A working paper for the G20

Smart, Sustainable and Resilient cities:

the Power of Nature-based Solutions

Acknowledgments

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FOREWORD

Italy, as holder of the G20 Presidency, would like to focus attention on the important ecosystem services that nature can provide to urban populations. Nature-based Solutions (NbS) directly address three urgent and fundamental challenges: they improve the quality of life in cities, they reduce the urban ecological footprint, and they increase cities' capacity to adapt to climate change in a cost-effective way.

By accelerating the implementation of NbS, decision-makers can help their cities adapt to the changing climate while also enhancing climate resilience and providing other critical benefits, including cleaner air and water.

Covid-19 recovery plans offer a great opportunity to scale up NbS in cities, with a view to building back better in ways that protect, conserve, and restore our ecosystems and their services, while addressing the social and economic challenges of urban areas and significantly reducing environmental impacts.

By building on the Riyadh (2020) and Osaka (2019) G20 legacy and the full engagement of the membership to pursue concrete climate action, we have paid special attention to smart cities. As the world's centres of innovation and economic dynamism, cities will be critical to defining the path toward a zero-emissions future with resilient and prosperous societies.

To this end, we have focused the G20 work on the evaluation of multiple benefits and how to maximize them with good quality governance. Cooperation across sectors and subnational authorities is key to fostering the integration of NbS into urban, peri-urban and infrastructure planning.

To better reflect the different governance structures in G20 countries, a survey was promoted jointly with UNEP and UNDP to gather information and suggestions from G20 countries at different administration levels. Two events were organized to facilitate exchanges among G20 members on this important topic: the first in collaboration with UNEP on "Resilient, Smart and Sustainable Cities: The power of Nature-based Solutions" (16 April 2021), the second on "Multilevel Governance Approaches to Scale Up Nature-based Solutions in Urban Contexts", organized in collaboration with UNDP and UNEP, and with the contribution of Urban20 and ICLEI (23 April 2021).



Both events highlighted the multiple benefits of implementing NbS in cities and demonstrated that NbS – adapted to local circumstances – can work in all contexts. Scaling up the positive experiences will require further quantification of the breadth of benefits, the integration of NbS into planning processes, as well as innovative business and finance models and smooth multi-level governance.

On the basis of the results of the G20 process undertaken during the 2021, the Italian Presidency is pleased to present this report, which offers an overview of the best practices of NbS implementation in cities. The report also offers a set of guiding principles to improve territorial governance and establish multi-level governance frameworks to increase the impact and coherence of policies and private investments. We would like to express our sincere gratitude to UNEP for its support in preparing this report.

A fundamental climate transition needs to take place in cities. We hope that the report will inspire further action by national governments and city authorities to enhance Nature-based Solutions in cities to reduce their vulnerability to climate change.

Roberto Cingolani

Italian Minister of Ecological Transition

Acronyms and abbreviations

CBD	United Nations Convention on Biological Diversity
CEU	Central European University
C40	C40 Cities
EbA	Ecosystem-based Adaptation
GHG	Greenhouse gas
ICLEI	Local Governments for Sustainability
ILO	International Labour Organization
IUCN	The International Union for the Conservation of Nature
NbS	Nature-based Solutions
SDGs	Sustainable Development Goals
TNC	The Nature Conservancy
UCLG	United Cities and Local Governments
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization
WRI	World Resources Institute
WWF	World Wildlife Fund







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Executive Summary

City life is becoming the default human experience. Cities are engines for development, and increasing urban populations provide connection and opportunity. But cities can also exacerbate some of the world's most serious environmental and socioeconomic challenges.

Cities concentrate millions of people into locations that can be highly vulnerable to disaster, pollution, and the impacts of climate change. Twenty-one of the world's 33 megacities are in low-lying coastal areas: it is estimated that almost 700 million people live in urban or peri-urban areas that are less than 10 metres above sea level. Meanwhile, cities are hotspots for both air pollution and disease. A recent study estimated that meeting WHO air quality standards in 1,000 European cities would save 52,000 lives annually.

For years the story of cities has been a tale of attempting to carve a place for humans outside of nature, but we are increasingly realizing that smart, sustainable and resilient cities need to **harness the power of nature.**

Nature-based solutions (NbS) deliver important ecosystem services to urban dwellers. Examples of NbS include forests, wetlands, green belts and parks in and around cities as well as green infrastructure such as natural wastewater plants, green roofs, green walls, combined non-motorized transport and ecosystem corridors and other green, blue and hybrid infrastructure. These and other nature-based solutions build resilience and reduce disaster risk while delivering many other benefits: climate adaptation and mitigation; clean water and air; cooler streets; and access to green public spaces for recreation and physical, mental and spiritual well-being.

This report recognises there is **no multilaterally agreed definition of NbS**. Instead, it uses NbS as an umbrella concept that encompasses a range of established approaches, such as ecosystem-based adaptation, ecosystem-based management, green infrastructure and blue-green infrastructure and ecosystem-based disaster risk reduction, and so on.

NbS are ready-to-go, (often) low-tech and low-cost solutions for people, planet and prosperity. There is increasing evidence that green, blue and hybrid infrastructure can cost-effectively deliver what otherwise would require expensive grey infrastructure investments or other energy-intensive responses.

NbS can create jobs, and COVID-19 recovery schemes can tap into this potential. But, like any innovation and change, they can require trade-offs and lead to unintended consequences. This underlines the need to communicate better to policy makers and the general public about the opportunities, and also the implications, of NbS action.

This report highlights the multiple benefits that nature-based solutions offer to make cities smarter, more sustainable and more resilient in the twenty-first century...





Initiatives to pilot urban NbS are underway in many countries in the G20. These demonstrate that NbS – when adapted to local circumstances – can work in all contexts. They are providing important lessons on how to protect, sustainably manage, finance, and restore nature in an urban context. Yet these efforts are often piecemeal, underfunded and applied at too small a scale to have a transformative impact. Delivering NbS at scale requires action at all levels of government coupled with public-private partnerships and community engagement.

Quantifying and communicating the benefits of NbS will help to build the **new business and finance models** that are needed to scale up action. Incorporating the benefits of nature into **business accounting** allows the monitoring of impacts of NbS interventions. But environmental financial data, particularly in developing countries, is still missing.

For cities to make peace with nature, we need to design urban infrastructure with nature in mind. To be successful over the long term, NbS have to be integrated into the infrastructure planning process at the earliest stage possible (upstream planning stage) and tailored to local contexts. They also have to take into account the climate impacts that the region will experience. Stronger national policies, procurement guidelines and regulations, as well as technical capacities are needed to create a favourable environment for the effective implementation of NbS.

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The way we design, plan and manage our cities and infrastructure may determine whether we can meet the Sustainable Development Goals (SDGs). Three quarters of 2050's infrastructure doesn't yet exist. We need to integrate nature into infrastructure as we build it. This integration can take many forms, from green and hybrid infrastructure to renewed efforts to reduce the negative impacts of construction materials that put further pressure on climate and nature. The Global Biodiversity Outlook 5 identifies sustainable cities and infrastructure as key to a transition to living in harmony with nature.

The G20 is a powerful platform to accelerate the uptake of nature-based solutions to promote smart, sustainable and resilient cities around the world, including as part of COVID-19 recovery. NbS should be a cornerstone of a green and resilient recovery given its potential to create jobs, provide green space for recreation, and improve urban health.

