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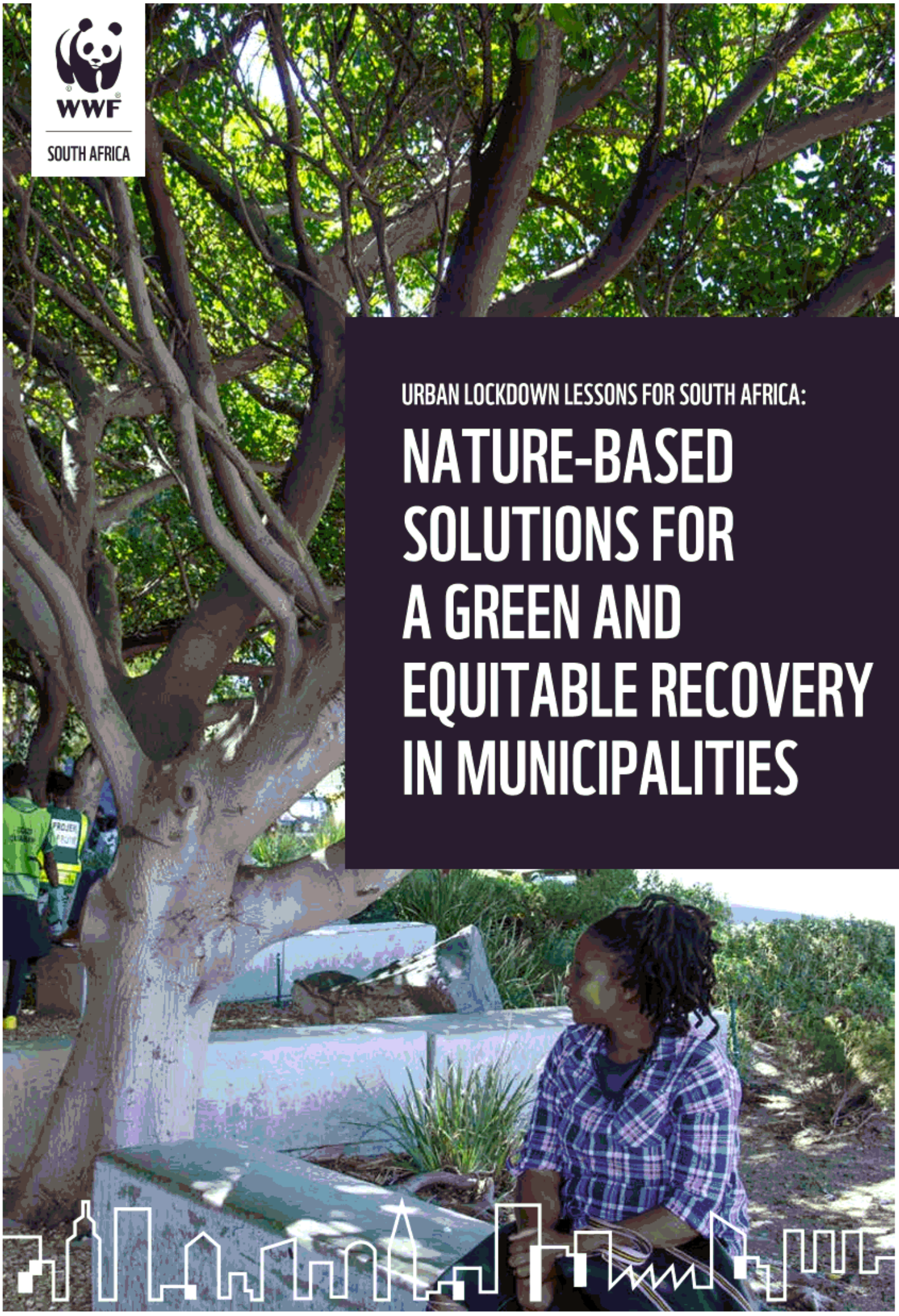
SOUTH AFRICA



URBAN LOCKDOWN LESSONS FOR SOUTH AFRICA:

NATURE-BASED SOLUTIONS FOR A GREEN AND EQUITABLE RECOVERY IN MUNICIPALITIES

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Citation:
Gulati, M. and Scholtz, L. 2020. *Urban lockdown lessons for South Africa: Nature-based solutions for a green and equitable recovery in municipalities*. WWF South Africa, Cape Town, South Africa.

