providing unpaved, biologically active spaces |
| Urban Agriculture | Growing plants or animals in and around cities, also local processing and delivering food |
| Streets | Supporting linear natural infrastructure with strips of trees, plants and vegetation at various scales, planting street trees, and establishing green corridors |
| Buildings | Building green roofs and walls, capturing, and recycling stormwater, improving air quality, controlling for extreme temperatures, promoting albedo roof treatment |
| Water Management | Constructing green storm water (e.g., landslide prevention / slope remediation, bioretention areas, bioswales, impermeable surfaces) and drinking water (e.g., watershed conservation and restoration) infrastructure |
| Riverine Restoration | Improving and or greenlighting rivers, and protecting wetlands, floodplains, embankments, and natural culverts, removing trash |
| Coastal Protection | Restoring or preserving mangroves, salt marshes, dunes and beaches and conserving and restoring reefs, removing trash |

Source: Adapted by the authors from *Smart, Sustainable and Resilient cities: the Power of NbS* (UNEP 2021)



The second approach categorises interventions by goals and the relative costs and benefits of investments. This holistic approach combines project financials that looks at external societal and ecosystem co-benefits. See Table 2.

Table 2. Typology of Urban NbS Benefits and Prevented Costs

| Category | Definition | Net Benefits Examples | Prevented Costs Examples |
|---------------------------|--|---|---|
| Well-being | Mental and Physical Health | Increased productivity | Avoided healthcare costs |
| Ecosystem Services | Provisioning, Regulating, Supporting Cultural Services | Payment mechanisms for key services; avoided costs of water purification; reduced air conditioning costs; effective supply chains | Economic losses due to drought, heat; Investment cost (e.g., desalinization) |
| Resilience | Hazard Protection | Avoided damages, healthcare costs, lower insurance rates | Large public expenditures, fiscal sustainability; relative cost/person or cost/economic output of investment versus other interventions |
| Biodiversity ^x | Abundance of Plants and Animals | Biomedical resources; pollination/food production, air/water quality; disease prevention | Loss of resources for pharmaceutical use, lower food production; lower air & water quality |

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 Source: Authors

Within these two approaches, **efforts to inventory and evaluate urban nature-based solutions are emerging**, especially in the biodiversity community. For example, Singapore developed the Singapore Index on Cities’ Biodiversity (SI) in 2008, updated 2021, to assist public and private sector decision-makers in formulating, financing, and monitoring programs that not only promote biodiversity (e.g., native bird species) but also provide quantifiable sustainable development benefits (e.g., recreational services). Meanwhile, the European Union supported a four-year project, Naturvation, that assessed more than a thousand projects in cities across Europe.^{xi}

monetization of co-benefits such as amenities and health.^{xii} They have now *crafted* urban natural capital accounts for several cities, including London, Belfast, Birmingham, Toronto, Vancouver, Philadelphia, and New York.^{xiii} NCA can reframe cities’ approaches towards investing in the environment by demonstrating the value of urban natural assets and allowing the quantification of the benefits of biodiversity and nature.^{xiv} NCA, though still in its early days for cities, has the potential to become a useful tool to build business cases for NbS projects in urban areas.

Natural capital accounting (NCA) is another approach employed at national and regional scales to assess the value of NbS. It is an area of growing interest for cities. Researchers originally conceived NCA to incorporate the value of natural assets in national accounts and reflect

Urban NbS Projects and Investments: Case Studies From Around the World

Freetown, Sierra Leone

Aiming to reduce the risks associated with extreme heat, landslides, and flooding, Freetown, Sierra Leone is implementing its 1 million tree planting plan and an associated grassroots economic development campaign, #FreetowntheTreetown. Starting in 2020, the city partnered with two NGOs, the Environmental Foundation for Africa and Greenstand, to plan the planting and develop an employment program for monitoring and caring for the trees. It secured a share of a \$57 million GEF grant, Resilient Urban Sierra Leone Project, awarded to the national government in 2021 to support key development issues: municipal capacity-building and infrastructure investment and from a million dollar grant from Bloomberg philanthropies. In addition, the city recently labelled its 5,000 geo-tagged trees as “tree-impact tokens,” available for sale to organizations and businesses in an effort to create a tree trading market to finance additional planting.