...and suggests ways to scale up the experiments in urban NbS that are underway in many G20 countries.





Bosco Verticale
(Vertical Forest), Milan, Italy

01 Foundations

City life is becoming the default human experience; more than half of the world's population already lives in cities, and on current trends by 2050 two thirds of a global population of more than 9 billion people will live in urban areas. Cities are becoming an increasingly consequential force in the global ecosystem: already they account for some 75 per cent of global resource and energy use, while producing more than half of global waste and at least 60 per cent of greenhouse gas (GHG) emissions.[1]

This report

This report investigates the potential of nature-based solutions (NbS) to help build smart, sustainable and resilient cities. It draws from more than a decade of research and experience from G20 countries and beyond. It is informed by the rich discussions held by the energy and climate working group of the G20 in March and April 2021, as well as collateral events organized on 16 and 23 April 2021 by the Italian Presidency with the support of UNEP and UNDP.

Section 2 outlines what we mean by nature-based solutions and the multiple benefits they can deliver. Section 3 describes some of the experience that has been gained to date in applying nature-based solutions to urban challenges. Section 4 investigates the systems that need to be in place for NbS to thrive: viable business models and multilevel governance, drawing off a review of multilevel governance among G20 cities and countries (see Annex 1). Finally, section 5 looks to the future and the role of the G20 in deploying nature-based solutions at scale across the world's cities..

Cities on the frontline

Cities allow for economies of scale, delivering services to large numbers of people, driving economic growth and innovation, and creating jobs. But cities are also at the forefront of both the causes and impacts of major environmental challenges such as climate change, pollution and biodiversity loss.

Cities concentrate millions of people into locations that can be highly vulnerable to disaster and the impacts of climate change. Migrants arriving in cities from rural areas are particularly likely to end up in exposed and poorly serviced urban areas. Intense rainfall events put huge strain on urban storm wastewater systems, particularly where large parts of cities have been rendered impermeable by road and building construction. And with 21 of the world's 33 megacities located in low-lying coastal areas, it is estimated that more than 700 million people worldwide live in urban or quasi-urban areas that are less than 10 metres above sea level.[2]

Cities are often hotspots for air pollution, which is a major environmental cause of death worldwide. A recent study investigated the mortality impacts of air pollution across 1,000 European cities. It estimated that compliance with World Health Organization (WHO) guidelines would save more than 52,000 lives per year while reducing air pollution to the lowest levels could save 205,000 lives per year.[3]

Cities offer opportunity and innovation, but are also on the frontline of the planet's most serious environmental challenges: climate change, pollution and biodiversity loss.



Treelined streets in Guangzhou, China[4]

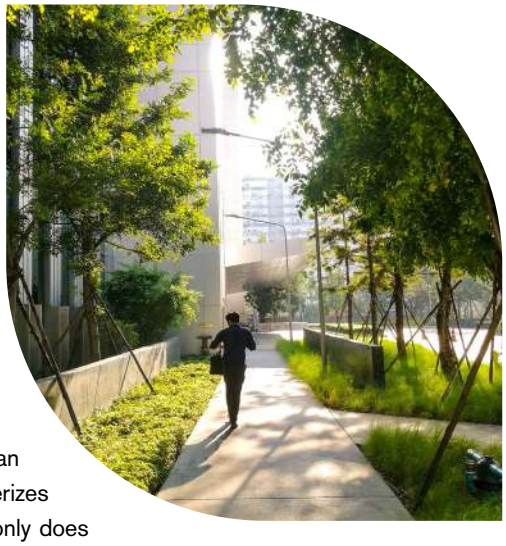
Urban development – both planned and unplanned – drives habitat loss, impacting the very ecosystems on which cities and the health of their citizens depend. Biodiversity is key to maintaining functional ecosystems. Diversity of species supports ecological redundancy and resilience in the face of environmental shifts.[5] Infection rates for zoonotic diseases are reduced wherever landscape fragmentation is low and native biodiversity is high.[6] But losing access to nature also leads to a fundamental disconnect from the social and mental health benefits that nature brings.

A challenge to confront

Disasters in the form of storms, landslides and floods are growing challenges for city authorities, national governments and urban residents alike, damaging infrastructure and disrupting city life. Rising sea levels are increasing the exposure of coastal cities to storm surges. By 2050, 90 per cent of coastal cities will be hit by sea level rise. Meanwhile, droughts, which are expected to become more frequent as climate change progresses, put huge pressure on the water systems on which cities depend. In 2018 Cape Town narrowly escaped Day Zero, the day it would effectively run out of water, only as a result of its citizens enduring months of severe restrictions on the use of water.[7]

But just as cities are at the frontline of the pollution, biodiversity and climate crises, they are just as often at the forefront of our responses to those crises. More than 700 cities from across 53 countries have committed to halve their emissions by 2030 and to reach net zero by 2050.[8] Meanwhile 37 mayors have signed the C40 Clean Air Commitment on behalf of their more than 140 million residents, promising to meet WHO Air Quality Guidelines in their cities by 2030, which could save up to 40,000 lives every year.[9]

Building back better



The COVID-19 pandemic has been a powerful reminder of the importance of living in harmony with nature. It has also underlined the unequal access to urban green spaces that characterizes inequity in many cities.[10] Not only does nature provide food, water and shelter, but connecting with nature in daily life is essential for people's well-being.

The ways that COVID-19 may ultimately affect cities are still unclear. The pandemic did result in temporary reductions in noise, traffic and air pollution. But over the long term there may be consequences for public transport, if, for example, there is a loss of confidence in the health security of shared public spaces. It could also influence the design of office spaces as well as options for urban planning that emphasize interconnected neighbourhoods and the "15-minute" city, a residential urban concept in which all city residents should be able to meet most of their needs within a short walk or bicycle ride from their homes.[11]

COVID recovery programmes offer an opportunity to recalibrate the relationship between cities and nature.

Recovery after COVID-19 offers an opportunity to recalibrate the relationship between cities and nature. Unprecedented fiscal stimulus programmes are being designed and implemented in an effort to help the world economy rebound. Much of this is being directed at major infrastructure programmes, decisions around which will shape the trajectory of sustainability in cities for decades. Economic responses to the COVID-19 pandemic that embrace the notion of "building back better"– could provide jobs and generate economic growth in ways that protect and restore the natural environment, address climate change, promote the energy transition and provide dignified livelihoods to shape a more inclusive society. Doing so could help urban areas adapt to climate change and support biodiversity, and also reduce pollution and other emissions, while improving the well-being of urban dwellers.

02 Building the case

Nature-based solutions (NbS) is a collective term that has come to describe interventions that benefit human well-being while simultaneously supporting biodiversity. They include a broad range of actions that harness the power of nature for sustainable development and that support climate resilience, healthy populations, sustainable economies, green jobs and biodiversity conservation.

Understanding nature-based solutions

There is as yet no single, multilaterally accepted definition of NbS.[12] The most commonly used definition is from the International Union for the Conservation of Nature (IUCN), which defines NbS as *"actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"*.[13] This paper takes the view that NbS is an umbrella concept that encompasses a range of other established approaches, such as ecosystem-based adaptation, ecosystem-based management, green infrastructure and blue-green infrastructure and ecosystem-based disaster risk reduction.[14] However, which term is used is less important than the broad principle of bringing nature into cities for the multiple benefits that it can deliver.