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KEY MESSAGES

COVID-19 has significantly reduced municipal finances due to the confluence of reduced revenues and increased expenditure.

- The pandemic has highlighted:
  - The precarious position and existing inequalities of urban residents who were already disadvantaged or vulnerable before the pandemic
  - The need for municipalities to become more resilient to future climate-related shocks.
- Responding to these challenges, municipalities need to identify and implement strategies and actions that address the need for prompt recovery responses to COVID-19, while achieving long-lasting change by making cities climate resilient, healthy and liveable.
- Nature-based solutions offer opportunities that can address pressing social and environmental concerns while supporting long-term resilience to future climate impacts and shocks.
- Tree-based nature-based solutions provide the following cross-cutting benefits:
  - Address unemployment through creating immediate low-skill, fast-implementing and no-harm jobs
  - Improve environmental conditions, for example through reducing concentrations of air pollutants
  - Promote outdoor activities and active lifestyles that support physical and mental well-being to address these critical concerns that are emerging from the pandemic
  - Act as carbon sinks, reducing pollution and addressing urban heat islands.
- Critically, municipalities must ensure that tree-planting initiatives have a strong equity component in deprived, disinvested/underinvested and poorer areas of cities.
- Challenges to implementation include accessing funding, a lack of understanding of the economic and environmental benefits and existing procurement practices.
- Innovation in business and financing models are necessary to build capacity across city departments and repurpose procurement to move away from a focus on cost at point of purchase.

INTRODUCTION

COVID-19 has sounded a warning bell for urban resilience in South Africa. South African municipalities (covering cities and towns) are facing unprecedented challenges in the face of COVID-19.

On the one hand, municipalities have been at the forefront of dealing with the immediate effects of the pandemic. On the other, they are facing additional and unexpected expenditure on public health responses, declining revenues due to the economic slowdown induced by lockdowns and restrictions to manage the spread of COVID-19, and reduced transfers from the national government which itself has multiple financial priorities to juggle in the face of the pandemic. This is having a devastating effect on municipal finances.

DID YOU KNOW?

The City of Cape Town has estimated that the pandemic is likely to have substantive impacts on the City's finances in the next financial year due to additional COVID-19-related expenditure that had to be incurred for items such as personal protective equipment (PPE) for frontline workers, additional services in water and sanitation for informal settlements, and assisting the provincial government on health aspects. The City is also expecting increased debt impairment, reduced revenue and some reduced expenditure, amounting to a projected net impact of R2,1 billion (PMG, 2020).

More importantly, the pandemic is compounding the many vulnerabilities municipalities already face in the form of climate-related shocks and stresses, particularly droughts and increased flooding, with the lack of investment in water supply capacity exacerbating the effects of the lack of rainfall. Cape Town nearly became the first big city on the planet to run dry following a three-year drought. The same trends are now seen in the Eastern Cape province, with the Nelson Mandela Bay Metropolitan Municipality and several other major towns in the province, such as Grahamstown, Graaff-Reinet, Bedford and Queenstown, are also experiencing severe water shortages. Johannesburg in Gauteng has closely escaped a drought in the past but has regularly experienced heat waves in the past four years (Joburg Newsroom, 2014).

Municipalities are also bearing the brunt of worsening storms and flash floods that cause extensive damage to infrastructure, and cost lives. Most recently, cities and towns in Gauteng have faced heavy rains that have damaged infrastructure and private property, and caused flooding (Mokhoali, 2020). The severity of these weather events is exacerbated by the inability of the existing infrastructure to cope with excessive additional amounts of stormwater. Incidences of flooding have also marred the ability of some municipalities to manage the COVID-19 outbreak. In the early days of the pandemic, some local authorities were struggling with delivering public health responses during flash flooding in informal settlements where social distancing measures critical to the control of the pandemic were nearly impossible to implement (WRI, n.d.).

