English

LOGIN/SIGN UP TO SAVE

Implementation Guides November 2021

Nature-based solutions: How cities can use nature to manage climate risks

Adapting to Climate Change | Spotlight On: Nature-based Solutions | Urban Planning and Design

Author(s): **C40 Cities Climate Leadership Group, C40 Knowledge Hub**

From extreme heat to floods, the impacts of climate hazards on urban lives and livelihoods are already worsening. Nature-based or ecosystem-based solutions[1] can help to tackle many of these risks, while offering additional benefits for health, wellbeing and urban economies. Efforts to create or revive urban nature are already reducing negative climate impacts and boosting people's quality of life around the world. This article explains how your city can design and implement nature-based solutions (NbS) to climate risk.

Identify green assets, gaps and opportunities as part of a climate risk assessment

Map and assess the city's climate risk and vulnerability. A climate risk assessment is a core part of climate action planning, providing the evidence base needed to effectively adapt to climate change and manage evolving climate-related risks. It will identify populations, infrastructure and assets at risk due to climate hazards – now and in the future.

Map and assess your city's natural profile and characteristics, as well as relevant urban trends, if this has not been included as part of the climate risk assessment. This analysis is critical for designing locally appropriate nature-based solutions to climate risk.

These assessments will identify needs and opportunities to upgrade and expand green space and

infrastructure across the city. Good examples include the mapping and analysis conducted by Rotterdam, Melbourne, Paris, Buenos Aires and Austin.

To understand your city's natural profile and characteristics, draw on land use maps, local knowledge and datasets to:

- Map and characterise existing green space and canopy cover to produce a baseline natural vegetation inventory. This will provide a clear understanding of the quality, character and distribution of green space, including gaps in access across the city.
- Map man-made permeable and non-permeable surfaces.
- Map native natural ecosystems, particularly the native vegetation and natural water courses and water bodies that existed before the city's foundation. Water often flows along natural pathways even if they have been built over, so this knowledge is valuable for designing nature-based flood solutions, while the planting of non-native species risks making the ecosystem more fragile.

Seek access to data held by national government departments, local universities and non-governmental organisations to support this work. If possible, consider purchasing risk data from insurance companies. Tools such as the CORINE Land Cover data and the Urban Atlas can support cities that don't have their own land use databases.[2] *How to expand your city's tree canopy cover* provides more detailed advice on mapping and assessing the health of tree canopy.

Analysis of trends in your city should include:

- Mapping areas where growth and development are happening. This includes planned, zoned and permitted development, and any unplanned growth which is forecasted.
- Aspects of urban space and function that are changing. Identify, for example, how policies to increase sustainable transport mode shares are altering the need for paved parking and road space, or whether strategies for urban development, industry, waste and other sectors are altering the use of sites or assets. Seoul's restored Cheonggycheong river was previously a motorway, for example, while Buenos Aires' Lago Lugano nature reserve used to be an urban dumpsite.

Cities should ideally also undertake:

- **A natural capital accounting exercise** to understand and raise awareness of the value of urban nature (including, but not limited to, its economic benefits for climate hazard risk reduction). Natural asset and biodiversity valuation in cities by the Global Platform for Sustainable Cities provides practical advice on how to do this. Examples include London's natural capital accounting study – the study has proven to be a valuable advocacy tool, providing the evidence needed to win the support of senior decision makers for greater investment in parks, green spaces and green skills programmes.[3]
- **An assessment of the health of tree and vegetative species, and their vulnerability to changing**

climate conditions. Melbourne's urban forest strategy, for example, responds to evidence that without action the city would lose 44% of its tree cover within 20 years due to the age of its trees and their lack of diversity. *How to expand your city's tree canopy cover* explains more.

While native species will usually be best adapted to the city's climate, there may be a need to integrate species from climate zones comparable to those expected in the future, and to prioritise species that are resilient to drought, wildfire or other climate impacts. Diversifying species can also strengthen the resilience of the local ecosystem. Cape Town found that wildfire risk can be reduced by restoring the native fynbos vegetation and clearing invasive species like pine, for example, while Chicago identified a need to incorporate species that are adapted for warmer temperatures.[4, 5]

Work with relevant city departments and non-profits

Key departments include those for city planning, budgeting, buildings, environment, parks, land use, public works, water utility and maintenance, roadways. These groups, as well as relevant private and civil society stakeholders, should be included throughout the design and implementation of nature-based approaches. London has created a new Centre for Excellence for London's green spaces to help unite the fragmented green space sector and provide coordination across sectors including health, housing, culture and sport, delivered by supporting and resourcing the non-profit Parks for London.