Nature-based solutions are important for urban areas on three levels:

1 **Within cities**, where they can provide natural shading and reduce urban heat island effects and cooling needs, manage run-off water, improve health and well-being by reducing air pollution, and offer recreational spaces;

2 **Around cities**, where they can form part of city-region interlinkages related to watershed management, recreational spaces, wildfire management, reduction and capture of CO_2, sand and dust storm reduction measures; and,

3 **Away from cities**, where nature-based solutions can be applied to the procurement of goods and infrastructure as well as built environment decisions that influence urban supply chains.

Nature-based solutions provide important ecosystem services for residents in cities, around cities and in the supply chains that provision cities.

Examples of urban NbS include:

- **Forested catchments** that provide clean water and store carbon.
- **Urban wetlands** that increase water infiltration and reduce flood risks.
- **Urban and peri-urban farms** that reduce food miles and connect people to the food they eat.
- **Parks, tree-lined streets, green roofs and building facades** that mitigate the urban heat effect and accelerate water drainage while reducing noise pollution, air pollution, and energy demand for cooling.
- **City parks** that connect people to nature, provide recreational space and islands of biodiversity.
- **Mangroves, dunes and healthy reef systems** that protect coastal cities from storm surges.[15]
- **Tree-shaded walking and cycling paths** that provide combined ecosystem and mobility corridors, particularly when linked to city-wide public space networks.[16]

In July 2020, the IUCN launched the Global Standard for NbS as a tool to help governments, communities and businesses implement strong, effective NbS projects.[17] The IUCN proposes eight criteria, which are gauged through 28 indicators for the NbS standard.[18] These criteria help users to assess the extent to which a proposed solution qualifies as a Nature-based Solution, and to build adaptive management mechanisms that maintain the relevance and robustness of the intervention throughout its lifespan.[19]

Multiple benefits of nature-based solutions

Well-implemented nature-based solutions offer multiple benefits: resilience and avoided losses; economic gains and long-term growth; and essential social and environmental services. But maximizing these multiple benefits of NbS, requires that we understand, value and track them. And putting them into action depends on the quality of governance, the level of political will and citizen engagement and the effectiveness of the planning, design and management of the different approaches. Ultimately the success of NbS programmes often turns on how well local city authorities are able to interact with state or national governments to ensure the coherence and complementarity of policies and actions at different scales.

Resilience and avoided losses

NbS help to increase resilience and avoid losses – saving billions of dollars every year by protecting communities and infrastructure from flooding, heatwaves, and storm surges.[20] Singapore's Active, Beautiful, Clean Waters (ABC Waters) initiative, for example, has instituted a programme of "naturalising" (restoring) its waterways to lower flood risks. This reduced the flood-prone area from 3,200 hectares to 32 hectares, saved an estimated $390 million in water costs annually and successfully encouraged communities to take ownership of Singapore's waterways and water bodies, with 321 active partners adopting ABC Waters sites.[21]

In urban areas, vegetation significantly reduces air and noise pollution. By one estimate urban trees in 10 of the world's megacities generate $482 million per year in health cost savings as a result of the reduction in pollutants.[22] This link has come into even sharper relief in light of the COVID-19 pandemic, where a strong correlation has been shown between air pollution (especially concentrations of PM2.5 particulates) and the health consequences of COVID-19 infection.[23]

In Kenya, meanwhile, the Tana River provides 80 per cent of Nairobi's drinking water and 70 per cent of Kenya's hydropower. However, unsustainable agricultural practices are accelerating costly erosion and sedimentation. One study suggested that investing in sustainable land management practices in the delta region would deliver an estimated return of $21.5 million over 30 years as a result of increased power generation and agricultural crop yields, and savings in water and wastewater treatment.[24]

Nature-based solutions in cities can be cost-effective approaches that provide multiple benefits: climate resilience, healthy populations, sustainable economies, green jobs and biodiversity conservation.

Economic benefits

NbS offer important economic gains. These include jobs, cheaper infrastructure, business productivity, tourism and recreation value, as well as long-term economic growth associated with increasing food and water security.[25]

Worldwide ecosystem services are worth an estimated $125 trillion annually.[26] Green or hybrid infrastructure can help to bridge the multi-trillion-dollar financing gap for global infrastructure. While developing green or hybrid infrastructure may require more time and labour at the outset, this kind of investment tends not to depreciate over time and, if given time and space, will keep growing. A 2015 study that examined 25 case studies of projects in urban regions, estimated that each hectare of urban green area provided a range of between $3,000 and $18,000 of benefit every year in terms of carbon storage, stormwater reduction, and pollution removal.[27]

NbS also offer an opportunity to quickly support "no harm" jobs which also support the transition to a more sustainable economy.[28] The International Labour Organization (ILO) and the World Wildlife Fund (WWF) argue that NbS can be harnessed to create employment while simultaneously protecting nature, mitigating climate change and making communities healthier and more resilient. The report estimates that up to 750 full time equivalent jobs can be created in developing countries for every US$ million invested in NbS activities.[29] Meanwhile, low-carbon and climate-resilient investments deliver far higher economic returns than investment in traditional infrastructure and fossil fuels.[30]

Social and environmental benefits

Besides these economic benefits, NbS offer essential social and environmental services. These range from cleaner air and water, to increased habitat for endangered species, to corridors for pollinators, which improve the health of both people and the planet.[31]

Natural spaces and green infrastructure can reduce soil erosion and protect riverbanks while reducing run-off and thus safeguarding water quality. Given that nearly a third of the world's 105 largest cities depend on protected forests for their drinking water, management of those water catchments is critical for the provision of fresh water to millions of urban residents.[32]

Green spaces and natural corridors encourage the biological and ecological connectivity that animals and plants need to survive and thrive.[33] Nurturing green spaces and corridors across cities and towns can help to piece back together the natural mosaic that has been so damaged by habitat fragmentation.[34] NbS can also strengthen the social mosaic of communities, providing a sense of inclusion, belonging and community. This can translate back into real economic returns: the resale value of apartments overlooking New York's High Line park which was redeveloped starting in 2008, have risen much faster than those from just surrounding areas.[35]

Urban natural spaces provide important mental and physical health benefits. Access to green space has been statistically linked to reduced mortality and improved, perceived and actual health benefits.[36] Furthermore, tree shade and evapotranspiration can reduce temperatures by 7-15°C, thus reducing the negative health impacts of the urban heat island effect. Research has shown that urban trees can reduce the air conditioning costs of buildings by between 20 per cent and 50 per cent, while also lowering the greenhouse gas emissions associated with mechanical cooling.[37]

Value for money

Finally, NbS interventions are often highly cost effective. The best-known example occurred in New York City in the 1990s, when the city's water supply was deteriorating. Instead of spending billions on water treatment plants the city invested in protecting the Catskills and Delaware watersheds which produce 90 per cent of the city's water supply. And the project worked: saving the city more than US$ 300 million per year on water treatment operation and maintenance costs.[38]

An analysis of the options for improving water quality in Portland, Maine (USA) found that protecting the health of the watershed would be 51 per cent to 76 per cent cheaper than installing a conventional filtration system (at an estimated cost of between $100 million and $150 million). It would also bring other benefits such as sequestering carbon and providing a habitat for salmon habitat that were estimated to be worth between $72 and $125 million over 25 years.[39]

Other examples abound. Singapore has a high level of biodiversity thanks to urban greening and biodiversity conservation programmes. Studies suggest that greening cities reduces healthcare costs and energy consumption while preventing combined sewer and stormwater overflow events. The late founding Prime Minister of Singapore, Mr Lee Kuan Yew said that "greening is the most cost-effective project I have launched".[40]