These existing challenges will be exacerbated by the physical impacts of climate change, further impacting on the ability of municipalities to finance and deliver services and infrastructure in future. Research by the City of Johannesburg for its 2040 strategy shows that, if not tackled, climate change will intensify the existing urban heat island effect and see temperatures in summer push closer towards 50 °C, rather than the high 30s that are now common (Kings, 2016). Similarly, Cape Town will face a significant increase in mean annual and maximum temperatures along with more high heat days and more frequent and intense heat waves. Drastic rises in temperature are also projected for the

City of Tshwane, with extreme temperature events such as very hot days (maximum of more than 35 °C), heat waves and more high fire-danger days (Mphanga, 2018).

Moreover, both climate change and the COVID-19 pandemic have aggravated the stark inequalities and the deep-rooted social disparities in cities. The COVID-19 pandemic itself and the ensuing lockdown regulations have not affected everyone equally. Measures have had a disproportional impact on urban residents who were already disadvantaged or vulnerable: those living in dense informal settlements or low-income neighbourhoods characterised by substandard housing, overcrowded conditions, a lack of access to clean water, and inadequate space to self-distance and isolate. These residents are also part of the low-skilled groups in the labour market, or they work in the informal economy, often as daily wage earners, and therefore have irregular incomes and insecure jobs (see Box 1).

BY APRIL 2020, EVERY THIRD INCOME EARNER WAS NOT EARNING INCOME

18%

OVERALL DECLINE IN EMPLOYMENT FEBRUARY-APRIL 2020

311 000

DECLINE IN TOTAL EMPLOYMENT IN PRIVATE HOUSEHOLDS FEBRUARY-APRIL 2020

JOB LOSSES IN EMPLOYMENT SECTORS

20%

INFORMAL AND DOMESTIC WORKERS

10%

FORMAL WORKERS

BOX 1: IMPACT OF COVID-19 PANDEMIC ON THE LOW-SKILLED AND INFORMAL SECTOR WORKERS IN URBAN AREAS

Urban residents who form part of the low-skilled groups in the labour market or work in the informal sector have been affected more than others by the sizeable and devastating economic impacts of the pandemic. The country's National Income Dynamics Coronavirus Rapid Mobile Survey (Benhura and Magejo, 2020) indicates that job losses and a decline in wages have been disproportionately concentrated among the already disadvantaged groups and the low-skilled groups in the labour market. In addition, workers in the informal sector in urban areas who are self-employed have also been highly vulnerable to livelihood shocks.

One estimate suggests that the total employment in private households, which includes gardeners, private security guards, butlers, pool cleaners, drivers and domestic workers, declined by 311 000 between the first and second quarters of 2020 (Damons, 2020). Another suggests that over a fifth of informal and domestic workers lost their jobs, compared to around a tenth of formal workers (TIPS, 2020).

The National Treasury confirms this (IMF, 2020). There was a decline of about 18% in employment between February and April 2020 with every third income earner in February 2020 not earning income in April 2020. These job losses were concentrated among women and manual labourers, with those at "the bottom of the income distribution" being impacted the most (IMF, 2020a).

These trends have continued with employment data for the second quarter of 2020 also showing that job losses were highest for lower-skilled, lower-income and informal workers (TIPS, 2020). A report by the UNDP and other UN agencies in South Africa also estimates that the less educated have been hit hardest (UNDP, 2020; UN in SA, 2020). Others point out that the full extent of the impact on urban workers who are informally employed is yet to be revealed with regard to the livelihoods of hawkers and the shutting down of home businesses (Fray, 2020).

SOUTH AFRICA'S ECONOMIC RECOVERY PLANS

THE MISSED OPPORTUNITY FOR IMMEDIATE JOBS

The responses to COVID-19 from municipalities have been rightly focused on the pressing challenges relating to the health and well-being of people. But they now need to plan for recovery and future resilience.