Prioritise equitable access to green space

In most cities around the world, areas that are home to groups that are lower-income, marginalised and suffer from housing insecurity tend to be less green. This raises hazard risks in these areas and can also mean that these neighbourhoods have less access to recreational green space, therefore facing worse air quality and other issues. The video below explains the causes and impacts of inequitable coverage of trees and green space in Phoenix, Arizona:

Set goals and targets for the expansion of green and blue infrastructure

Goals should be established for restoring, conserving and ensuring equitable access to natural assets in the city. They should be informed by the mapping and assessment explained above, as well as social and political priorities. Goals can be city-wide and/or adjusted for population density at a neighbourhood scale, to reflect differences areas where planting is possible. Publicise these goals to ensure their accountability and longevity beyond political terms.

Design goals and targets to respond to the city needs assessment, if this has been carried out as part of the climate action planning process. Cities4Forests' guide to social equity considerations and the (United States-oriented) Tree Equity Score Methodology can support the design of equitable access goals.

Cities usually establish targets for the total area of green space per city resident, for residents' proximity and access to that space, and for the percentage of canopy cover. Examples include:

- **Quito's** target to increase the green area to at least 20m^2 per resident by 2030, with a focus on the equitable distribution of green space in parishes across the city.
- **Melbourne's** target to increase canopy cover from 22% to 40% by 2040.
- **Los Angeles'** target to ensure that at least 65% of residents live within half a mile of a park or open space. This target rises to 75% by 2035 and 100% by 2050.
- **Lisbon's** target for 90% of the population to be less than 300m from a green space bigger than

2000m^2 by 2030.

Target access to green space at the neighbourhood level

Access to green space in every neighbourhood is among the goals in the '15-minute city': an urban planning concept that aims to ensure that everyone, in every neighbourhood, can meet their core needs within a short walk or bike ride from their home. Read this for an introduction to plans that prioritise proximity to green space in, among others, Portland, Bogotá and Barcelona, and this for advice on ways to expand access to green space at the neighbourhood level.

Design nature-based interventions that respond to local hazards

Responding to the assessments set out earlier, and working with relevant city departments and wider city stakeholders, plan interventions for green and blue spaces and infrastructure.

Nature-based solutions can help cities to respond to every climate hazard:

- **Extreme heat.** Trees and vegetation provide evapotranspiration and shade, which both result in localised cooling. Linear parks and green corridors can also help to improve urban ventilation. Read *Heat: How to expand your city's tree canopy cover* for more.
- **Flooding.** Restored floodplains as well as trees, vegetation, natural permeable surfaces and waterbodies will slow, reduce and store stormwater runoff. Trees – and especially older, established trees – also stabilise slopes, reducing the risk of landslides associated with heavy rains and flooding. Read *Flooding: How to increase your city's permeability*.
- **Drought and water scarcity.** Trees, vegetation, natural permeable surfaces and waterbodies also help groundwater aquifers to recharge through infiltration, and to store water locally.
- **Wildfire.** Restored fire-adapted ecosystems and the planting of less flammable, fire-resistant and fire-retardant species helps to reduce the likelihood and intensity of wildfires.
- **Coastal flooding and sea level rise.** Onshore solutions like coastal wetlands, mangroves and sand dune buffers stabilised by vegetation, as well as offshore solutions like coral reefs, oyster bays and other natural barriers, help to prevent coastal erosion and slow the movement of water during storms.

Follow the links above for advice on understanding and managing the risks associated with each of these hazards.

Cities can reduce risks from multiple hazards at the same time by expanding and restoring urban green spaces of all sizes – from large city parks to small 'parklets', school yards and gardens – planting street trees, replacing impermeable surfaces with natural infrastructure, and increasing the coverage of green

roofs. Planting initiatives should prioritise native species of trees and vegetation to reduce maintenance costs and maximise benefits for local biodiversity. *Urban rewilding: The value and co-benefits of nature in urban spaces* looks at biodiverse nature-based approaches on four scales.

