



U20

RIYADH 2020
URBAN



Addressing Finance And Capacity Barriers

For Nature-based Solutions
Implementation At City Level



Nature-based Urban Solutions

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About Urban 20

Urban20 (U20) is a city diplomacy initiative that brings together cities from G20 member states and observer cities from non-G20 states to discuss and form a common position on climate action, social inclusion and integration, and sustainable economic growth. Recommendations are then issued for consideration by the G20. The initiative is convened by C40 Cities, in collaboration with United Cities and Local Governments, under the leadership of a Chair city that rotates annually. The first U20 Mayors Summit took place in Buenos Aires in 2018, and the second took place in Tokyo in 2019. For 2020, Riyadh City is the Chair city and host of the annual Mayors Summit. The first meeting of U20 Sherpas was convened in Riyadh, Saudi Arabia, on the 5th – 6th February during which the foundations were laid for the U20 2020 Mayors Summit in the Saudi capital later this year.

About the Urban 20 Taskforces

As U20 Chair, Riyadh has introduced taskforces to add additional structure and focus to the U20. These taskforces explore specific priority issues and bring evidence-based solutions to the final Communique.

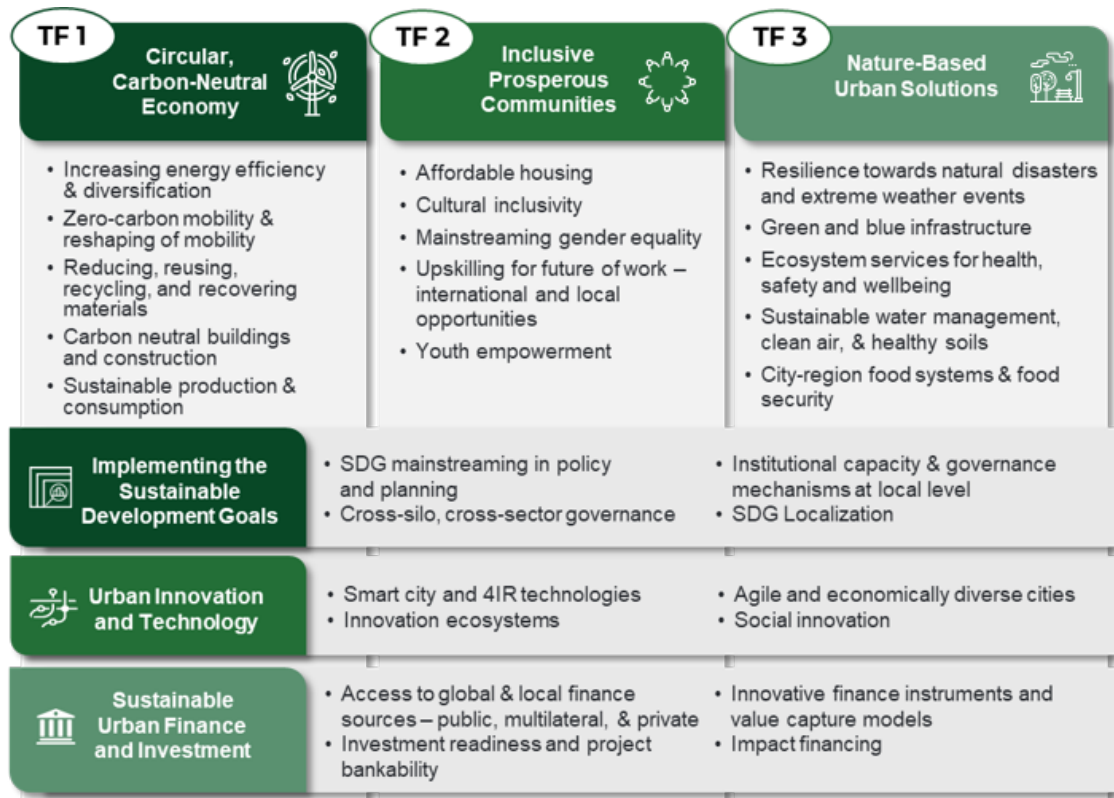
Each taskforce has commissioned whitepapers led by chair cities, and with input from participating cities and knowledge partners. These whitepapers help us build an evidence-based, credible and achievable set of policy recommendations.

Taskforces activation

The taskforces workstream was an innovative and recent introduction to the three-year-old U20 initiative by the chairmanship of the city of Riyadh this year. Three thematic taskforces, each guided by one of the U20 Riyadh 2020 overarching themes of Circular, Carbon-neutral economy, Inclusive Prosperous Communities, and Nature-based Urban Solutions, were officially launched and activated during the U20 First Sherpa meeting back in February. During the meeting, the U20 priority topics that fell within the three overarching themes and intersecting with the three cross-sectional dimensions of Implementing the Sustainable Development Goals, Urban Innovation and Technology, and Urban Finance and Investment were prioritized and refined through the statements delivered by all attending cities. The top 5 topics were then chosen to be the focus of whitepapers for each taskforce.



The top 5 topics under each of the three taskforces and cross cutting dimensions were then chosen to be the focus of whitepapers for each taskforce:



Cities and Partner Engagement

The vast majority of the twenty-three cities who attended the first Sherpa meeting, representing 12 G20 countries, along with the U20 Conveners, agreed to the importance of having taskforces as interactive platforms to produce knowledge-based and evidence-based outcomes that can effectively feed into an actionable U20 Communique. During and following the meeting, several cities demonstrated interest in volunteering in the capacity of chairs and co-chairs, leading and overseeing the activities of each taskforce. The cities of Rome and Tshwane co-chaired Taskforce 1 on Circular, Carbon-neutral Economy, Izmir

Taskforce 2 on Inclusive Prosperous Communities, and Durban on Nature-based Urban Solutions. Others expressed interest to participate in the taskforces, some in more than one, both during and after the meeting.

Alongside interested U20 cities, several regional and international organizations proffered to engage in the work of the taskforces, in the capacity of knowledge partners, to share their knowledge and experiences with cities in producing whitepapers. Some of the knowledge partners volunteered to play a leading role as Lead Knowledge Partners, supporting the taskforces' co/chairs in review and guidance.



All participants who actively took part of the taskforces were subject matter experts nominated by the cities and knowledge partners and have enriched the taskforces' discussions with their know-how and experiences. In over 3 months, all three taskforces, with great effort and commitment from all their participants, produced a total of 15 evidence-based focused whitepapers, bringing about more than 160

policy recommendations addressing the national governments of the G20 Member States.

The taskforces content development efforts is comprised of 23 U20 cities and 31 U20 knowledge partners. The 100+ experts and city representatives produced 15 whitepapers which widely benefited and informed the development of the first draft of the communique.



Content Development

Under the leadership and guidance of the chair city, Durban, and the lead knowledge partner, ICLEI, the work of Task Force 3 kicked off with an orientation for all participants in mid-March.

During the period between March and April, the participants of Taskforce 3 presented more than 23 concept ideas and 12 concept notes and developed initial outlines for the whitepapers focusing on