© Julliette Bisset Greenpop

This recovery and future resilience should take into account increased climate variance and impacts, reduced income and revenue for the foreseeable future, and the need to reduce inequality within our cities and build a fairer and healthier society.

The immediate priority in South Africa, with its endemic unemployment, should be to invest in programmes with the shortest lead times that will deliver the greatest job creation benefits and that will set cities firmly on the path to a resilient and net zero-carbon economy.

There are many proposals in the country for stimulating economic recovery, including proposals to transition to a green, low-carbon, socially inclusive and more resilient economy. Policy actions have also been announced by the national government to resuscitate the economy and reshape it in the long run. These proposals and policy actions aim to accelerate reforms to jump-start growth and employment creation (IMF, 2020b). The South African Economic Reconstruction and Recovery Plan prioritises interventions in the green economy and commits to wide-ranging structural economic reforms across the economy and different sectors to support the reconstruction and recovery.

The green interventions include retrofitting public and private buildings with measures to improve energy and water efficiency, waste management measures, retrofitting of the ageing Mpumalanga power stations with solar power, diversifying South Africa's

THIS COMMUNITY GARDEN IN HANOVER PARK IN THE WESTERN CAPE HELPED TO PROVIDE FOOD TO THE POOR IN THE COMMUNITY DURING COVID-19 LOCKDOWN.

energy sources in line with the existing national plans, and rolling out a biodiversity economy infrastructure (SA Government, 2020).

However, it will take time for many of the measures announced by the government to come into effect and then for investment and employment creation avenues to become effective. Neither the finalising of the mining legislation (Mining Charter) nor the land reforms (IMF, 2020b), for example, are likely to become effective even in the immediate future. Creating investment opportunities in the electricity sector by accelerating Eskom's turnaround or by opening sectors such as ports and railways to private sector investment (IMF, 2020b) will also not happen overnight. Moreover, many of the proposed investments are unlikely to create jobs across the board and across all labour groups and will in many instances require reskilling. As such, these opportunities do not respond to those work-seekers who are neither well educated nor possess the skills and experience required (StatsSA, 2020).

For these reasons, green economy interventions, while much needed and relevant for reorienting the South African economy, are not going to create immediate jobs. Experience from other countries suggests that, rather than boosting overall economic activity in the short run, **green economy interventions in recovery packages are more successful at reshaping the economy towards green sectors by increasing the local demand for green skills** (Popp et al., 2020). Green stimulus measures are also most effective in communities where workers already have the technical and engineering skills needed to operate, maintain and develop green technologies (Popp et al., 2020; Chen et al., 2020).