Use the International Union for Conservation of Nature (IUCN) Global Standard for Nature-based Solutions to support the design of successful interventions

Published in 2020, this is the first available global standard designed to support governments and other stakeholders to design, implement and verify nature-based solutions to challenges including climate change, biodiversity loss and food security. The Global Standard includes a self-assessment with eight criteria and indicators, designed to inform the development of new projects, scale-up existing projects, and to assess past projects and new proposals. *Financing and implementing nature-based solutions in urban areas* provides a guide to developing ideas into viable, funded project proposals in line with the IUCN Global Standard.

Tree planting in and around Freetown is helping to reduce risks from flooding and landslides

Freetown, Sierra Leone, is among the world's rainiest cities. Heavy rains coupled with deforestation have resulted in devastating landslides, including a severe event in 2017 which claimed nearly 1,000 lives.[6] Freetown the Treetown is the city's campaign to plant and grow 1 million trees by the end of 2022, increasing canopy cover by 50%. It prioritises areas at risk of landslides, riverbanks and low-income areas that are most in need of regreening, and is implemented in collaboration with residents who track tree planting and maintenance on a mobile app where they are rewarded with micropayments.[7] Watch Mayor Yvonne Aki Sawyerr's TED talk about the programme or the video below to learn more. Our case study explains how it is financed.

Implement nature-based solutions through dedicated and sectoral plans

The biggest opportunities are:

- **Develop a masterplan for urban nature, or integrate nature-based solutions into the city's existing masterplan.** This is important for long-term continuity, as nature takes years or even decades to develop, and must be institutionalised within the city's governance. Prioritise biodiversity in urban nature programmes to improve resilience and maximise benefits. Examples include Melbourne's 10-year urban forest plans for each of its ten precincts, which are described in the city's Urban Forest Strategy and visualised here; Barcelona's 20-year Trees for Life master plan; and Medellín's network of 'Corredores Verdes' (green corridors). This report from the London Rewilding Taskforce offers recommendations and principles for a nature-based approach that prioritises biodiversity.

- **Integrate the solutions into disaster risk reduction and climate change adaptation plans.** It is critical that opportunities to create natural buffers and reduce the scale of disasters are maximized as part of adaptation and/or disaster preparedness and prevention plans. For instance, the Indian city of Kochi has embedded a role for trees, forests and other nature-based solutions in the city's disaster management and adaptation plan, working at the neighbourhood scale in collaboration with non-profits and local residents to design and deliver urban restoration and regreening projects.[8]

- **Encourage or require green roofs through incentives and building codes.** Rotterdam, which is working to transform unused flat roofspace for green roofs, blue roofs and other uses, suggests starting with municipal buildings and incentives. *Flooding: How to increase your city's permeability* explains more. As green roofs help to reduce building energy consumption for heating and cooling, requirements for green roofs can be incorporated in building energy efficiency standards for new and existing buildings.

- **Land use policies and regulations, including community benefits ordinances.** Utilise land use zoning and other development codes to require a certain proportion of natural or unpaved area in each development. These can be delivered in the form of incentives – allowing greater development rights for plans that provide more space for nature – or mandates requiring a certain maximum lot coverage. For example the Detroit Community Benefits Ordinance, approved by voters in 2016, has enabled residents to secure more and higher quality green spaces and stormwater-sensitive surfaces from developers, among many other benefits. Consider adopting the Green Space Factor pioneered by Malmö, which provides a 'menu' of urban greening options and awards points to planned developments according to the extent and quality of green space. By requiring a minimum value, this approach allows flexibility while ensuring that targets for green space are met. The system has been adapted by cities including London and Seattle. *Policy and planning tools for urban green justice* sets out 20 policy tools to improve access to green spaces in cities, including land use tools, developer requirements, financial schemes and other regulations and ordinances. *BiodiverCities by 2030: Transforming cities' relationship with nature* details land-sparing interventions that can increase the space for nature in cities.

- **Invest in capacity building for the design and maintenance of nature-based solutions.** Key skills to foster include arboriculture, landscaping and forestry, emphasising the need to develop knowledge of species that are native, and those that are resilient to climate change and other stresses. New Orleans, for instance, has worked with private sector partners to train staff to transition from turf management, and expanded the green infrastructure workforce by supporting training programmes like Thrive Works Green.

Involve local people in the design, implementation and monitoring of nature-based targets and solutions

The *Inclusive Community Engagement Playbook* is a guide to engaging stakeholders in the design and implementation of climate actions. It provides a wide range of tools and gives examples of cities that have used them, such as Freetown's Treetown programme and Melbourne's Adopt a Tree programme. Melbourne encouraged residents to register their 'adoption' of a tree on their street and take responsibility for watering it with greywater, easing pressure on the city's tree maintenance budget.