Garden by The Bay, Singapore

Figure 1: What nature can do for cities



03 Building the experience

Cities have harnessed nature-based solutions for a long time. Mangrove restoration for coastal defence, for example, has taken place since the early 20th century. However, an appreciation of their potential at a large scale has grown over the past two decades.[42]

Cities are gathering valuable experience in how to protect, sustainably manage, finance, and restore nature in an urban context. The solutions are as varied as the contexts in which they are being applied – from regreening urban centres in Italy (see case study 1) to fostering 'sponge cities' in China (see case study 2). But other examples abound:

- **Jakarta and Mexico City** are investing in massive tree-planting campaigns to improve air quality.[43]
- **Rotterdam** aims to be 100 per cent climate proof by 2025. By mixing grey and green infrastructure, with a focus on adaptive measures to capture rainwater and slow drainage, the authorities are aiming to build a waterproof city.[44]
- In **Tanzania** a mixture of grey infrastructure (sea walls) and green infrastructure (rehabilitation of mangroves, coral reefs and vegetation-stabilized shoreline) is strengthening disaster resilience for Dar es Salaam, directly benefiting 430,000 people.[45]
- For the last decade **Singapore** has had a Landscaping for Urban Spaces and High-Rises (LUSH) programme, which aims to encourage more greenery in the built environment; support rooftop urban farming; set Green Plot Ratio standards for private developments; and count vertical greenery and green roofs towards the Landscape Replacement Area requirements.[46]
- **Lisbon** is developing the Main Green Corridor project to provide ecological connection, improve air quality, reduce traffic and support non-motorized transport options.[47]
- The "CityAdapt" project in **San Salvador** is restoring coffee plantations and digging infiltration ditches aiming to reduce flood risks for 115,000 people by 2022.[48]
- The **UK** government has announced that future flood defence efforts will include nature-based approaches such as grassland restoration, the creation of buffer strips, and allowing rivers to flow more freely across the landscape.[49]
- In **Kathmandu** the urban poor regularly face food price inflation because of poor transport connections, a predominance of food imports and increasing climate instability. In response, the city piloted rooftop gardens with rainwater-harvesting systems, increasing residents' food and water security.

Cities across the G20 are experimenting with nature-based solutions.



Coastal defences on the River Orwell Suffolk, United Kingdom, a traditional sea wall and a "nature like" constructed mudflat that not only protects the sea wall but also provides wildlife habitat.

CASE STUDY 01

Urban forests and nature-based solutions in Milan, Italy

The city of Milan in northern Italy has a population of nearly three million people spread over an area of more than 1,500 square kilometres.[50] An industrial and economic powerhouse, Milan also struggles with urban air pollution and a hot and humid climate in the summer, when temperatures in the city can be six degrees centigrade higher than in surrounding areas.[51]



The metropolitan area of Milan deploys nature-based solutions in a number of innovative ways. One such example is the expansion of urban greenery to cool the city. Heat mapping surveys have enabled the city to focus its tree-planting efforts in the hottest neighbourhoods, and the local administration has committed to plant three million trees by 2030.[52] In 2019 the city inaugurated the "Tree Library", a large park developed in what was previously a concrete square in the business district and which is now home to hundreds of trees. It is estimated that the 30 per cent expansion in urban tree cover could absorb 5 million tons of carbon dioxide every year while reducing PM10 small particles by 3,000 tons over the next ten years, with significant benefits for the population's health.[53]



A second example is a plan to renaturalize up to 41 old quarry sites, through the metropolitan area's "quarry plan", a territorial planning tool that helps to locate the quarries, define the extraction volumes and develop mechanisms for environmental recovery after extraction has finished. A third is the provision of community gardens in municipally owned areas upon request of groups of citizens.[54] A fourth is the integration of nature directly into new buildings. An example of this is the architect Stefano Boeri's Vertical Forest, which consists of two residential blocks built in 2014 that feature 800 trees, 15,000 plants and 4,500 shrubs that cover every balcony. The blocks provide an oasis of nature in one of the most densely packed areas of the city, attracting more than 20 species of birds and absorbing 30 metric tons of carbon dioxide each year.[55]



There is clearly a surge of interest in the potential of NbS in cities. A degree of momentum is building. But harnessing the power of nature in cities is not something that happens naturally. It must be planned and requires local, city and national authorities to cooperate to make it happen.[56]

While important lessons have been learned about what works, several barriers need to be overcome for nature-based solutions to deliver transformative change.

Barriers to mainstreaming NbS

Some good practices and initiatives are in place, but these efforts are often piecemeal and uncoordinated.[57] If only implemented as stand-alone urban experiments, the full potential of NbS to address complex environmental and social challenges will not be realised. Mainstreaming NbS broadly at scale faces four barriers to do with perception, policy, timing and finance.

The first barrier is the perception among some policy makers (and the people who elect them) that nature is too slow, too soft and not a real part of the solution. There is still a strong assumption in many cities that progress requires construction and concrete, rather than trees and tracks.

The second barrier is that innovative NbS may be blocked by out-dated building codes, construction standards or planning guidelines. This often means that NbS can be ignored in key policy and infrastructure decision-making processes, which blunts their potential for significant change.

The third barrier is around timing. In essence there is a disconnect between the often short-term character of municipal initiatives and the long-term investments that nature-based solutions require. Trees, for example, need not just to be planted, but also to be managed over the long-term.

The fourth barrier is finding the necessary finance to power the large-scale deployment of NbS. Environmental features, such as wetlands, rivers and parks, tend to be seen in municipal budgets as costs to be serviced rather than assets whose multiple social, economic and environmental features benefit the city. These benefits might be shared across the entire city in terms of health outcomes, reduced energy needs and lower disaster impacts, but the costs of investment and upkeep tend to be concentrated, typically falling to the city parks authority, whose budget may be seen as largely optional, to be sacrificed in times of hardship.





CASE STUDY 02

Sponge cities in China

After decades of rapid urbanization, overexploitation and pollution, many urban areas in China face serious water shortages interspersed with periodic floods that are made worse by the climate crisis. Between 2007 and 2016, water-related issues led to estimated losses of more than $36 billion every year.[58]

In 2014 the Chinese government introduced the idea of 'sponge cities' to address urban flooding by increasing rainwater permeability in vulnerable cities. Sponge cities are a context-specific urban approach to integrated water resource management that use grey-green infrastructure like waterways and greenways, green roofs, porous design and water-saving approaches to control urban flooding, limit water pollution, recycle rainwater and reinstate degraded environments.[59]

The government chose 30 cities as pilots. The goal is to retain as much water as possible during the wet season by limiting erosion and slowing run-off so that it is absorbed into the surrounding soils and drainage systems and available to meet needs when droughts hit.[60]

While the initiative shows significant promise for the integration of NbS in urban design, a review of the pilot phase



of the initiative also pointed to several important lessons. First, differing water and land-use policies and property rights made regulation and implementation complicated. Second, the lack of comprehensive standards and national guidelines meant that some of the essential low-impact green infrastructures needed for sponge cities were not readily available for use. Third, the local climate proved critical. In some areas, for example, cold winter temperatures can kill off some of the more effective green infrastructures such as vegetation buffers. Lastly, financing the initiative proved challenging. Central government covered roughly 15 per cent to 20 per cent of the total costs but cities varied in their ability to harness public-private partnerships to make up the remaining amounts.[61]