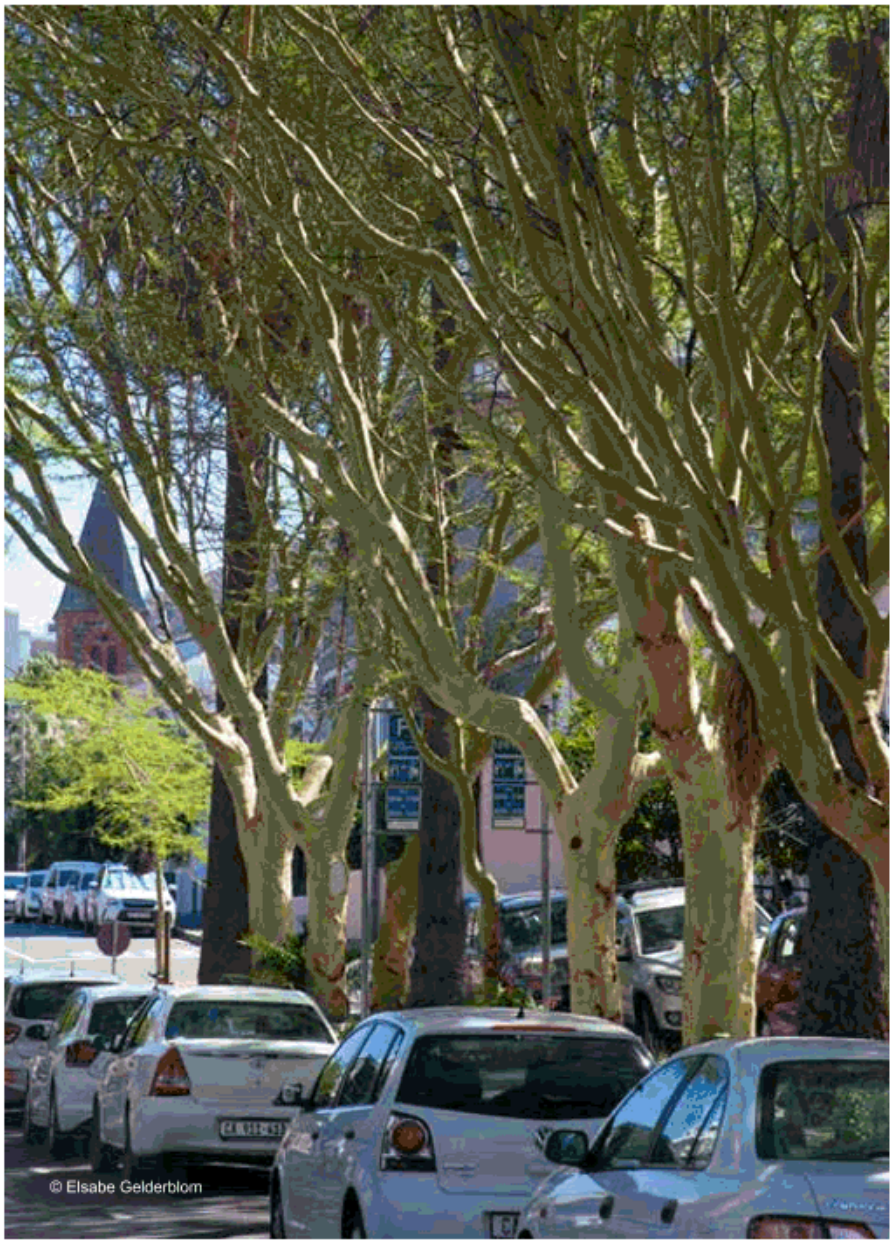
While cities and towns wait for national policy reforms and measures to come into effect and for investments needed to support future job creation, they can invest in programmes that are job-intense and provide opportunities for their most vulnerable and lowly skilled inhabitants. Given the vulnerability of South African cities and towns, these jobs should ideally contribute to the overall mitigation of and building resilience to future climate stressors and shocks. Nature-based solutions offer such an opportunity.

DID YOU KNOW?

Nature-based solutions offer an opportunity to mitigate climate stressors and shocks and build resilience in urban environments.

WHAT ARE NATURE-BASED SOLUTIONS?

"Nature-based solutions" is an umbrella term to describe solutions inspired by nature to address societal challenges such as climate change, food and water security, human health, disaster risk, and social and economic development (Cohen-Shacham et al., 2016).



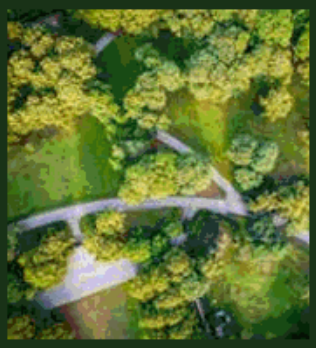
Nature-based solutions (NBS) include ecosystem-based adaptation, natural climate solutions and eco-disaster risk reduction (Preethan and Gupta, 2020). These measures can include infrastructure solutions that are solely supported by NBS, or hybrid infrastructure where NBS are used to increase the efficiency of traditional grey infrastructure (see Figure 1).

Nature-based solutions bring more and more diverse natural features and processes into focus through locally adapted, resource-efficient and systemic interventions. These solutions can be cost effective, simultaneously provide environmental, social and economic benefits, and help build resilience.