Quelimane, Mozambique

Quelimane, Mozambique, faces severe weather conditions and lacks adequate infrastructure to safeguard the population from the effects of climate change. Located at the head of the Bons Sinais estuary, one of the largest concentrations of mangroves along the east coast of Africa, the city has experienced rapid population growth – a 200 per cent increase – in the past 25 years. In 2015, the city and another nearby city, Pemba, began implementing a restoration project with \$15 million in technical and financial support from USAID. An important component of the project has been to work closely with the community, raising awareness of the importance of the mangroves and encouraging an active involvement from Quelimane residents, particularly women in managing and conserving the new planting in mangroves restored in the city’s poorest areas. The project included the creation of vulnerability maps employed in land use planning and permitting, emphasizing the need for capacity building within local government and among funders and for the integration of financing climate action with development funding.



Singapore

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Singapore depends heavily on its coastal and marine environment for shipping, industrial production and residential development is implementing an integrated urban coastal management (IUCM) system initiated in 2007. Its extensive regulatory framework encompasses ten plans including its master plan, climate action plan, and several sectoral plans (e.g. Singapore Blue Plan, Parks and Waterbodies Plan) and 35 regulations covering resource management, biodiversity, pollution control and waste management, marine activities, coastal hazard management and heritage conservation and managed by an inter-ministerial coordinating committee that oversees a Technical Committee on Coastal and Marine Environment and the Biodiversity and Environment Database System (BIOME) a repository of Singapore's flora and fauna, plants and animals and other environment related data.

Melbourne, Australia

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Exposure to climate extremes from heavy rains to bush fires to drought – especially the Millennium drought (1997-2009) – made Melbourne's leadership – with strong electoral support – realize the need to incorporate nature throughout their city (population 170,000). It embarked on developing a holistic greening approach in 2011. Following the issuance of its updated comprehensive plan, Future of Melbourne 2026 in 2016 that made caring for the environment its first goal, the city issued three implementing strategies, including its Urban Forest Strategy (UFS, 2017).



London, United Kingdom

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London, United Kingdom, though considered one of the world's greenest cities, faced ever growing financial costs to maintain its 31,000 acres of public green area. Using NCA, the city determined the gross asset value of its green space at more than £91 billion. This figure reflects the monetization of co-benefits related to amenities (residential property values), mental and physical health (exercise and recreation), environment (carbon sequestration, urban heat island reduction), and avoided health care costs. This type of accounting enabled city managers to argue successfully for increased budget allocations to support London's green space.

Seville, Spain

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As one of the hottest cities in Spain, Seville is focusing on NbS to mitigate the impact of increasing number of extreme heat days on its residents. Seville is the first city to name its heatwaves using proMETEO Seville: the first weather warning system in the world to tie meteorological forecasts to health impacts, in partnership with Atlantic Council's Adrienne Arsht-Rockefeller Foundation Resilience Center. The city is expanding the use of a 1,000-year old technology called Qanants, underground aqueducts that use river water to cool the air. New urban pedestrian spaces including squares, fountains, and landscaping is aimed at reducing the heat island effect in the Macarena District. That project is co-financed with European funds through the @LifeWatercool.

Miami, USA

Between its Atlantic coast, Intracoastal Waterway, and expansive Everglades, the City of Miami, USA cannot manage its water resources without nature-based solutions, especially trees. Miami-Dade County administers a Tree Trust Fund for improving canopy cover, of which the mayor recently committed an extra \$2.5 million. Not only do county efforts include an adopt-a-tree program - encompassing 8,000-10,000 trees a year in priority areas - and a program for increasing street trees with up to \$100,000 in matching funds for municipalities. But these incentives are also complemented by the Million Trees Miami initiative, which raises private donations from groups such as Arup, American Forest, and Wells Fargo for plantings in parks, public lands, and for other landowners.