Trade-offs and unintended consequences

Meanwhile, it is important to acknowledge that NbS initiatives can also involve trade-offs and unintended consequences if they are not planned carefully. Trade-offs can occur, for example, if expanded green spaces lead to increases in unwanted organisms such as mosquitoes, resulting in negative impacts on human health and local ecosystems.[62] Implementing NbS may also involve trade-offs between different sectors, if, for example, agricultural areas are used as temporary reservoirs for flood management, transferring, in effect the risk of flooding from urban dwellers to the affected farmers.[63] This just goes to underline that NbS interventions happen within a social context: they are not inherently socially just. Depending on how they are planned, where they are implemented (e.g. only in richer neighbourhoods?), and how well they are maintained they can alleviate, or exacerbate, existing socio-economic inequalities.[64]

Well-intentioned NbS projects can also lead to a series of unintended consequences - particularly when an approach that has been developed in one climate is translated into a completely different climatological context. For example, urban tree planting that unwittingly uses invasive species, or species that are not adapted for the local climate can damage soil and biodiversity or draw precious water from local communities. Likewise other projects have led to the (re)connection of highly polluted rivers with floodplains, which has contributed to the diffusion of pollutants across agricultural areas and into groundwater.[65] This all goes to emphasise the importance of taking the local ecological and social context as well as future climate projections into account when NbS interventions are being planned and implemented.

04 Building the systems

Cities need to move away from business-as-usual urban planning and move towards urban design that is nature-sensitive. Building the right systems to govern, manage and finance NbS in cities across the G20 will help to maximise their benefits, resolve any trade-offs and avoid unintended consequences.

Multi-level governance: Building Nature-based Solutions, together

Ecosystems cut across administrative boundaries. It follows that central, regional and local governments need to work together to develop appropriate strategies, to find the necessary funding and to share knowledge among all actors involved (see Annex 1).[66] Promoting vertical governance (i.e. at local, regional and national levels) as well as horizontal governance (i.e. among cities or different sectors) can help to ensure that local experimentation informs a long-term approach to sustainability.

The need for a national strategy

Many local and central governments recognize the importance of establishing a national strategy to scale up urban NbS. This is particularly important given that cities are, in effect, responsible for delivering at least part of the national-level commitments that countries have made under the UN Framework Convention on Climate Change (UNFCCC), the UN Convention on Biological Diversity (CBD) and the Sendai Framework on Disaster Risk Reduction.



Bandung, Indonesia



New York, USA

Local and national governments should work together to craft the right mix of incentives and regulation to create a supportive environment for the widespread application of NbS.

Such strategies should include elements such as:

1. Linking policy with economic and infrastructure planning;
2. Creating repositories of experiences on NbS to promote best practices;
3. Establishing dedicated funding windows and including criteria in existing ones;
4. Setting up cross-cutting working groups engaging relevant ministries, departments and agencies, central and local governments and their associations, as well as private sector and financial stakeholders.

The national strategy also needs to:

1. Recognise NbS as an important tool in urban sustainability and resilience;
2. Define the scope of NbS covered;
3. Develop local impact assessment techniques;
4. Introduce procedures to ensure NbS are incorporated into land use and infrastructure planning and decision-making;
5. Identify mechanisms to gather data, to build on cities' experience and practice and create synergies and knowledge;
6. Monitor and report on the uptake of NbS at the local level to reflect trends and impact; and
7. Promote NbS as part of a commercially viable system, to ensure sustainable financing for the maintenance and management of the solution.

Ultimately the process of creating the national strategy can be as important as the outcome. Doing it well involves encouraging cross-sectoral collaboration and the co-design of NbS approaches, facilitating participative processes and fostering cooperation on science, data and knowledge management. It requires facilitating better inter-departmental cooperation, enhancing the role of city networks, aligning communication and awareness-raising initiatives and coordinating monitoring and evaluation systems. Involving citizens, the private sector and all levels of government in defining a common vision for nature in cities is key.

In essence, NbS bring nature back into cities, link ecosystems between urban and rural areas and ensure greater sustainability of urban supply chains. Diverse ecosystems require just this type of comprehensive approach. Annex 1 offers some more detail on principles that can guide the development of multi-level governance approaches to scaling up NbS.



Warsaw, Poland



Removing barriers to expanding NbS in cities

Perception barriers

Awareness of the potential for NbS to enhance life in cities needs to shift at every level -- from civil servants in planning departments, to individual developers, to citizens choosing the priorities for their own city. Involving environmental experts in the planning and design of urban areas can be an important way to shift the conversation about the role of nature in cities.

Policy barriers

NbS are not yet widely recognized, and consequently supportive legislative frameworks do not exist in many places. Without a standard definition of NbS, it is difficult to develop methods of implementation or evaluation techniques. For this reason, defining the characteristics of NbS at the national level is an important element of removing barriers to scaling up these types of solutions. This needs to be complemented by local impact assessment techniques. Regulation needs to provide flexibility to cater for the requirements of green infrastructure that may vary by location or climatic conditions, and over time.

Capacity barriers

The lack of capacity is another barrier. Access to evidence-based best practices, sharing lessons learned and practical online training modules are practical ways to facilitate the scaling up of NbS in cities.[67] In particular, it would be useful to share methods of validating and measuring the impact of investment decisions on people and the planet.

Financial barriers

Promoting and supporting small local businesses in deploying NbS will stimulate innovation and generate employment opportunities. By creating jobs, NbS can very rapidly bring tangible benefits that can reduce any remaining resistance. NbS can also be used to deliver on specific environmental targets; establishing and measuring related indicators can help to prove the impact of this approach, which could reduce any financial barriers. Improving sustainable finance standards for NbS in cities is also critical to unlocking private capital, as is being clear about the risk-return profiles of key NbS business models.





CASE STUDY 03

Urban farms, Brussels, Belgium[68]

Brussels has set a target of sourcing 30 per cent of its food locally by 2030. The commune of Anderlecht, in the Brussels region, has worked to rehabilitate abandoned commercial sites while also boosting the provision of local food.

The BIGH (Building Integrated Greenhouses) Farms project, which is building a network of urban farms, is part of the way that Anderlecht is trying to deliver these twin goals. BIGH's design integrates aquaponics into existing buildings to reduce the site's environmental impact. Farms are linked to the building operation and benefit from any energy surplus, in effect reducing the building's CO_2 emissions.





Such urban agriculture locates food production closer to consumers, increases the sustainability of the value chain and delivers community benefits. BIGH Farms partners with local businesses and growers to make sure the farm's production is complementary to the existing food supply. And by supporting a circular bioeconomy, such urban farms can catalyze waste reduction and climate benefits. The pilot farm includes a fish farm, a greenhouse and over 2,000 square meters of vegetable gardens. In 2018, it started producing microgreens, herbs, tomatoes and fresh fish.

Business models

If multilevel governance provides the structure in which NbS could flourish, the private sector needs to help drive that change. Indeed, historically, a lack of private sector investment has inhibited the large-scale deployment of NbS.

The involvement of governments in creating an enabling environment for NbS is essential. For example, governments can provide tax breaks, subsidies, gap-funding programmes and risk-mitigation tools to encourage the private sector to engage. Local capital and sustainable finance markets that favour carbon finance or the issuance of green bonds are also helpful.[69,70] Beyond common financing models such as Public Private Partnerships (PPP), cities can think more broadly about how governments can secure ownership to ensure project quality. This can be achieved through, for example, local taxes or bonds, but also through land value capture and non-financial incentives such as green plot ratios, green procurement policies, etc.