Specific urban examples of nature-based solutions include tree planting, creating new woodland areas, greening of cycle and pedestrian routes, sustainable urban drainage, rain gardens, green rooftops, green walls or greened brownfields, green wharfs, community gardens, parks, non-woodland ecosystems (e.g. wetlands), woodland ecosystems, water bodies, spontaneous flora and greening river corridors (see Figure 2).

NATURE-BASED SOLUTIONS

Enhance the delivery of services that are analogous to public infrastructure



Enhance the delivery of co-benefits to human populations

Serve as a substitute for building traditional grey infrastructure and reducing the need for the latter

Increase the efficiency of traditional grey infrastructure

FIGURE 1: EXAMPLES OF NATURE-BASED SOLUTIONS (ADAPTED FROM IISD, 2020)

NATURE-BASED SOLUTIONS AT DIFFERENT SCALES

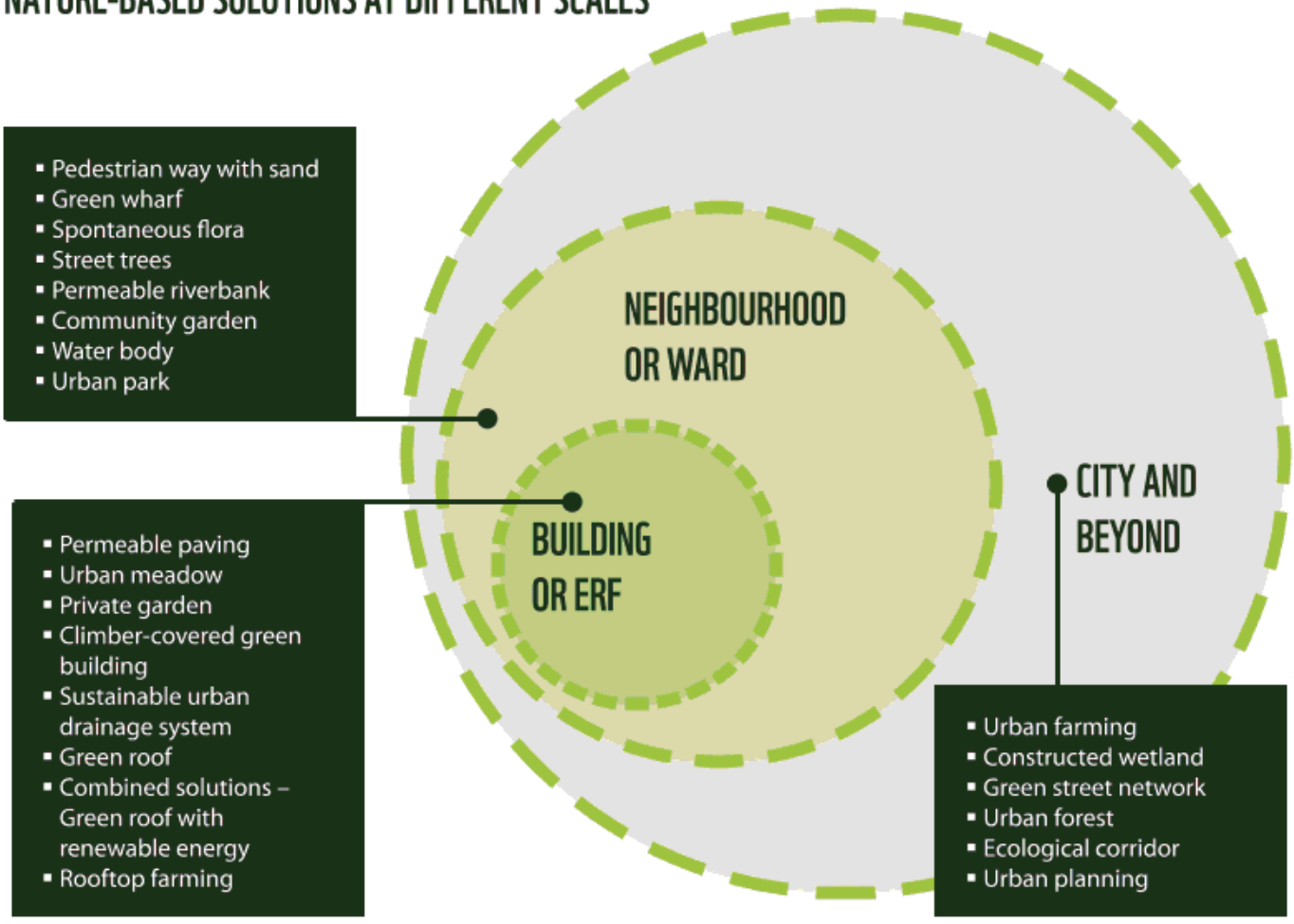


FIGURE 2: NATURE-BASED SOLUTIONS IN MUNICIPALITIES (ADAPTED FROM NATURE4CITIES, N.D.)

NATURE-BASED SOLUTIONS AS AN APPROPRIATE AND DESIRABLE RECOVERY RESPONSE

Nature-based solutions can deliver the multi-dimensional benefits that are required to address the interlinked challenges faced by municipalities. These solutions can boost the climate and environmental resilience of municipalities, while delivering several social benefits in the context of long-term recovery after the pandemic.