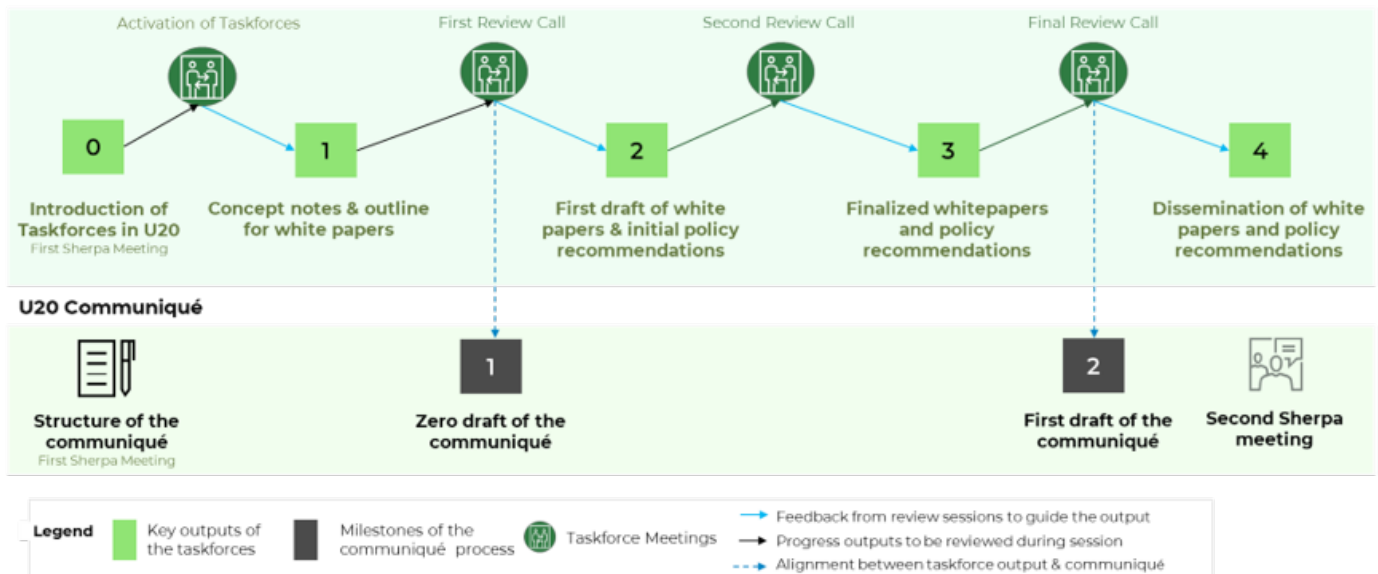
topics of interest. Teaming up into six author groupings, the cities and knowledge partners developed six outlines of whitepapers. Refined and revised outlines were then developed into draft whitepapers that underwent several iterations for development and finalization, ensuring that each paper delivers a set of concrete and targeted policy recommendations that address the different U20 stakeholders.



The six whitepapers under task force 3 (listed below) explore priority topics on food systems, urban sanitation and waste management, urban healthy and safety, resilience and biodiversity:

1. Towards transformative change: urban contributions to achieving the global biodiversity agendas
2. Resilience in the Anthropocene: mainstreaming nature-based solutions to build resilient cities
3. Addressing finance and capacity barriers for nature-based solutions implementation at city level
4. Urban health, safety, and well-being: cities enabling the provision and access of ecosystem services
5. Empowering cities for the development of sustainable food system policies
6. Urban sanitation and waste management for all

Taskforce Activities



Along the taskforces timeline of activities, three review meetings were held where co/chairs and lead knowledge partners presented and discussed with the U20 Executive Team the progress and findings of the taskforces they represent, leading to the U20 Second Sherpa meeting that took

place during the first week of July. Parallel to the taskforces activities, the first draft of the U20 communiqué was developed by the U20 Executive team incorporating recommendations presented at the third (and final) review meeting.



About the Nature-based Urban Solutions Taskforce

Nature-Based Solutions need to be mainstreamed in city planning and development to provide a healthy urban environment with productive ecosystem services, such as the provision of clean air and freshwater, food and nutrition, recreation and tourism, as well as livelihoods for local populations and resilience to climate change impacts.

Cities are highly dependent on a healthy local environment and productive ecosystem services. Rapid environmental degradation and biodiversity loss due to climate change, habitat destruction and pollution, threaten the foundation for life in and around cities across the globe. Local ecosystems need to be restored, protected, and upgraded to enable and improve the prosperity and well-being of people in cities. Water and food systems within which the city draws resources from, must be managed sustainably to ensure long-term

security. Nature-based solutions like endemic and biodiverse urban greening, ecosystem restoration, green roofs and walls, and natural water-retention methods, need to be mainstreamed and designed in city planning and development, taking into account the multiple co-benefits of policy choices. These can improve air and water quality, provide cost efficient cooling for districts and buildings and increase the physical and mental health of residents. They build the green and blue infrastructure needed for resilience against extreme weather events and the adverse effects of climate change, and attract global talent and sustainable tourism to the city. Nature must be integrated into urban environments. This increases both biological and economic prosperity and productivity, enabling new business opportunities for entrepreneurs and innovators, while providing habitats for biodiversity in harmony with traditional urban infrastructure.

15 cities

U20 Participating cities

Madrid	Riyadh
Mexico city	Rome
Montréal	Sao Paulo
Moscow	Strasbourg
Rio de Janeiro	

Chair city

Durban

U20 Observer cities

Amman
Dammam
Helsinki
Rotterdam
Singapore

14 knowledge partners

Knowledge partners

- Asian Development Bank Institute
- French Development Agency
- Global Alliance for Health and Pollution
- Inter-American Development Bank
- International Union for Conservation of Nature
- Lee Kuan Yew Center for Innovative Cities
- Metropolis
- National Institute of Urban Affairs
- The Nature Conservancy
- University Bocconi Milano – GREEN Centre
- University of Pennsylvania
- World Economic Forum
- World Wildlife Fund

Lead knowledge partner

ICLEI – Local Governments
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About the Authors & About the Contributors



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Geoff Tooley is Professional Civil Engineer with 30 years of experience in the stormwater and catchment management field within local government. As manager of the Catchment Management section, he is responsible for work relating to the rivers in eThekweni (Durban, South Africa) including floodlines, stormwater management plans, master drainage plans, rainfall distribution figures and erosion control as well as adaptation plans related to flooding. He managed the development of the new stormwater management policy for the eThekweni municipality and was part of the team which developed the Municipal Adaptation plan for the water sector.



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Jessy recently joined the CFF from South-South-North where she worked on several projects ranging from climate finance to improving energy access in rural parts of Sub-Saharan Africa and she has also previously worked in the fields of ecosystem-based and community-based adaptation in Southern, Central and West Africa. She has worked extensively on low emissions development strategies within Africa.



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Valerie holds an MSc in Sustainable Development from Utrecht University (Netherlands), and a BSc in Environmental Conservation Economics from the University of Alberta (Canada). Her master's thesis compared New York City and Rotterdam, looking at the similarities and differences in how they address community resilience. Prior to joining C40, Valerie worked for Cordaid, an international disaster relief NGO based in the Hague. She managed Cordaid's resilience and DRR programs in Kenya, Indonesia, and the Philippines.



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Disclaimer Note:

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Executive Summary



Executive Summary

Globally, a transformative approach is emerging which locates nature-based solutions within the rubric of urban social, spatial, economic and institutional development. Many studies have made a compelling case for cities to adopt the Nature Based Urban Solutions approach to infrastructure investment and addressing risk and vulnerability at city level. Yet cities are still seeing a very low uptake of nature-based adaptive responses to climate change despite what science tells us.

The 2019 Global Call for Leadership on Climate Resilience summarises key barriers to action as including: decision making that does not internalise climate change, lack of knowledge or understanding of appropriate solutions even when risks are known, short-term planning often linked to political leadership term of office, poor co-ordination and co-operation between and within institutions as well as lack of financial commitment to nature based solutions in the face of such uncertainty (Global Commission on Adaptation: 2019).

The writing of this paper is taking place in the middle of the Covid-19 pandemic, a global disaster that has already crippled economies of many nations. This presents both a challenge and an opportunity for the implementation of nature based urban solutions at city level. While a significant amount of the fiscus is expected to be redirected towards fighting the pandemic in the short term, further relegating NBS to the bottom of the decision making priority hierarchy, there is an even better opportunity to position NBS as the basis of rebuilding the economy post the Covid-19 pandemic.

This paper therefore advocates for global action by cities to seize this opportunity and champion the call for a global policy directive for nature based urban solutions to be at the core of cities economic growth trajectory in the next 5 to 10 years. The paper demonstrates proof of concept by profiling evidence based approaches to NBS from various cities across the globe, further unpacks barriers to action including why these barriers exist to date and proposes solutions to be driven through the U20 process.



Background



Background

Our cities are subject to new climate extremes and related hazards that have called into question how cities have been developed during the 20th century. With urbanization in many parts of the world accelerating, climate change has also placed under pressure our cities ability to meet the basic food, water, and energy needs of millions.