But protecting nature and enhancing ecosystem services also needs to become a feature of business in cities, wherever possible. There are a variety of business models for scaling up NbS in commercially viable ways. These vary depending on the cost-benefit profile of the solution, the stakeholders involved, the types of capital and financing approaches needed, as well as the role of public-private partnerships. Some models have already incorporated such features, as illustrated in table 1.

Nature is good for business, and businesses can champion the spread of NbS in cities.

Examples of NbS embedded in commercially viable business models include hotel companies promoting urban ecotourism through green hotels;[71] the development of urban farms in Brussels, including aquaponic farms for fish production (see Case Study 3) and company models in inner Mongolia, China that combine landscape restoration with real estate development in the Kubuqi desert.

Table 1: Examples of commercially viable and self-sustaining Nature-based Solutions in cities

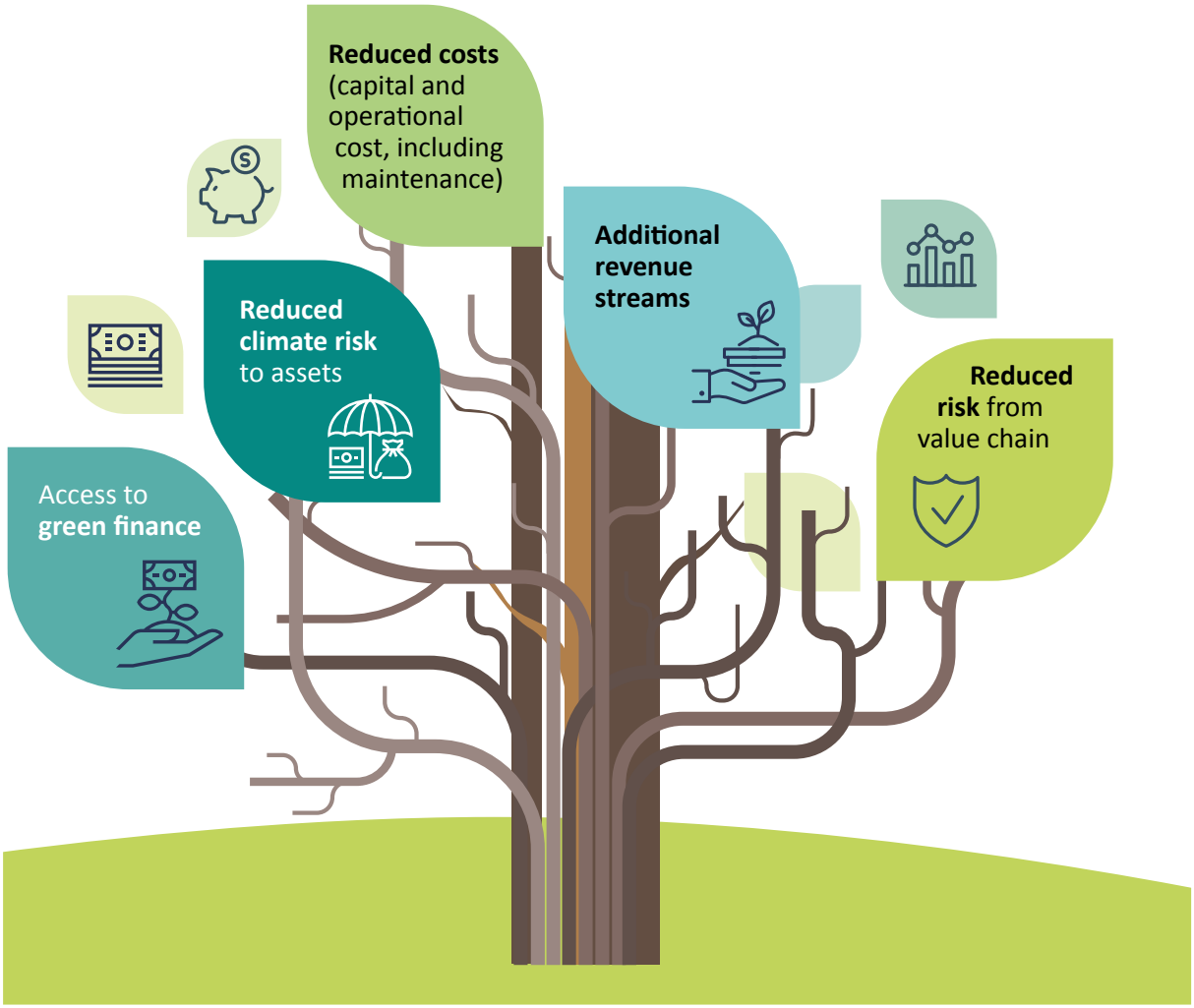
NbS types (non-exhaustive)	Lead private sector operator	Main revenue source	Avoided costs / indirect benefits	Government role / relevant policy instrument	Innovative finance sources
Urban and peri-urban sustainable agriculture	Farmers and cooperatives	Sustainable food products, with a price premium for organic products	Pollution from pesticides	Land use rights and/or land leases; organic market promotion	Carbon finance, if mitigation benefits of climate smart agriculture practices are proven
Water purification (catchment protection)	Water treatment company	Water-user fees	Savings on water treatment infrastructure / water quality and availability	Permits to operate; (possible) subsidies to support customer willingness to pay	Payments for ecosystem services[72]
Peri-urban ecotourism & recreation (protected areas)	Tourism operators, peri-urban national parks and protected areas	Entrance fees in protected areas	Health benefits, biodiversity	Biodiversity conservation policy; concession mechanism	Endowment fund; carbon finance if mitigation benefits are proven
Urban ecotourism	Hotels	Hotel nights	Savings from cost-efficient green infrastructure / biodiversity and health benefits	Standards; regulate the sustainable finance market	Corporate green bonds (hotel group)
Green housing	Real estate promoters	Real estate sales	Savings from cost-efficient green infrastructures / premiums from biodiversity and health benefits	Standards; regulate the sustainable finance market	Land capture value;[73] corporate green bonds (real estate group)



NbS business benefits

Under the right conditions, implementing NbS can provide business actors with very real competitive advantages (see Figure 2). Companies integrating NbS in their operations can get a variety of benefits, including reduced costs, new sources of revenue, lowered climate risks, sustainability in their value chain and access to sources of green finance (such as carbon finance, green bonds[74], concessional loans from green funds,[75] and urban framework loans[76]).

Figure 2: Nature means business



New horizons

Making technical knowledge on NbS more easily accessible to private sector companies is critical to a wider take up of NbS by key economic actors. Processes to allow for co-creation of enabling frameworks will unlock the engagement of the private sector, public and private finance partners, and communities. Ongoing research is tackling a number of issues:

- The use of economic analysis methods such as cost-benefit analysis that can help to identify revenue-generating models.
- Dataset development on the costs and benefits of NbS in cities.
- Identification of innovative business models, alongside co-creation of supporting policies and technical standards that are critical to engaging the private sector and mobilizing finance.
- Innovative financing arrangements to capture value that is shared and dispersed across public and private sectors.