From a climate perspective, nature-based solutions can increase the climate and environmental resilience of municipalities by:

- Providing more carbon sinks in the urban environment, thereby reducing carbon emissions
- Addressing rising temperatures
- Minimising heat island effects
- Providing areas of shade during heatwaves
- Providing a source of natural flood risk management
- Reducing soil erosion and excessive sediment entering watercourses
- Improving air quality.

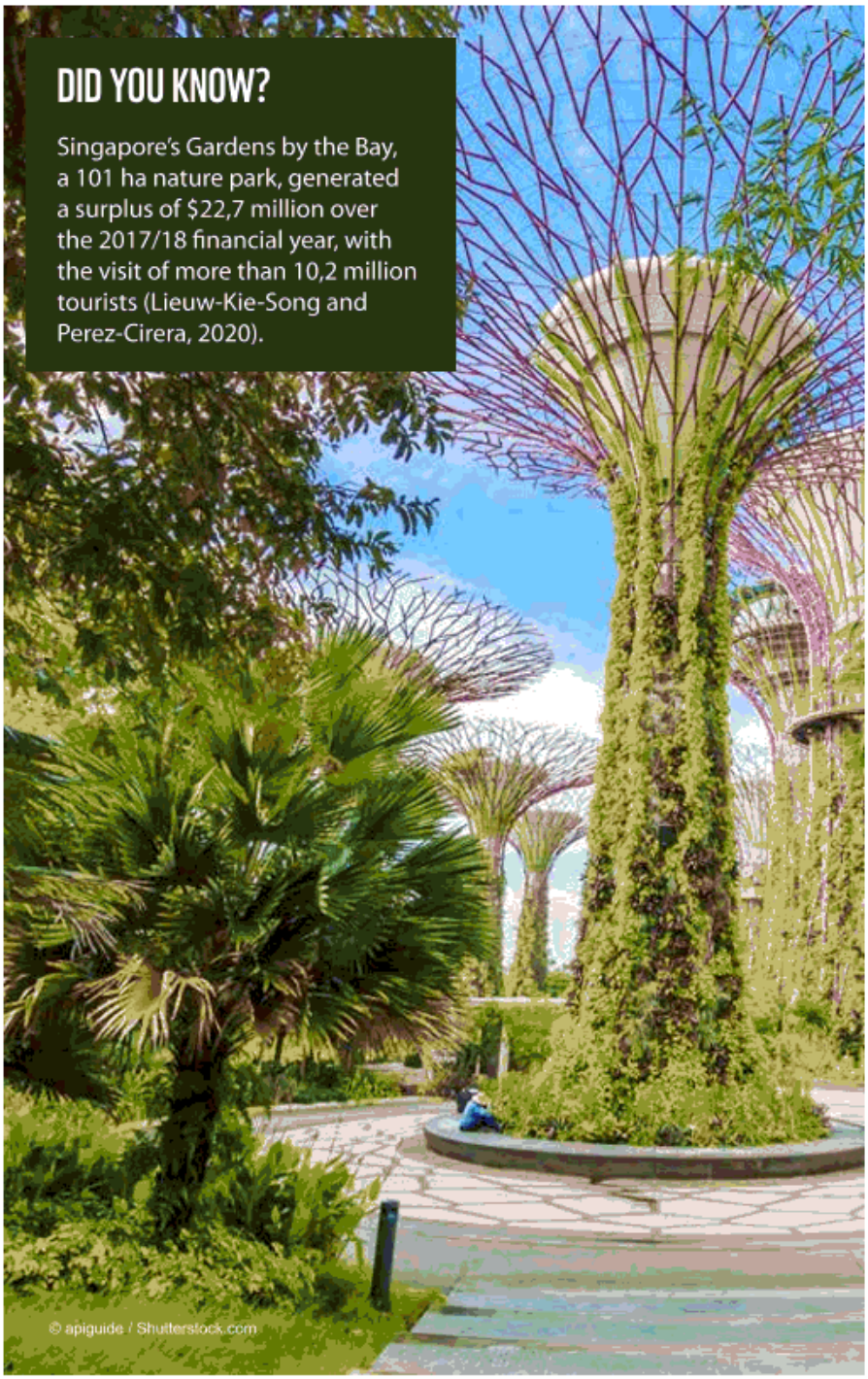
Nature-based solutions not only address social issues relating to high levels of unemployment, they are also labour intensive and have the potential create immediate low-skill (Cook and Taylor, 2020), fast-implementing (Cook and Taylor, 2020) and no-harm jobs (European Commission, 2020). The cost for municipalities of creating employment in nature-based solutions is less than the cost in conventional industrial sectors (GCRO, 2016). In addition, the type of employment created is more suitable for South Africa's needs by catering to those with low skill levels, in proximity to places of residence, and by nurturing a sense of place and belonging (GCRO, 2016). In doing so, nature-based solutions can redress the capital-labour structure of the existing economy and support labour absorption, not to mention the positive social impacts of nature-based solutions on physical and mental health, particularly of children, and social cohesion.