Cities and urban infrastructure finance have in recent years recognized the need to invest in low-carbon, climate-resilient, sustainable investment, where the focus has been on low-carbon investments and the need to minimize negative social and environmental impacts. Although this focus is commendable in meeting the urgent need to avoid the disastrous effects of long-term climate change, it has left a significant gap to the important need to incorporate resilience to the impacts of current levels of global warming. Rather than looking to take advantage of integrated, mutually enforcing social and environmental systems that offer long-term resilience to climate change, many projects have instead focused on developing best-practice social and environmental safeguards in line with methodologies aimed at mitigating impacts on people and the environment. There is a huge opportunity to now to fill this gap by incorporating and maximizing the benefits of natural capital, ecosystem services and urban biodiversity - systems collectively referred to as nature based solutions - into urban infrastructure planning.

Furthermore, as we have exceeded the heat balance of the Earth, with potential catastrophic consequences for our survival, we resort to nature-based solutions as part of a suite of interventions

to address a man-made problem. The window to limit the factors that are driving climate change is closing in on us and our coping mechanisms deployed to date, are being outpaced by fast changing climate. This places nature-based solutions at the centre of our global response to climate change.

Most countries' response to climate change has focused on 'hard' or 'grey' infrastructure options. Examples include reservoirs to address water shortages and seawalls to tackle coastal erosion. Hard and grey infrastructure is challenging to finance (especially in developing countries), build, and maintain. Even though such options are costly, in many instances, they are preferred over nature-based solutions for a host of reasons. Economic valuation can show the "hidden" values of natural capital and of its services. The logic behind the valuation of ecosystem services is to reveal the socio-economic impacts and to explain how human choices and activities can affect ecosystem functions.

In spite of several institutional efforts to define methodologies to value ecosystem services generated by nature-based solutions (System of Environmental-Economic Accounting Experimental Ecosystem Accounting - SEEA-EEA adopted by United Nations Statistical Commission, Mapping and Assessment of Ecosystems and their Services - MAES Urban developed by the European Joint Research Centre JRC, etc.), their practical application is still very limited. Nowadays, impacts generated by nature-based solutions are not valued in a consistent and complete way.



Background

The U20 Buenos Aires Communiqué called on G20 member states to “Enable Wider Access to Finance for Infrastructure”

- Collaborate with cities to improve access to bilateral, multilateral and private sources of capital to implement sustainable infrastructure projects. In some instances, these are among cities’ biggest challenges due to high costs, potential financing gaps, regulatory obstacles, and governance challenges.
- Simpler and more direct access to financing should be accompanied by joint efforts to strengthen good governance and promote transparent, participatory, and research-based planning processes that advocate for solutions to meet citizens’ needs and expectations.

The U20 Tokyo communiqué called on the G20 to collaborate with cities to “Strengthen resilience and adaptive capacity to climate change”

Support cities by unlocking the necessary resources and encouraging multi-stakeholder engagement in adaptation planning across national and subnational levels of government.



Introduction



Introduction

The European Commission defined NbS as “solutions inspired and supported by nature, designed to address societal challenges which are cost-effective, simultaneously provide environmental, social and economic benefits, and help build resilience” (EC, 2016).

Nature-based solutions can enhance a wide range of ecosystem services that are able to provide economic, social and environmental benefits in cities. Some ecosystem services, such as provisioning services, are exchanged on markets so they can be evaluated through prices, but many other services present characteristics of public goods and markets cannot capture their value (market failures). So most ecosystem services bring positive externalities that do not find adequate remuneration since they are used without any cost by consumers. Consequently, price signals do not correctly indicate the scarcity of natural capital from which the ecosystem services originate.

NBS Approaches

The term NBS has been broadened over time to cover and address multiple societal challenges while also delivering economic and environmental benefits. The concept of NBS has its roots in the relationship between biodiversity and human well-being. NBS is part of a paradigm shift in nature conservation moving from focus solely on nature, to focus on people and nature. (Core principles REF). NBS are intended to support the achievement of society’s development goals and safeguard human well-being in ways that reflect cultural and societal values and enhance the resilience of ecosystems, their capacity for renewal and the provision of services. NBS are designed to address major societal challenges, such as food security, climate change, water security, human health, disaster risk, social and economic development. (IUCN, 2016)

Figure 1.

NBS as an umbrella term for ecosystem-related approaches (IUCN, 2016)





Introduction

Approaches under NBS can be placed into five categories (see Fig. 1) (Cohen-Shacham et al., 2016):

Restorative

- Ecological restoration, Forest landscape restoration, Ecological engineering

Issue-specific

- Ecosystem-based adaptation; Ecosystem-based mitigation; Ecosystem-based disaster risk reduction; Climate adaptation services

Infrastructure

- Natural infrastructure; Green infrastructure

Management

- Integrated coastal zone management; Integrated water resources management

Protection

- Area-based conservation approaches, including protected area management and other effective area-based

NBS are critical to city vulnerability and resilience. Often, vulnerability and resilience are used interchangeably, however there is a need to define such terms along with many of the terms that are repeatedly used in this paper.

- **Vulnerability:** The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of a hazard (IUCN, 2017).

- **Resilience:** The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions (IUCN, 2017).

The following concepts which have evolved in the climate debate are also fundamental to NBS:

- **Ecosystem-based adaptation (EbA):** It is a nature-based solution that harnesses biodiversity and ecosystem services to reduce vulnerability and build resilience to climate change (IUCN, 2019). Ecosystem-based adaptation is more than ecosystems substituting for built infrastructure to protect against damage; it is increasingly clear that ecosystems and the services they provide can increase local resilience and adaptive capacity especially when managed appropriately (Reid, 2014). EbA remains an emerging area of study that needs a wider evidence base and more scientific data to influence policy- and decision-makers despite their cost-effectiveness.
- **Community-based adaptation (CbA):** is a community-led process, based on communities' priorities, needs, knowledge and capacities, which should empower people to plan for and cope with the impacts of climate change (Reid, 2014). CbA identified the most vulnerable people to climate change and place them at the centre of the response to climate change, including at all levels from planning to implementation of interventions to build their resilience.



Introduction

- Transformational adaptation: Our initial efforts to adaptation have been met with varying degrees of success with at best local benefits – generally limited to the project level - that have not translated across nations to effectively build resilience to climate change. Transformational adaptation goes beyond the piecemeal approach and involves systemic changes that lead to large-scale adaptation interventions resulting in far more impactful efforts to build climate resilience.

The concept of transformative adaptation suggests a multi-dimensional approach. GIZ developed a guidebook on transformation to guide their work and others. It defines transformational change as: “A structural change that alters the interplay of institutional, cultural, technological, economic and ecological dimensions of a given system. It will unlock new development paths, including social practices and worldviews”. (Mersmann et al., 2014) The C40 City Finance Facility (2019) identify two elements together determine whether a transformation has occurred:

- Firstly, a transformative solution will relate to the scale and nature of the impact, the change that has occurred and whether it is fundamental and significant enough to be classified as a transformative impact. This includes the criteria of large-scale and radical impact, positive impact (which may also include the delivery of development and poverty reduction co-benefits), long-term and sustained impact and catalytic impact.
- Secondly, such a solution will relate to how the impact is achieved, including a shift in fundamental structures and ‘rules’ governing the social and economic system. This would embrace new technologies, changes in management practices and processes, or new strategies by the government to address climate change, enhanced political will, new policies and laws, regulatory reform, new economic incentives and adjustments to values, ideology and mindsets.



Challenges and
Opportunities



Challenges and Opportunities

Identifying the global city drivers & context for urban nature-based solutions

Nature-based solutions provide multi-faceted co-benefits such as job creation, increased resilience to multiple climate change impacts, and restore the integrity of ecosystems from which we derive ecosystem benefits on which our lives and livelihoods depend. It is becoming increasingly clear that we need nature-based solutions to: i) decrease the overall levels of greenhouse gases that we emit through our economies and lifestyle through nature's potential for carbon sequestration; ii) adapt to the impacts of a changing climate; and iii) address disaster risk reduction to limit the impacts of climate change and variability to safeguard vulnerable communities and our economy. At the time of writing, we are faced by a global pandemic, which has demonstrated the urgency with which we need to address threats that undermine our

wellbeing and economy. Climate change remains our biggest challenge to tackle.