Narrative, inclusion, managing and measuring

Developing the right governance mechanisms and a strong business case for NbS are essential to helping the concept achieve its potential. But at the same time, those implementing urban NbS projects need to ensure they are designed, managed and monitored in partnership through a process that fully engages and builds on local knowledge and generates local benefits.

Getting the narrative right

It can be challenging to distill a complex, multi-layered issue such as context-specific NbS into a clean, comprehensible concept. However, communicating the real advantages of NbS for communities is key to moving beyond isolated pilot cases.

Let the numbers talk

Part of that narrative is the importance of quantifying benefits of NbS on economic terms, including issues such as job creation. Specifying financial returns is also key to attracting investment. This requires a clear understanding of (1) the build cost for different interventions, as distinct from their maintenance costs, including life-cycle management, procurement and public communication, and (2) the business models that can provide information on possible cashflow options for different approaches.

Engage all stakeholder groups

As with any other public policy, including citizens in the different stages of planning and implementation is the best strategy for the policies' success. This also requires taking into consideration indigenous knowledge, engaging local communities and involving youth. Grassroots movements have been responsible for implementing NbS themselves for a long time before public action. Finally, it is necessary to include the financial and private sector to increase the public budget and private investment for NbS (research, implementation and evaluation), especially given that the technical knowledge is often in the hands of the private sector.





Measuring impact

Still, turning the general awareness of the potential of NbS into on-the-ground investment requires robust methodologies to assess the costs and benefits of different interventions. This kind of analysis is crucial to making the case for implementation. However, this requires that appropriate indicators are chosen to bring out these benefits, such as green cover ratios, change in temperature, job creation, mobility shifts and so on. In particular, the increasing availability of digital technologies allows us to better identify the opportunities for action.

A common monitoring framework would allow countries to better capture and track the uptake of NbS in cities. Given the diverse nature of NbS, this requires a set of appropriate indicators. Several efforts are underway to develop such indicators. The International Union for the Conservation of Nature (IUCN) is developing an urban nature index which is due to be launched at the September 2021 World Conservation Congress in Marseille. The Convention on Biological Diversity, meanwhile, is developing a City Biodiversity Index in collaboration with Singapore. The global "CitiesWithNature" initiative is recognized by the CBD as the future accredited commitment and reporting platform for cities on biodiversity and nature. It will launch its dedicated commitment platform for cities ahead of the CBD COP15 and the new Global Biodiversity Framework to be adopted at COP15, in support of new national targets. It is also a mechanism to help deliver under the UN's Decade on Ecosystem Restoration.

What's measured gets managed. Monitoring the impact of NbS will help to improve their implementation and make the case for expanding their use.

Ho Chi Minh City, Vietnam





Beehives on the roof of a building in the city center



Rotterdam, The Netherlands

05 Building the future

The decisions that city authorities take now will shape their sustainability and prospects for decades. It is estimated that as much as 75 per cent of the infrastructure that will exist in 2050 is yet to be built.[77] The next wave of urbanization will take place predominantly in low- and middle-income countries, which are expected to account for 90 per cent of future urban growth,[78] with much of it in medium-sized cities.

Harnessing the power of nature in cities could help to strengthen the resilience of billions of urban dwellers to climate change while delivering multiple benefits in the form of cleaner air and water, reduced cooling needs, access to nature and wildlife and so on.

But if nature is to deliver on its potential then governments at all levels need to intentionally align their policy, planning, regulations, incentives and institutional arrangements to meet that goal. Governments across jurisdictions also need to work together if they are to deliver meaningful impact at a landscape scale.

Collectively, we need to find ways to value nature in cities, and to support learning, to encourage the uptake and upscaling of NbS, to develop innovative approaches to multilevel governance, all while finding new ways to talk about, finance and sustain NbS interventions.[79] We need to show that, managed well, nature in cities is not a cost but an enormous social, environmental and economic asset.

Hosting many of the world's best known, most dynamic and most innovative cities, members of the G20 have both the opportunity and the responsibility to encourage the uptake of nature-based solutions in urban areas around the world.

This year, we face critical choices: decisions taken in international meetings on climate and on biodiversity will set an institutional path for cities for decades to come. Cities need to continue to demonstrate that they are the drivers for the sort of changes that the international processes are aiming to achieve by helping to meet national commitments.

Meanwhile, efforts to "build back better" after COVID-19 offer an opportunity to recalibrate the relationship between cities and nature. The temporary dispersal of populations and the decrease in property values during the COVID-19 pandemic might provide an opportunity for municipal governments to increase the acquisition of public green space. And infrastructural investment has roared back as an issue of international significance as countries look to provide economic stimulus.

For millennia, cities have demonstrated their capacity to reinvent themselves. For too long the story of cities has been to endeavour to carve a space for humans outside of and separate from nature, to control it, to banish it from lives of urban dwellers. And yet, we are realizing that most of us cannot live healthy and fulfilling lives without nature.

Cities must now use their untapped power to stand up for nature. Designing more sustainable and more liveable neighbourhoods requires the integration of natural and artificial systems. The stakes are huge. Ultimately, the way we design, plan and manage our cities will largely determine whether our economies and societies will be able to meet the Sustainable Development Goals and reduce inequality.

It is clear that a fundamental transition needs to take place in cities. Many of the existing best practices are cost effective and readily available. However, this has not always translated into action by national governments or city authorities. While we have gathered experience in how to deliver NbS, it is clear that implementation needs to be urgently

scaled up. We need to act quickly, and with new levels of ambition, if we are to be successful. We need to see the future of cities through the lens of nature.

Political momentum for NbS is apparent in the 2016 New Urban Agenda, in the 2019 Climate Action Summit's NbS Manifesto, in the 2019 UNCCD Delhi Declaration, in the 2020 "Leaders Pledge for Nature", and in the 2021-2030 Decade on Ecosystem Restoration where it is highlighted by the 5th Global Biodiversity Outlook published by the UN Convention on Biological Diversity and UNEP in 2020. In July 2020 IUCN launched the first-ever global standard on NbS to facilitate implementation, which was another milestone in the emergence of NbS as a mainstream topic.

The G20 is an important platform to build on this momentum and to accelerate the uptake of nature-based solutions to promote smart, sustainable and resilient cities around the world. This can be done by collectively recognizing the multiple benefits of NbS and the role of cities in meeting national commitments to multilateral environmental agreements and by G20 members individually embedding the power of nature into relevant national plans and planning processes.



Central Park[80]
New York, USA



Rooftop gardening, Canada



Munich, Germany

A1 Annex 1 – Principles for Multilevel Governance

Many governments, cities, networks and organisations are working to roll out nature-based solutions in urban areas. They are thinking through the ways in which multilevel governance can support this.

Between March and May 2021, in order to capture some of this collective wisdom, UNDP and UNEP surveyed the experiences and perspectives of 13 countries and 19 local and regional governments in the G20.[81] This was complemented by discussions with different G20 member states and local government networks, including a dedicated webinar.[82] From these rich inputs we draw five broad "features" or "principles" for the effective multilevel governance of nature-based solutions in smart, sustainable and resilient cities, accompanied by actions and considerations that can help deliver those principles.



Principle 1: Promote NbS as integral elements of climate change mitigation and adaptation strategies

Get the narrative right:

- Design by nature is part of the new normal, NbS are a necessity and not an option.
- Remember that nature is part of community life and cannot be separated from social and economic issues: the multiple benefits of NbS are the essence of the business case and NbS can be a tool to solve social problems on top of environmental problems.