Monterrey, Mexico

Monterrey, Mexico offers an example of governance reform and stakeholder engagement to enlist private sector investments in important aspects of its Green Deal climate program, developed under the city's mayor elected in September, 2021. In early summer 2022, after appointing a Sustainable cities cabinet (composed of departments of infrastructure, public services, human development and sustainable urban development), the mayor joined the business and academic communities to create a seven-member Joint Commission on Urban Development, Mobility and Sustainable Infrastructure to advance an ongoing dialogue with the city's developers. The aim is to smooth the way for their investment in green infrastructure in exchange for fast-track permits. Developers can either donate land for the city to build a public project (from the city's Green Deal project pipeline) or support the construction of a park or green space jointly with the city on public land. The Commission monitors the project according to Monterrey's NbS criteria, supervises the building process, and enforces quality guidelines.

Quito, Ecuador

The first water fund launched by The Nature Conservancy (TNC) was established in Quito, Ecuador in 2000. After seven years the Municipal Council approved the ordinance which stated that 2 per cent of the water utility company revenues had to go to the Fund. The Quito Water Fund (FONAG) was established as a 80-year trust fund that receives revenues from water users, public utilities, private companies and NGOs to fund NbS. FONAG doubled its return on investment, improving watershed function, water supply and water quality. FONAG's successful model has been replicated throughout Latin America and has generated interest throughout the world.

Quantifying Urban NbS Investments and Co-Benefits

While the conceptual foundations of urban NbS have already been established in other reports, **data collection – both in terms of methods to collect data, and in the quantity of data available – is at a nascent stage.** Current global climate models, some of which were also employed in the SFN-2022, depend primarily on data models used to estimate various categories of land-use. Classification of land-use in forests, agriculture, coastlines, and riverine valleys, allow for the modelling (and simulation of outcomes associated with various climate change pathways) of environmental degradation and biodiversity loss. **Urban activities tend to be overlooked in such data models since cities cover less than 3 per cent of global land cover, and therefore present modelling and simulation challenges as they do not fit the norm.** They neither account for urban activities nor consider cities due to their low land coverage – 2-3 per cent of the global total. Efforts to incorporate urban investments in SFN 2022 found that an accurate accounting of NbS in cities in the global narrative of NbS investments was impossible because urban NbS investments are either currently integrated into national or subnational budgets, folded into larger loans incorporating grey and green infrastructure, and/or, not disaggregated in global investment databases.

As things stand, most of the funding information for NbS comes from public sector sources; data on private sector investment in urban NbS are extremely limited despite the need to report them for designing viable business projects, estimating impact or ESG investments, and delivering effective philanthropy. Except for urban watershed ecosystem services, funders, donors, and city budget officials generally do not track urban NbS investment data as separate accounting categories. Recently, multilateral development banks, donors, and specialised NGOs have begun to measure the occurrence and potential of NbS in urban projects for resilience while also recognising the importance of an approach adhering to a guiding/normative principle that holds “green when possible, grey when needed”.^{xv}

The scanty extant data - on public, philanthropic, and private sector investments flowing to urban NbS projects can provide the foundation for a more robust accounting of urban NbS in the future. Although limited, data sources include multilateral development banks, donor funds and governments, specialised non- governmental organisations, governments (national to local), and private sector impact investors. They range from national to local government appropriations and revenues, multilateral finance institutions’ grants and loans, public private partnerships agreements, sales of green and blue, bonds, carbon offsets, and such risk reducing tools as blended finance and parametric insurance. Of the sources providing information about urban NbS, some present data on an ongoing basis, others do not. For example, the World Bank and Nature Conservancy have running assessments while Naturvation, an EU focused database, inventoried USD 800 million to USD1.1 billion worth of urban NbS dating from 2008 to the 2017 before it discontinued its counts.^{xvi}

Donor funds and national and subnational governments have funded some city-focused programs. For example:

- The Global Environmental Facility (GEF) has invested USD 197 million in NbS in its Sustainable Cities program, a sum that has leveraged more than USD 3 trillion from multilateral development banks, and national and subnational sources.^{xvii}
- In 2020, the Green Climate Fund (GCF) created a USD 168 million Global Subnational Climate Fund, to leverage equity investments in climate projects ranging from USD 5 to USD 75 million, administered by Pegasus Capital Advisors.^{xviii}
- China, through its Sponge City initiative, has invested between more than USD 12 billion in thirty pilot projects.
- Urban watershed investments include: The Netherlands’ Room for the River program, (USD 2.7 billion); New York City’s watershed protection program (USD 2.5 billion); and Toronto, currently spending USD 1.25 billion on its waterfront restoration effort.^{xix}