Urban planning has begun to shift in response to the recognition of the value of ecosystem services and the wider socio-economic and socio-cultural benefits provided by natural systems. Discussions increasingly recognize the current challenges facing urban areas and their populations, such as a reduced availability of physical space, threats to human health arising from climate change and increased densification and decreasing connection with nature. Consequently, urban planning processes increasingly consider implementing multi-purpose measures that utilize natural systems to foster the delivery of ecosystem services and wider societal benefits. (Davis, M. et al. 2018). These Nature-based Solutions (NbS) are critical to addressing current and future urbanization challenges.

Examples from the Global North

Case study 1: New York

Approach: Green Infrastructure

The High Line, located in New York City, USA, is an old train line repurposed into an elevated linear park. The train line ran from the 1930s to the 1980s and was left abandoned afterwards. In the 2000s, inspired by the Promenade plantée (tree-lined walkway) in Paris the train line was redesigned as an aerial greenway. The High Line is now one continuous, 2.3km long greenway featuring 500+ species of plants and trees. On top of public space and gardens, the High Line is home to a diverse suite of public programs, community engagement, and world-class artwork and performances, free and open to all (High Line History, 2020). Apart from ecological benefits, the High Line attracts millions of tourists each year and thus increased surrounding property values by more than 100 percent (Patrick, D. J., 2011).



View of the High Line aerial greenway in New York, looking south at 20th Street.



Challenges and Opportunities

Case Study 2: Netherlands – Room for the River

Approach: Issue Specific / Management

The Netherlands forms the low-lying delta of North-Western Europe. Over the past 1000 years the rivers have been harnessed between higher and stronger dikes. However, due to climate change, river discharges have increased and extreme high water levels are expected to occur more frequently. After the river flooding in 1995, the national Room for the River programme was initiated to give back more space to the rivers in order to reduce the risk of flooding. The main goal was to manage higher water levels in rivers by lowering the levels of flood plains, creating water buffers, relocating levees, increasing the depth of side channels, and the construction of flood bypasses (Holmes, D. 2017, September 13).



Before



After development of flood bypass

Optional Diagrams and Photos <https://worldlandscapearchitect.com/room-for-the-river-nijmegen-the-netherlands-hns-landscape-architects/#.XrvPghMzZQI>

Case Study 3: Madrid

Madrid, the capital of Spain and one of the most important cities in Europe, is implementing a project for Nature-Based Urban Solutions at city level, on the Metropolitan Forest, a process consisting of the re-naturalization of free city spaces generating a network of habitable itineraries, improving the living conditions of the citizens and advancing in the achievement of the Sustainable Development Goals (with special attention to SDG 3, 11, 13 and 15) which will be completed in the next five years in Madrid. This process will mean the construction and completion of a forest ring around the city of Madrid with a length of 75 kms.



Challenges and Opportunities

Challenges in the Global South

It is difficult to implement these solutions in cities characterized by massive population growth and levels of poverty and informality that defy conventional planning approaches. The growth and urban sprawl outpace the cities' ability to support sound development or deliver basic services into these new areas.

Under these conditions, the rationale for NBS is development oriented and often NBS and other ecological efforts can only gain traction when they are financially efficient and demonstrate contribution to livelihoods, local economics, and urban resilience.

The following case studies in this paper will elaborate on challenges in the Global South:

Case Study 4: Transformative Riverine Management Programme in Durban

Clarify key terms and the evolving narrative relevant to urban nature-based solutions including Ecosystem-based Adaptation (EbA), Community Based Adaptation CbA, Transformative Adaptation, ecological infrastructure and blue and green infrastructure.

Unpack typical approaches of cities in the North to urban nature-based solutions including those of New York, Berlin, Stockholm and others and will explain why cities in the South need a more transformative emphasis due to extreme pressures of poverty and urbanisation and the huge costs of adaptation relative to scarce resources.

To manage its rivers and address the impacts of climate change, eThekweni Municipality with a population of 3,8 million has become a leader in the protection of ecological infrastructure, which is a central pillar of its climate change adaptation response. It has mapped 94,000 ha of ecological infrastructure, of which river systems form the core, and recognised it in key policies as critical for the supply of ecosystem services. The value derived from the flow of ecosystem services (such as flood attenuation and water supply) is at least R4.2 billion per annum. The use of resource economics to demonstrate the financial value of ecological infrastructure has helped build awareness throughout the city administration on why investment in its management makes good financial sense (Cartwright et al. 2013).

eThekweni Municipality has built a strong policy base and institutional buy-in to partnership-based riverine management. Since 2010, several riverine management projects have been implemented. Although slightly different in focus and structure, they contribute collectively to the city's experience and track record in managing river systems for locally important socio-economic, financial and ecological benefits. These projects support cost-efficient city service delivery and have become a mechanism for addressing climate change risks.

(continued)



Challenges and Opportunities

Case Study 4: Transformative Riverine Management Programme in Durban

With support from the C40 Cities Finance Facility (CFF), eThekweni Municipality is building a case for investment in transformative, city-wide urban river management known as the Transformative River Management Programme (TRMP). The TRMP aims to restore and increase the resilience of the 7 400 km of streams and rivers in the city in light of the present risks seen in these degraded systems and the predicted increase in flooding, drought and higher temperatures that can be expected from climate change. The TRMP is nested in the Durban Climate Change Strategy and its Climate Action Plan as a C40 city. It builds on the city's considerable experience with ecosystem-based adaptation and its commitment to increase the resilience of eThekweni Municipality's most vulnerable communities.

The project vision is to build a compelling Business Case (based on Cost Benefit Analysis) for transforming some 7 400 km riverine corridors:

- to be resilient to climate change
- to be valuable places which are clean, safe, healthy, useful and pleasant open spaces
- to close the loops with recycling
- to create jobs and build the green economy
- to build communities
- to work in partnership with all affected stakeholders
- to impact positively on the City as a whole.

The TRMP builds on a range of transformative river management projects in Durban and Kwa Zulu Natal, notably the 10-year-old Sihlanzimvelo stream cleaning programme. This programme utilizes community co-operatives for stream management (streams with a catchment less than 1000Ha) and in so doing builds enterprises and creates jobs: a good example of transformative adaptation. At a cost of US\$ 1 500 per month a community co-operative will take care of 5km of streams. The community co-operatives employed through the Sihlanzimvelo project have been given the core skills needed to establish and run a co-operative, remove invasive alien plants, and comply with health and safety regulations. The community assessors play a wider role in creating awareness and behaviour change in the surrounding communities. In 2019 some 300km of streams were being managed supporting some 55 enterprises and 400 jobs.

(continued)



Challenges and Opportunities

Case Study 4: Transformative Riverine Management Programme in Durban

Another transformative river management project is the Aller River Pilot Project Eco-Champs initiative. It was specifically designed to build human and social capital to mobilise wider community stewardship of riverine areas. This involved training and employment of seven local community members to assist with river health maintenance, waste reduction, monitoring and community awareness, under a Team Leader and Community Liaison Officer. The Eco-Champs team worked with schools and churches to promote community awareness and behaviour change. This approach was made possible by the skills and experience of the Kloof Conservancy, whose interest in the project was centred on establishing a community-driven river stewardship model.

Similarly, the Green Corridors project has built skills and capacity in beneficiary communities extending beyond riverine management actions. These include helping people making a living from waste upcycling / recycling and producing food while improving the health of their local rivers. The Green Corridors programme is now able to manage a substantial and diverse portfolio of projects (approximately R20 million per year – US\$1.35m) with a focus on non-profit community development. Municipal funding means it can focus on delivering its own mandate rather than those of external funders.

The TRMP project will ensure that individual river management projects fit within a systemic narrative to ensure that success in one area does not compromise success in another area. Current models will be expanded to a broad range of river conditions, ecological infrastructures, land ownership and land use conditions to anchor the green economy and develop the social and economic capital of the city. Ultimately it is unanticipated that the TRMP could support 12 000 to 16 000 jobs and hundreds of enterprises. This will provide a scalable and replicable model for how cities across the world can manage and maintain their waterways while maximizing socio-economic benefits.

The TRMP Business Case being developed by the C40 City Finance Facility will use cost benefit analysis to persuade a range of funders including the municipality itself, businesses and property owners in Durban and global climate funders to make the investments required. It will be grounded in GIS based vulnerability assessment linked to an advanced hydrological model and the best available climate circulation models.