Develop a national strategy:

- Central and local governments recognize the importance of establishing a national strategy to scale up NbS in cities. National strategies need to:
  1. Recognize NbS as an important tool in urban sustainability and resilience;
  2. Define the scope of NbS covered;
  3. Identify mechanisms to gather data, to build on cities' experience and practice, create synergies and knowledge; and
  4. Include ways to monitor trends in the uptake of NbS.
- Such strategies should:
  1. Link policy with economic and infrastructure planning;
  2. Create repositories to share best practices;
  3. Establish dedicated funding windows and including criteria in existing ones;
  4. Set up cross-cutting working groups engaging relevant Ministries, departments and agencies, central and local governments and their associations.
- The process of creating a national strategy can be as important as the outcome. Involving citizens and governments at all levels and in all the stages of defining a common vision is key to change the perception of NbS as an innovative solution (rather than a traditional and low-tech option), to bring to fruition the multiple environmental, social and economic benefits of NbS, and ultimately to help scale up of successful urban experiments.

Principle 2: Quantify the multiple benefits of NbS and recognise those benefits in policy instruments, such as planning guidelines, infrastructure standards and building codes.

Let the numbers talk:

- Quantify benefits of NbS in economic terms (including job creation).
- Establish clear guidelines and criteria that NbS projects must comply with.

Remove policy barriers:

- NbS are not yet widely recognized as a stand-alone tool, so legislative frameworks do not exist.
- Without standard definitions, no methods of implementation, no evaluation techniques of NbS impact can exist.
- The first requirement is to recognize NbS as an important tool in urban sustainability and resilience, define it in standard documents, and attempt to develop local impact assessment techniques.
- Regulation needs to adapt to provide for flexibility to adapt to requirements of green infrastructure that may change from location/geo-climatic conditions and over time.
- Breaking the silo approach: make cross sectoral collaboration around innovative service delivery arrangements and cross cutting projects is usually very difficult and reliant on individual effort and championship.
- As with any other public policy, including citizens in the different states of planning and implementation is the best strategy for sustainability.

Principle 3: Share experience with NbS through dedicated peer-to-peer learning processes

Remove capacity barriers:

- The lack of capacity is still a strong obstacle for scaling up: training and exchange opportunities for public servants and private sector experts is paramount as internal resistance from people unwilling to change is often a major barrier.
- Sharing methodologies to validate and measure impact of investment decisions on people and planet would be useful.
- A good way to start is always to pilot NbS solutions to raise awareness and interests, as well as experience to inform scale up.

Principle 4: Design mechanisms that help overcome the "wrong pocket problem", across line ministries and departments, across national and local government, and bridging between benefits for the community and private sector investments

Remove financial barriers:

- NbS expansion requires measuring building cost versus maintenance cost, including life-cycle management, procurement and public communication.
- Measuring impact and communicating the real advantages of NbS for communities is also key.
- Promoting and supporting small local businesses will contribute to creating local employment and local innovation. The job creation element rapidly shows tangible benefits for communities, which generates support and is able to remove many resistances.
- Setting specific targets for NbS within urban development process can also help, measuring and establishing indicators to encourage using NbS to deliver on specific environmental targets.

Principle 5: NbS are designed, implemented, managed and monitored in partnership through a process that fully engages and builds on local knowledge and generates local benefits.

Engage all stakeholder groups:

- Take into consideration indigenous knowledge and engage communities. Grassroots movements have been responsible for implementing NbS themselves for a long time before public action.
- Incorporate the financial and private sector to increase the public budget and private investment in NBS (research, implementation and evaluation).
- Involve the youth and marginalised groups.
- Facilitate better inter-departmental cooperation and enhance the role of city networks.

Lead by example:

- Set targets and indicators to measure impact.
- Include NbS as a requirement in infrastructure procurement.

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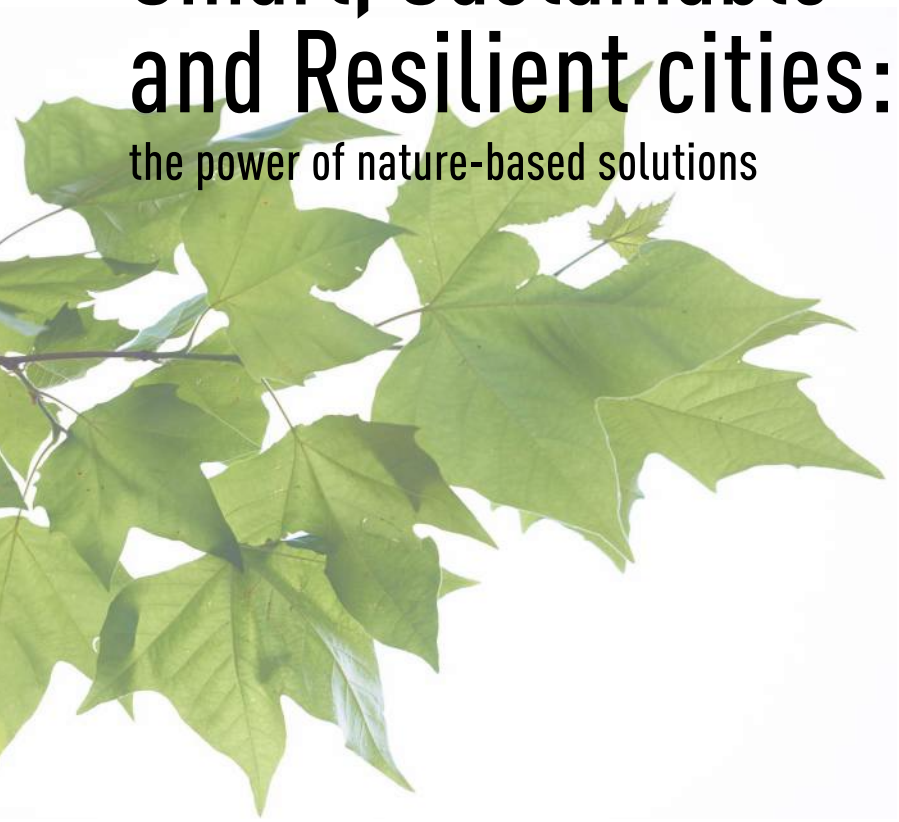
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66 The following compilation of ideas and suggestions emerge from the discussion with different G20 member states and local government networks during the months of March – May 2021, including a dedicated webinar and a survey compiled by 13 countries and 19 local and regional governments. Our special thanks to Urban 20 and ICLEI and the member states that responded to the survey for their contribution that informs the following guiding principles:
67 Various repositories for best practice and lessons learned are currently being developed through entities such as the CitiesWithNature initiative. For more information please see: https://www.citieswithnature.org/
68 For more information: https://bigh.farm/fr/home/
69 For more information: https://www.c40knowledgehub.org/s/article/How-to-issue-a-Green-City-Bond-The-green-city-bonds-overview?language=en_US
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72 Beneficiaries of NbS can be asked to pay for the ecosystem services provided by well-functioning ecosystems. For example costs of NbS for water purification systems can be matched by water-user fees, following a payment for ecosystem services/user-pay principle approach. For such a system to be well-designed and sustainable, willingness-to-pay (WTP) has to be carefully assessed.
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81 The full (35 page) survey is available as a separate document from this link: https://www.unep.org/explore-topics/cities-and-lifestyles
82 Our special thanks to Urban 20 and ICLEI for their contributions.

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