Seek dedicated financing for nature-based solutions, including in sectoral city budgets

Nature-based solutions offer value for money and a strong return on investment. They are typically cheaper than many hard infrastructure approaches for managing climate risk, and offer significant economic benefits associated with better physical and mental health, and growth for sectors like leisure and tourism. *The value of urban nature for communities, investors and climate* offers quantified estimates of nature's cost-saving potential for buildings, stormwater management and transportation in six cities, and a replicable methodology. Nevertheless, dedicated financing is critical for the upfront cost of restoring, expanding and protecting the city's natural assets, as well as for ongoing maintenance in the long-term.

Dedicate city budget and explore opportunities to raise revenue for nature-based solutions

- **Seek routes to fund nature-based solutions through relevant sectoral city budgets,** especially those for health, emergency preparedness, transport and urban planning. Consider partnering with local non-profits to advocate for greater budget allocations. Experience from Pittsburgh, Detroit and other cities has shown that partnerships with these groups can help to build community support, fundraise and help municipal governments to access financing for nature-based programmes.[9]

- **Build pipelines of viable green projects that can attract private investment.** One good example is Greater Manchester's Natural Capital Investment Plan, which aims to attract investment in priority green projects. *Financing and implementing nature-based solutions in urban areas*, aimed at local authorities in the Global South, offers a practical guide to developing viable nature-based projects to attract finance for implementation. *How cities can encourage private sector adaptation finance* looks more broadly at this issue.

- **Explore co-financing mechanisms and other options to raise revenue.** For example, in the United States, Austin has created a carbon credit scheme to fund its tree-planting programme, St. Louis uses

a combination of property tax and sales tax transfers to fund urban forestry, while in Burlingame, urban forestry receives a portion of the city's gas tax.[10] Melbourne established the Urban Forest Fund, funded partly by donations, which offers grants for homeowners to implement nature-based solutions on their properties. *Funding your urban forest program* offers more (United States-oriented) tips on this.

- **Consider engaging the insurance sector.** The insurance industry is increasingly interested in supporting the adoption of nature-based solutions as a measure for reducing climate risk. While clear opportunities are only beginning to emerge, a report by the global industry group ClimateWise explores the need for collaboration with governments and other stakeholders to enable the insurance industry to play a meaningful part in climate action. *Building climate resilience in cities through insurance* explains how cities can use insurance to boost the mobilisation of capital, as well as improve understanding of risk and incentivise risk reducing behaviour.

While not specific to urban nature interventions, *How cities can attract private finance for climate action* and *How cities can encourage private sector adaptation finance* offer more advice on raising revenue and attracting funding.

Seek access to public international finance, and advocate for more

Some limited international public financing is available for cities, particularly in the Global South, to support the expansion of urban nature. The Cities Climate Finance Gap Fund and Cities Finance Facility both include tracks for urban greening and nature-based solutions.

However, just 1.5% of all public international climate finance is currently supporting nature-based solutions for adaptation in developing countries.[11] Cities should consider advocating for increased funding for these solutions, and greater municipal access to that funding, such as by joining relevant campaigns and networks (see below).

Join city campaigns and networks on urban nature

Why city diplomacy is vital to meeting your city's climate ambitions and *Better together: How cities can collaborate for faster, more effective climate action* each explain benefits of working with other cities and partners. International opportunities on the topic of nature-based solutions include:

- **CitiesWithNature.** Led by ICLEI, The Nature Conservancy and IUCN, CitiesWithNature helps cities to connect, share experience and make a shared commitment to nature-based solutions. Around 200 cities are currently members.
- **C40 Cities' Urban Nature Declaration.** All cities, whether C40 members or not, are invited to join a peer group of over 30 signatory cities working on nature-based solutions.

- **Cities4Forests.** Run by the World Resources Institute, Cities4Forests is a declaration signed by over 70 cities that calls on key institutions to ramp up policies and investment to support forest conservation, restoration and sustainable forest management.

All of the above offer a degree of technical assistance, peer-to-peer knowledge sharing, resources and more.

One notable national network is Brazil's National Front of Mayors (FNP). This network of more than 400 Brazilian mayors who worked with the Global Covenant of Mayors for Climate and Energy to win the support of 10,000 additional cities and local governments for the Amazon Cities Pact, which advocates for greater forest conservation.[12]

English