As part of the CFF's commitment to optimising the impact of its support for eThekwin it will implement a knowledge-sharing exchange with the 17 municipalities that are part of the Central KZN Climate Change Compact, as well as the wider global community of climate stakeholders.

(continued)



Challenges and Opportunities

Case Study 4: Transformative Riverine Management Programme in Durban

The following lessons have been learned from the TRMP thus far:

- Transformation: Practices that resulted in positive changes to systems, financial flows, skills and climate action implementation at scale, including improving transversal working and horizontal integration between sectors and stakeholder groups.
- Operational sustainability: Practices that underpinned the sustainability of the investment and secured positive outcomes.
- Human and social capital development: Practices that built people's skills, community institutions, capacity and / or levels of social cohesion, supporting the multiplier effect.
- Partnerships and collaboration: Practices that built relationships between the city and other groups, including catalysing wider action, impact or investment.

Case Study 5: Institutionalizing biodiversity protection in the City of Durban

Durban's biodiversity and ecosystem services

Globally there is a growing awareness of the importance of the natural environment in reducing risk, enhancing resilience and ensuring sustainable communities in urban areas. In spite of this, human-induced changes to the global environment since the 1800's have caused a significant decline in biodiversity worldwide and driven changes in the global distribution of species – often referred to as the “Sixth Extinction”. The concern is that continual biodiversity loss may result in nonlinear and irreversible changes in the Earth system, and therefore have a direct impact on society. This is particularly relevant to Africa, the most rapidly urbanising continent, where a large percentage of the population are poor and live in informal, often poorly serviced settlements and are more directly dependent on natural systems to meet their basic needs.

Durban's natural environments have been similarly impacted by landscape change (habitat destruction, degradation and fragmentation), invasive alien species, over exploitation (e.g. illegal sand mining practices) and pollution. Durban is situated in the centre of one of 36 Global Biodiversity Hotspots, namely the Maputaland-Pondoland-Albany region, and is consequently characterised by

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Challenges and Opportunities

Case Study 5: Institutionalizing biodiversity protection in the City of Durban

unique and highly threatened globally significant biodiversity. The situation in Durban suggests that current policy, law, governance and environmental management efforts have been inadequate to prevent this degradation. Furthermore, the true value of the loss of this 'natural capital' has not been recognised in the city's strategic planning processes, and this issue needs to be urgently addressed.

Turpie et al. (2017) estimated the total asset value of Durban's natural and semi-natural areas at R47.8 billion and the annual flow of ecosystem services at R4.2 billion per year. Two of the highest value ecosystem services in the World Bank study were the 'amenity value to property owners' (measured in terms of property value for land located close to green space) and 'tourism value' of the natural environment. The natural environment asset therefore contributes significantly towards the local economy, both in terms of its contribution towards increased rates generation opportunities for properties adjacent to the natural asset, and tourism. It also provides essential services (such as water provision, climate regulation and flood attenuation) which underpin the city's ability to grow and develop. Turpie et al. (2017) noted that proximity to good condition, well managed natural areas attracted premiums of 2 percent (R4.4 billion) of property value, and 6.5 percent relative to public parks (R13.8 billion).

Integrating Biodiversity into Spatial Planning

The Durban Metropolitan Open Space System (DMOSS) is the primary tool used to guide Durban's protection and management of the rich, highly threatened and valuable natural resource base in the Durban area. D'MOSS is a spatial layer of interconnecting open spaces in public, private and traditional authority ownership designed to ensure the protection of Durban's biodiversity and associated ecosystem services for future generations. It has evolved over the past three decades in terms of its spatial extent, underlying methodology, and legislative standing, and as of 2018 totals approximately 95 000 ha. The current D'MOSS footprint is considered the minimum area required to achieve biodiversity and ecosystem objectives in the eThekweni Municipal Area. The planning underpinning D'MOSS has progressed from focusing on species and habitat protection to include the recognition of ecosystem services. An increasing focus on implementation of the plan, through the restoration of ecosystems, and growing concerns related to the impacts of and adaptation to climate change have also influenced the plan. New tools such as systematic conservation planning, have assisted in improving the scope and accuracy of the plan by providing better methodologies for conservation prioritisation.

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Challenges and Opportunities

Case Study 5: Institutionalizing biodiversity protection in the City of Durban

As a result of the inclusion of D'MOSS in the Municipality's scheme provisions, any planning application for a site included in or immediately adjacent to D'MOSS must be assessed by the EPCPD. Including environmental considerations in planning applications ensures that local government's interests are covered and that small-scale developments, which do not require assessment in terms of national legislation, do not have a significant local or cumulative environmental impact.

Expanding the Protected Area Network

The assessment of development applications is a reactive response to the threat posed to biodiversity in Durban. A more proactive response is to look to increase the conservation area network. Despite the incorporation of D'MOSS in the Municipality's spatial plans and the use of innovative tools, only 8.2 percent of the 95000 ha included in D'MOSS, or 3 percent of the eThekweni Municipal Area, enjoys some form of legal protection. The area enjoying 'legal protection' includes proclaimed and unproclaimed private or public nature reserves, properties that have been bought through the local government's biodiversity land acquisition programme, sites where sensitive portions have been protected by conservation servitudes as a result of development application processes and sites that have been rezoned to zones created for conservation purposes.

The key question remains is how to dramatically scale these interventions to ensure the protection of Durban's natural resource base and ensure the continued flow of services to its citizens. Looking at a post covid-19 reality, and addressing the issue of economic recovery, biodiversity needs to be a priority for several reasons:

1. Grandcolas and Justine (2020) article 'Covid-19 or the pandemic of mistreated biodiversity' highlights one of the consequences of rampant habitat loss, and the important role that intact ecosystems play in preventing the spread of zoonotic diseases.
2. The direct benefit that landowners receive in terms of property value from proximity to well managed natural areas may offer an important option for sustainable financing linked directly to Durban's most valuable ecosystem services. The City receives additional income, through rates collection, as a result of investment in the management of natural resources. This transactional loop, and the ring fencing of funds to adequately support one of the City's largest assets need to be explored in greater detail.
3. Linked to the point above, the expansion of green job programmes aimed at managing areas for biodiversity represents an attractive option that creates significant employment opportunities while investing in one of City's key assets.



Challenges and Opportunities

Opportunities for restoring natural ecosystems, for improved biodiversity protection

On the 1st of March 2019, the United Nations declared a Decade of Ecosystem Restoration. This declaration aims to enhance opportunities for sustainable development by increasing global levels of ecosystem restoration. Durban, in acknowledging that the field of biodiversity protection is changing, saw a need to increase ecosystem restoration and management. Specifically, this meant ensuring better understanding, engineering and management of intact and novel ecosystems. The Municipality's Restoration Ecology Branch has subsequently taken a number of steps, including implementation of projects within several large-scale ecological restoration programmes, with ground-breaking and transformative innovations.

Ecological restoration can be enhanced through:

- effective control of biological invasions, preventing new invasions and managing existing invaded areas as per Durban's Invasive Alien Species Strategy;

- effective fire management of prioritised land parcels.
- restoring habitat types, for which targets are not likely to be met due to high levels of transformation, either due to development or as a result of climate change and its impacts;
- integrating biodiversity protection, social accountability, and economic development and to promote a "green economy".

The outcomes of the above initiatives include opportunities for community upliftment, green jobs and local livelihood improvement, while establishing natural "carbon sinks" and restoring biodiversity. The initiatives also contribute towards mitigating climate change impacts and increasing local resilience and adaptive capacity to climate change.

Going forward, the Municipality will continue to scale up restoration efforts primarily in catchment areas and in open space corridors, which are deemed important for wildlife and human use.



Challenges and Opportunities

Case Study 6: Amman

Amman is trying to address the issues of extreme weather conditions related to climate change. One of these issues is conducting a revision to the current methods for flash flood prediction and prevention by collaborating with researchers and experts to develop a stormwater masterplan for the city to successfully collect freshwater to enhance the agricultural sector in urban areas. This is a new low “initial cost” territory that attracts investments since it was not utilised before due to the fact that Jordan suffers greatly from water scarcity.