Philanthropic sources include such specialised non-governmental organisations (NGOs) as the Nature Conservancy (TNC) and the World Resources Institute (WRI) inventory for urban-related NbS funding. While neither claim to be comprehensive, each illustrates the extent and nature of funding provisions. TNC has catalogued 18 Water Funds, reporting some USD 316 million in funding coming from local and national government and philanthropy (corporate and non-corporate). WRI's assessment of more than 150 NbS projects that are urban or urban related (almost 64 per cent late stage or undergoing implementation) that have secured USD 100,000 or more (minimally USD 15 million but clearly much more) in financing outlines effective financial instruments.^{xx}

Private sector investments in nature are either business investments, mainly in energy, and corporate philanthropy devoted to environmental and social issues (ESG); they are not necessarily urban-focused. Current records indicate that while nature is included in rating systems now being developed by business associations, they emphasise mitigation and focus on a few sectors such as food, agriculture, and energy.

Some private sector entities engage in what is labelled "Impact investment," a growing class of finance that in 2019 constituted an estimated USD 404 billion in assets (AUM).^{xxi} Defined as "Investments made with the intention to generate positive, measurable social and environmental impact alongside a financial return, they can be across asset classes, in both emerging and developed markets, and target a range of returns from below-market to market-rate, depending on the investors' strategic goals."^{xxii} Impact investors include for-profit and not-for-profit asset managers, foundations, development finance institutions (DFIs), pensions, insurance companies and others. Asset managers and DFIs represent the highest number of participants.

Several other areas of private sector interest in NbS and nature investments are emerging, but they are still in the pilot or experimental stages and not necessarily urban focused. Some are de-risking approaches based on indexed ESG efforts (e.g., HSBC World ESG Biodiversity Screened Equity UCITS ETF), blended finance (e.g., Green Climate Fund's USD 250 million Global Subnational Climate Fund with Pegasus Advisors), innovative insurance solutions (coral reef and mangrove parametric insurance in Mexico and Florida), or green bonds; others provide carbon offsets through the voluntary blue carbon market (Cispata Bay, Colombia mangrove restoration/preservation).^{xxiii}

Efforts to collate projects for the SFN 2022 report uncovered glimpses of urban NbS funding amounting to partial and preliminary estimates of USD 20-23 billion in funding over the past decade. Using the SFN overall figure for the gap in NbS funding against the GCF's claim that 70 per cent of known climate solutions are within subnational boundaries offers an extremely rough idea of insignificance of the current urban investment figure – **less than 5 per cent of the needed investment.**^{xxiv} Clearly, additional work on assessing urban NbS is needed to get a more accurate picture.

Targeted interviews with city officials, mayors, and key officers of global financial institutions also offer additional insights on the type, extent, and funders of urban NbS. Information gleaned from those who are engaged in providing urban NbS could inform the next steps in understanding the challenges of uncovering the full extent of needed funding for NbS in cities.



Next Steps: Enhancing NbS Investments In Cities

Many public, private, and philanthropic decision-makers, are recognizing the value of investing in nature as a public good.^{xxv} The SFN 2022 finds that NbS can “provide the means to cost-effectively reach climate, biodiversity and land degradation neutrality targets” and shows that a rapid doubling of finance flows to NbS can halt biodiversity loss, reduce emissions by 5 GtCO₂ per year by 2025, and help restore nearly 1 billion hectares of degraded land.