Amman also signed the [C40 Clean Air Cities Declaration](#) while working on the baseline to meet the commitments based on the World Health Organization Quality Guidelines for particulate matter (PM2.5, PM10), nitrogen dioxide, ozone, and sulphur dioxide. Currently, the city has 6 fixed stations that monitor and record air quality in 22 districts in real-time, Greater Amman Municipality is developing an action plan to increase the accuracy of these measurements in collaboration with the Ministry of Environment through the installments of new technologies through the private sector that can track air quality in all districts. This is also another aspect where the City tries to connect the health of its ecosystem with investments, since investing in pollution control improves economic development and living conditions.

Amman also was the first city from the Middle East region to develop the [Amman Climate Action Plan in 2019](#) to achieve the goals of GHG emissions reduction targets by 2030 and 2050 respectively. In this action plan, there are various opportunities for investments since the capital cost of most of these actions are not that high, for instance; Greater Amman Municipality is exploring opportunities to incentivize urban agriculture in Amman, including zoning, financial incentives and other policies, this will provide source of food for low-income households and possible, source of income. Another example in the Climate Action Plan is implementing educational and recreational projects within the city that return people back to nature and enhance their knowledge in these fields like botanical and theme gardens, eco parks, birds' gardens, butterflies gardens and zoos.



Challenges and Opportunities

Case Study 7: Mexico City

Mexico City's fast and disorderly growth, excessive natural resources demand, and waste production had a negative impact in the environment, increasing its inhabitants' vulnerability to climate change effects, and affecting its quality of life. Mexico City Government is developing initiatives to preserve nature, encompassed in two ambitious programs: Green Challenge (<https://retoverde.cdmx.gob.mx/>) and Altépetl (<https://bit.ly/2UteOum>). Both aim to preserve biodiversity and ecosystemic services, as well as to increase the city's adaptability to climate change, along with citizen participation.

More than 50 percent of the city's territory is rural and most of it belongs to ejidos and communities that guard the ecosystems biological diversity and the ecosystemic services supplied to the city by those areas. Part of the territory encompasses agriculture zones that still use ancient techniques such as milpa and chinampas, based on a rich cultural heritage and community's traditional knowledge. Therefore, the Altépetl program supports conservation activities and restore ecosystems and agroecosystems of the region throughout community action encouragement and rewards environmental services conservation; besides promoting and supporting sustainable agricultural activities and rescuing the community's biocultural wealth.

Green Challenge summons different social sectors, including companies, NGOs, citizens, and county governments, as co-responsible of planting and maintaining 10 million trees in the city; it can be throughout revegetation of urban parks and other public spaces, reforesting protected natural areas or establishing pollinator gardens in charge of women specialized in the issue. The objective is that the green areas conform a vegetal framework able to connect the rural areas of the city with the urban areas and also with the protected areas, improving the overall ecological connectivity within the city and with the peri-urban areas. This network of green infrastructure besides reconnecting the urban and the rural, adds to climate change mitigation and the city's resilience.

Both Altépetl and Green Challenge are initiatives that contribute to improve air quality, increase aquifers recharge, and regulate local weather. At the same time both programs promote native biodiversity conservation and strengthen community environmental management and governance.

The success of these measures relies heavily in community and citizenship involvement in designing and implementing the initiatives. The programs goals and continuity can only be achieved if the government departments involve the inhabitants in the decision-making process, include empiric and community traditional knowledge, and promote the engagement of the communities. The social dimension is fundamental for the effectiveness of these programs.



Challenges and Opportunities

Key enablers for nature-based solutions

The transition from traditionally delivered grey infrastructure solutions to NBS requires far more than a simple switch from one technology to another. NBS are inherently innovative in that they challenge traditional technologies, traditional accounting practices and the status quo of how projects are designed, funded, built and managed.

The basis of the discussion needs to start from an understanding of how natural assets are seen relative to constructed assets when it comes to the interpretation of Generally Recognized Accounting Practices (GRAP).

In most developing cities, the natural river system provides the backbone of the stormwater system however it is not seen as an asset of the city. What is not realised however is that no developing city would ever be able to afford to replace the river systems with pipes, culverts and canal with the same capacity to convey flood waters.

It appears that rivers are not seen as assets by the local government officials due to the fact that no funding has been spent to construct the river whereas a canalised portion of river is considered an asset due to the capital funds spent to construct it.

It is in this subtle difference where the challenge lies. The river systems are not valued by the services (in this case we have only looked at the conveyance of stormwater) provided but rather by the funding spent on acquiring or constructing it. In other words, the value of the stormwater conveyance provided by the natural river systems is taken for granted by cities.

Herein lies the problem. A natural river system may have been providing this service for many years “free of charge” and has got to the stage where intervention is required to “repair” the river. If it is decided that concrete canalisation is the solution, then capital funding will be sort and provided. However should a nature based solution be the prefer choice of “repair”, then it is viewed a maintenance (in terms of the interpretation of GRAP by the municipal accountants) and capital funding is denied. The response is normally that operational funds should be used for this repair.

This is highlighted even further in the case of an existing concrete canal. Should an existing concrete canal have reached a condition where replacement is cheaper than ongoing maintenance then capital funding is sort and provided for the replacement of this concrete canal and yet capital funding would not be provided for the “repair” of a natural river that is providing the same service and more, as a concrete canal. Again the response is normally that operational funds should be used for this repair.

This highlights another challenge and that is that operational funding is provided by cities based on the value of the asset meaning that as natural **rivers are not seen as stormwater assets**, the operational funding provided for the maintenance and “repair” of natural river systems is minimal.

The final challenge is the traditional approach to river maintenance which is tried and tested in the engineering field, versus a nature based solution of which there are few examples and little if any engineering design manuals.



Challenges and Opportunities

A practical example might be to contrast a concrete canalization or “grey Infrastructure” solution for dealing with bank erosion on a section of river with a nature-based solution involving ecological infrastructure. In the case of the grey infrastructure solution the project will be designed in the office of an established consulting practice well trained in the discipline of mainstream civil engineering. Funding would be sought from traditional government funds, development finance banks and mainstream infrastructure funders. The construction will usually be tendered to a contractor who will deploy technologies for which universities and technical colleges have training programs. Supplies such as steel, cement and piping will be sourced from firms using traditional process technologies. Maintenance will be undertaken by government agencies or private sector firms which once again involve mainstream technologies, skill sets and materials.

In the case of nature-based solutions design may embrace indigenous technologies that may be embedded in communities who have lived alongside the river for generations such as crop cultivation and seasonal occupation. The design process may need to involve consultation with the community and research into ecological infrastructure solutions used in other parts of the world such as planting of riparian vegetation, removing alien vegetation and implementation of community-based construction and management systems such as the Sihlamzimvelo project in Durban (Case Study #1). Finance might need to be equally creative so that it can be made available to community-based contractors and service providers. Infrastructures required will typically

be outside the sphere of what is conventionally designated as capital assets which may make it difficult for financial institutions and agencies to provide funding. Construction techniques may also need to be innovative unlucky to be innovative in being more labor intensive, using local materials and technologies which are relatively simple. This will challenge the status quo of existing construction industry and all the allied trades and suppliers linked to the construction of the concrete canal. Maintenance would likely also need to be more innovative and possibly more costly and labour intensive in building a local green economy that is inclusive. Proving the business case for the NBS solution will thus typically require broader evaluative frameworks, ranging from Cost Benefit Analysis to environmental and socio-economic impact assessment and Multi Criteria Assessment so that the reconfiguration and redistribution of costs, benefits, rewards and risks can be considered.

We may thus identify the following enablers for NBS, in addition to the principles and technologies of ecological infrastructure:

Firstly, transformative governance and economic systems and programmes are required to support NBS. This implies:

- Political and institutional will to absorb the costs and regulatory and policy demands of NBS innovation
- Development of new professional, technical, and administrative mindsets, practices and codes
- Integrating the life cycle and maintenance regimes of NBS into the operational practices and systems of local governance



Challenges and Opportunities

- Appropriate interpretation of GRAP and the training of municipal officials in this new interpretation.
- Appropriate finance and funding mechanisms

Secondly, transformative NBS projects should be designed to build human and social capital to enhance human health, well-being and to grow the green economy. This includes:

- Support for the emergence and growth of the NBS green economy including producers, suppliers and distributors of green products, technologies and services
- Enterprise development and entrepreneurship development for businesses that can deliver NBS
- Community engagement, research and capacity building
- City partnerships with citizens, businesses and non-profits can leverage wider, longer-term investment in NBS, and offer opportunities for innovative approaches that bring enhanced project impacts and transformation.

Challenges

Institutional challenges

Most cities have experimented with NBS projects to a greater or lesser degree. The challenge is how to:

- Upscale: extend NBS projects throughout the city

- Mainstream: make NBS a part of the core planning, budgeting and delivery processes
- Institutionalize: build the required internal and external partnerships and legislative and policy processes

The following key insights have emerged from this research:

- NBS require partnerships with citizens, businesses and non-profits to leverage wider, longer-term sustainability and offer opportunities for innovative approaches that bring enhanced project impacts and transformation.
- NBS requires building effective transversal working relationships. Projects should be planned collaboratively to establish joint project resourcing and mutual accountability.
- For NBS projects to be institutionally and financially sustainable, a compelling business case is needed. This business case should justify the project purpose and benefits in the context of the services that the city should deliver and its socio-economic and environmental priorities.
- NBS projects should be sized to ensure they are technically feasible, contextually relevant, manageable and operationally sustainable.
- Appropriately skilled programme management capacity with a multi-year focus is vital for NBS projects to be sustainable.



Challenges and Opportunities

- Transformative riverine management projects should be designed to build human and social capital to enhance human health, well-being and to grow the green economy.
- Lack of awareness of NBS may exist among city departments which means non-inclusion in the planning process and thus the budgetary and funding process - Not just an issue with environment teams which usually do planning and strategy relating to environment and climate (e.g. green space as flood management,) but transport (e.g. green corridors to support pedestrianisation), buildings (blue/green development factors may be too low to incentivise use of green walls and roofs etc) , and waste (e.g. composting etc) teams.
- Departments may be siloed and thus also siloed in how they want to spend money - NBS tends to provide wide ranging benefits which may require collaborative planning and budgetary processes. e.g. green corridors may require teams responsible for transport, air quality, and environment coming together.
- Conflation of NBS with 'green space' or 'biodiversity' - this sets a narrow framing on what planners perceive NBS is and how it can support city planning.
- Lack of belief or knowledge in NBS often exists among sector specialists - many simply don't believe and stick to conventional grey infrastructure solutions.
- The benefits of NBS are positive externalities which frustrate effective inclusion in EIA, CBA, SEAs etc.
- Possible lack of focus on district scale solutions means some of the major benefits of NBS cannot be captured - e.g. Amsterdam, and Copenhagen use water bodies as part of district level urban cooling solutions.
- Lack of municipal control/ownership of land - Many NBSs require land which due to existing developing planning processes may not exist - e.g. streets too narrow to plant trees, lack of land to turn into blue/green space.
- Lack of authority and multi-level governance - Some NBS will require collaboration between regional and city level governments e.g. riverine flooding can be controlled with upstream riparian buffers, but city governments may lack ability to have these planted.

Capacity challenges

Key barriers to entry for Nature Based Urban Solutions observed so far include the lack of expertise by city professionals to package these solutions in a way that will link them to direct return on investment in order to produce a business case for allocation of budget. In addition, rigid city financial systems that are not designed to accommodate such solutions in mainstream decision making as well as lack of human and business capacity for implementation.

From the narrative advanced in this paper so far, a number of key areas requiring strategic, leadership and technical expertise are beginning to emerge alongside the obvious conclusion that cities that continue on a development pathway that perpetuates the current status quo will not be prosperous and will struggle to recover post



Challenges and Opportunities

Covid-19. Nature based urban solutions are already central to Climate Action Plans of many cities and would be a catalyst for a different economic development pathway that hopefully resolves the current inequality observed in many cities.

At the core of the problem is the traditional allocation of functions by national legislation to local governments. In South Africa, barring a complete amendment to the constitution, cities are only able to transform their core business through being innovative with the current structures in place. With the gradual emergence and acceptance of climate change action into mainstream business of cities, we begin to get a picture of the elements of the required transformative approach that will ensure innovation in bolstering the capacity of city functions for nature based solutions. Central to this innovation is mainstreaming of nature based solutions into the core business of cities, a proven transformative way to address socio-economic problems especially in cities of the global south that are currently plagued by high levels of inequality. Anything that is not mainstream, cities will struggle to motivate for funding and capacity for.

Capacity is required at many levels

Leadership capacity

It is not a question of whether cities have capable leadership or not, the key question is whether we have made a compelling business case for city leadership to put their weight behind nature based solutions as a way of responding to the mounting socio-economic problems, understanding that success of city leadership is measured through

their ability to have increased economic growth and social upliftment during their tenure of office. Challenges to be dealt with in this respect are mostly around the need to present nature based solutions in a way that makes sense to city leadership who in turn have to account to their constituencies.

Capacity to mainstream

There has already been a lot written in literature about the need to mainstream these nature based solutions responses into planning and urban service delivery. This requires a complete transformation of the current professionals within cities as well as a new stream of professionals that have been trained specifically to approach planning and service delivery in a holistic manner that embraces nature based urban solutions.

The capacity to collaborate, co-ordinate across functions, agencies, sectors and levels of government is essential for greater cohesion and maximum use of scarce resources in an efficient manner, avoiding silo approaches. The capacity to conceptualise and implement projects that are multidisciplinary in nature and that address multiple city problems requires a combination of technical and soft skills. Finally, stakeholder engagement plays a key role in the implementation of NBS approaches but these skills are often lacking in city practitioners.

Under Covid-19 pandemic, we are increasingly seeing functions that are not seen as key municipal core business take a back seat. It is expected that local governments and government at large will be shedding a lot of jobs as the public sector wage bill has become too big to sustain with the fiscus.



Challenges and Opportunities

It follows then that unless nature based solutions are made a key part of the economic recovery plan for cities, we can expect to lose even more skilled professionals from cities post Covid-19 as the pressure to focus only on expenses that can be recouped through proven return on investment amounts.

Financial challenges

Developed countries have pledged to mobilise US \$100 billion annually as of 2020 to support the response to climate change in developing countries as it affects vulnerable communities in impoverished countries disproportionately. The GCF which is one of the major financing instruments to large-scale climate intervention on a path towards a 1.5 scenario, has mobilised \$10 billion in public funding to date. The finance dearth will be devastating and hamper our efforts to roll out effective climate interventions. This illustrates the point that the climate finance that has been or is yet to be mobilised should be used in the most efficient way and prioritise NBS.

- It is estimated that on average the loss of a hectare of wetland results in US \$33,000 increase in storm damage in the United States (Costanza et al., year). This data has been obtained based on damage costs related to 34 major hurricanes since 1980. In addition, wetlands are estimated to contribute to US \$ 23.2 billion in storm protection services.

The implementation and uptake of NBS that can improve human health and wellbeing in cities will require new investments, which however are difficult to retrieve from public sources because of the tightness of public budgets. New financing

sources, strategies of cooperation between public and private actors, as well as new business models will play a key role in supporting this transformation.

Several instruments can be adopted in these circumstances, in order to modify the choices of economic actors and to involve them in the implementation of NBS in cities through command and control, economic convenience and availability of information. Effective and efficient use of these instruments requires to establish the value of ecosystem services. Assessing the economic value of ecosystem services is fundamental to manage and protect them and to define appropriate compensation mechanisms aimed to internalise the externalities generated by human activities. In the last years, there has been a gradual shift from the adoption of regulatory mechanisms to instruments based on incentives, compensations and voluntary agreements linked to the creation of new markets. UN-Habitat (2017) proposes a classification of financial instruments that cities can adopt for the realization of several project. These include local government-based financing options (e.g., general obligation bonds, revenue bonds, green bonds), development exactions (e.g., linkage fees, impact fees), public and private options (e.g., public-private partnerships [PPPs], pay for performance), and mechanisms to leverage private sector investment (e.g., loan guarantees, tax increment financing, blended finance). Also the NCFE defined several financial instruments that can be used by stakeholders to implement projects related with nature, including green infrastructures and NBS in cities (EIB, 2019).