These numbers, however, do not yet reflect the potential impact of urban investments due to the lack of a solid database for assessing the baseline conditions and monitoring corresponding progress from urban activities. As a result, **the unique features and co-benefits to resilience, conservation, and biodiversity of urban NbS remains relatively unknown to investors and decision-makers, at all levels of government.** The private sector is also only beginning to understand the pros and cons of nature-based urban projects rather than business-as-usual investment models. **Four actions could shift the trend:**

1. **Engaging champion mayors and city officials** already supporting urban NbS can help inform and educate national and subnational public and private sector decision-makers about the importance of investing in nature. Developing a widespread communication strategy on the long-term advantages of investing in nature in urban systems, particularly to address adaptation goals whose benefits are not reflected in short term project financing models is a critical need. Prominent successful examples can help demonstrate that early planning for urban NbS avoids costly mistakes.
2. Multi-level governance and policy reform are key to success. In line with the newly adopted Global Biodiversity Framework and Target 12, **aligning and placing local governance at the centre of national and global climate and biodiversity.** Actions towards this end could include restructuring local governance to coordinate municipal agencies’ investment in NbS with all-level climate action plans; aligning subnational and national approaches to urban-focused financing in nature; and enabling or requiring public and private sector entities to craft viable projects that consider urban NbS from inception (planning) to implementation (operations).
3. **Developing global metrics that track progress over time** can enable the integration of urban NbS in public and private sector decision-making. Such metrics can be facilitated through:
 - Work with managers of sources of data to develop a comprehensive database on urban focused NbS and investment in nature that addresses its special integrated and nested features.
 - Inclusion of urban NbS in climate action plans (CAPs) and land use planning.
 - Funding of additional technical assistance to align subnational and national approaches and track of urban-focused financing in nature.
4. **Increasing private investment in NbS at the urban level.** Cities, centres of economic and political power, are innovation hubs. In cities, the private sector, working with local governments, can have an important role in harnessing urban nature to reach global climate goals. While SFN 2022 indicated that private sector investment in NbS represents only 17 per cent of the total (USD 26 billion per year), that figure needs to expand and include urban NbS. However, shifting from “grey to green” in cities while maintaining investment returns requires the ingenuity of designers, engineers, and financiers to change business models, manage risks and quantify benefits. Identifying investment ready local-level (or subnational) NbS can be a catalyst to harnessing the power of private sector participation in cities to accelerate action. As SFN 2022 asserts “given the centrality of cities in the global economy, it is important to explore how investments in urban NbS can be mainstreamed and accelerated to protect and restore nature in and around cities, and to reach local and global ecosystem restoration and climate targets.”^{xxvi}

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Endnotes

- ⁱ Target 12: “Significantly increase [...] benefits from green and blue spaces in urban and densely populated areas sustainably, by mainstreaming the conservation and sustainable use of biodiversity, and ensure biodiversity-inclusive urban planning.”
- ⁱⁱ UNEP, 2021.
- ⁱⁱⁱ World Bank, April 2020.
- ^{iv} The Global Commission on the Economy and Climate, 2018, p.68.
- ^v Pinko, N., et. al., June 2020, p.1; World Resources Institute, April 23, 2020.
- ^{vi} ICLEI 2017, UNEP, 2021,
- ^{vii} “Actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, coastal, and marine ecosystems which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits.” United Nations Environment Assembly, 2022.
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- ^{ix} <https://www.unep.org/pt-br/node/29766>
- ^x Pearce, 2021.
- ^{xi} L. Chan, et.al. 2021.
- ^{xii} NCAVES and MAIA (2022).
- ^{xiii} World Bank, 2019.
- ^{xiv} University of Liverpool, 2022.
- ^{xv} World Bank 2021, p. 15.
- ^{xvi} Naturvation 2017-2021; Lunjun Xie and Harriet Bulkeley, 2020; Alope Barnwal, 2022.
- ^{xvii} Alope Barnwal, 2022.
- ^{xviii} Pegasus Capital Advisors, 2020.
- ^{xix} National Academy of Sciences, Medicine, and Engineering, 2020.
- ^{xx} Ozment, 2021.
- ^{xxi} Dean Hand et. al., 2020. p.5.
- ^{xxii} Dean Hand, et.al., 2020, p.74.
- ^{xxiii} HSBC, 2022; Green Climate Fund, 2022; Berg et. al., 2020; Rojan Bechauf, 2020; Daniel A. Friess, et.al., 2022.
- ^{xxiv} This figure is based on the Green Climate Fund assessment that 70 per cent of known climate solutions are within the boundaries of subnational authorities and the SFN 2022 estimate of the needed expenditure in nature.
- ^{xxv} Ozment et.al., 2021; World Bank, 2021.
- ^{xxvi} SFN 2022, page 46