The fact that city accountants do not see natural rivers as assets in terms of GRAP means that they are reluctant to borrow money for capital spend on the natural restoration of natural river systems. This means that although a fund like the GCF may offer low or no interest loans, the City accounting officials would not support the acquisition of this funding for natural river system restoration. This means that only limited operational funding can be used for this restoration meaning that restoration is slow and the realization of the resilience benefits of a restored natural river system is extremely slow. In contrast, the use of a capital fund to carry out the initial restoration work with an operationally funded maintenance plan to follow, will mean that the benefits are realized sooner and the avoided costs of damage would more than cover the repayment of the initial capital funding.

Further work needed:

- Pricing of ecosystem services
- National treasury guidelines for the classification of natural rivers as assets in terms of GRAP
- Integration of ecological infrastructure into definition of capital assets for budgeting and maintenance
- The packaging of NBS does not match the finance speak and therefore does not attract finance.
- Hard and grey infrastructure are often used as political legacy projects.
- NBS have significant co-benefits that further strengthen resilience to climate change.
- Because of the nature of the adaptation interventions, there is no market internal rate of return on investments (in the finance speak), although the benefits are many.

- There is no financial incentive to invest in adaptation whilst mitigation interventions, especially revenue generating activities, attract investment from the private sector because of potential tax benefits.
- It is crucial to encourage international donors and financing institutions to prioritize sub-sovereign guarantee programs on municipal nature-based solutions to support cities in planning for a more sustainable future
- Likewise, further efforts are needed to assist cities in mobilising a diverse set of financing options to catalyse investment in sustainable urban projects with high socioeconomic benefits

Link with the COVID-19 crisis

The Climate Emergency will require that cities be highly resilient (city agility & preparedness) in managing the transitions required by unpredictable game-changing events. While Covid-19 has rendered most cities vulnerable and exposed, the present global landscape is characterised by structural transition expressed in constant and continual change. The imperative for preparedness and agility is thus the new normal and Covid-19 is a sobering reminder of this.

The Covid-19 Pandemic thus presents a remarkable opportunity for cities to “double-pivot” to both respond meaningfully to and survive the poly-crisis and put in place the foundations for medium to longer term growth and structural transition. Broadly speaking this means becoming far more agile and includes:

- capitalising on exponential technologies and platforms including the tools and the strategies for bringing services online



- intensified community engagement and responsiveness
- fostering innovation, creativity and responsibility
- rethinking business models to embrace NBS and other new technologies and operating models.

Covid 19 presents a test run of how cities can transition through unpredictable game-changing events. This is the optimal time for cities to explore Nature Based Solutions, which are community-based and inherently resilient in a mutually reinforcing way.



Recommendations



Recommendations

To G20 National Leaders

1. NBS require prioritisation regarding technical, financial, and capacity measures. This includes transformative governance, economic systems, and programmes required to support NBS:
 - Political and institutional will to absorb the costs and regulatory and policy demands of NBS innovation
 - Development of new professional, technical, and administrative mindsets, practices and codes
 - Integrating the life cycle and maintenance regimes of NBS into the operational practices and systems of local governance
 - Appropriate interpretation of accounting practices & protocols and the training of municipal officials in this new interpretation.
 - Appropriate finance and funding mechanisms
2. Transformative NBS projects should be designed to build human and social capital, to enhance human health and well-being, and to grow the green economy. This includes:
 - Support for the emergence and growth of the NBS green economy including producers, suppliers and distributors of green products, technologies and services
 - Enterprise development and entrepreneurship development for businesses that can deliver NBS
 - Community engagement, research and capacity building

- City partnerships with citizens, businesses and non-profits can leverage wider, longer-term investment in NBS, and offer opportunities for innovative approaches that bring enhanced project impacts and transformation.
3. National agencies should collaborate with cities to improve access to bilateral, multilateral and private sources of capital to implement sustainable infrastructure projects. In some instances, these are among cities' biggest challenges due to high costs, potential financing gaps, regulatory obstacles, and governance challenges.
 4. Simpler and more direct access to financing should be accompanied by joint efforts to strengthen good governance and promote transparent, participatory, and research-based planning processes that advocate for solutions to meet citizens' needs and expectations.
 5. Support cities by unlocking the necessary resources and encouraging multi-stakeholder engagement in adaptation planning across national and subnational levels of government.

To Multi-lateral agencies & city governments

1. A transformative approach should be taken to NBS. Transformational change as: "A structural change that alters the interplay of institutional, cultural, technological, economic and ecological dimensions of a given system. It will unlock new development paths, including social practices and worldviews". (Mersmann et al., 2014), This includes:



Recommendations

- Practices that resulted in positive changes to systems, financial flows, skills and climate action implementation at scale, including improving transversal working and horizontal integration between sectors and stakeholder groups
 - Practices that underpinned the sustainability of the investment and secured positive outcomes
 - Practices that built people's skills, community institutions, capacity and / or levels of social cohesion, supporting the multiplier effect.
 - Practices that built relationships between the city and other groups, including catalysing wider action, impact or investment.
2. The outcomes of the above initiatives include opportunities for community upliftment, green jobs and local livelihood improvement, while establishing natural “carbon sinks” and restoring biodiversity. The initiatives should also contribute towards mitigating climate change impacts and increasing local resilience and adaptive capacity to climate change.
 3. Mainstreaming NBS into city core business, in this way using NBS as one of the deciding factors in infrastructure investment
 4. Building capacity of leadership at all levels to be able to make decisions that advance NBS into mainstream decision making and resource allocation
 5. NBS to be included in green stimulus packages for rebuilding the economy post Covid 19 pandemic, opportunity for creating an economic sector that is completely city led and sustainable
 6. Build the economic case for NBS: Proving the cost effectiveness of NBS and quantifying their direct and indirect monetary benefits is one of the most significant factors that determines the integration of NBS into mainstream urban planning.
 7. Stakeholder engagement at all levels of society are key, including social participation and community management, for conservation actions success, mitigation of environmental problems, and reduction to population vulnerability.
 8. Monitoring projects and its results over time is fundamental for continuous improvement and to achieve significant effects in nature conservation, as well as for cities sustainability.
 9. Capacity is required at many levels
 - Leadership capacity
 - Capacity to mainstream
 - Capacity to collaborate, co-ordinate across functions, agencies, sectors and levels of government for greater cohesion and maximise use of scarce resources in an efficient manner, avoiding silo approaches.
 - Capacity to conceptualise and implement projects that are multidisciplinary in nature



Recommendations

and address multiple city problems – combination of technical and soft skills

- Capacity for Stakeholder engagement plays a key role in the implementation of NBS approaches, but these are the skills that are often lacking in city practitioners.

To the Private Sector & Investors

To Civil Society

1. NBS require partnerships with citizens, businesses and non-profits to leverage wider, longer-term sustainability and offer opportunities for innovative approaches that bring enhanced project impacts and transformation.
2. NBS requires building effective transversal working relationships. Projects should be planned collaboratively to establish joint project resourcing and mutual accountability.
3. For NBS projects to be institutionally and financially sustainable, a compelling business case is needed. This business case should justify the project purpose and benefits in the context of the services that the city should deliver and its socio-economic and environmental priorities.
4. NBS projects should be sized to ensure they are technically feasible, contextually relevant, manageable and operationally sustainable.
5. Appropriately skilled programme management capacity with a multi-year focus is vital for NBS projects to be sustainable.
6. Transformative riverine management projects should be designed to build human and social capital to enhance human health, well-being and to grow the green economy.

Further Research needed:

1. Pricing of ecosystem services
2. National treasury guidelines for the classification of natural rivers as assets in terms of GRAP
3. Integration of ecological infrastructure into definition of capital assets for budgeting and maintenance
4. The packaging of NBS does not match the finance speak and therefore does not attract finance.
5. Hard and grey infrastructure are often used as political legacy projects.
6. NBS have significant co-benefits that further strengthen resilience to climate change.
7. Because of the nature of the adaptation interventions, there is no market internal rate of return on investments (in the finance speak), although the benefits are many.
8. There is no financial incentive to invest in adaptation whilst mitigation interventions, especially revenue generating activities, attract investment from the private sector because of potential tax benefits.



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