Moreover, a growing body of literature recommends that these solutions support long-term economic growth by increasing food and water security, business productivity, and tourism and recreation value.

The equity component of nature-based solutions is critical in a South African context. The lack of access to nature and natural areas contributes to health inequality, and improving it is key to tackling these challenges. Affluent neighbourhoods tend to have more green spaces, or residents in these neighbourhoods can access such spaces at shorter distances than deprived and poor neighbourhoods. This is true for 96% of South African cities, with the more affluent suburbs having the lowest density of housing and the highest area of green space per capita (Venter et al., 2020). In Johannesburg, tree canopy coverage of the city's northern and affluent suburbs is approximately 24,2% of the total area compared to 6,7% in the poorer southern suburbs (Van Staden, n.d.). Responses must therefore explicitly address the spatial inequality of nature-based solutions.

DID YOU KNOW?

In 2006, Johannesburg launched the Greening Soweto Initiative, a project that aimed to plant 200 000 trees in Soweto (Cities4Forests, n.d.). This project brought many benefits to the residents of Soweto through the creation of jobs and wildlife habitat, the provision of shade and, ultimately, improvement of the quality of life for residents of the township.



DID YOU KNOW?

Singapore's Gardens by the Bay, a 101 ha nature park, generated a surplus of $22,7 million over the 2017/18 financial year, with the visit of more than 10,2 million tourists (Lieuw-Kie-Song and Perez-Cirera, 2020).

DID YOU KNOW?

A study by the International Growth Centre conducted by South African researchers indicates that 21 000 particulate matter-related premature deaths occur due to current air-quality levels and that 7,4% of all deaths in South Africa come from chronic exposure to fine particulate matter. These premature deaths cost the South African economy $20 billion, or 6% of its gross domestic product (Altieri and Keen, 2016).

21 000

PARTICULATE MATTER-RELATED PREMATURE DEATHS IN SOUTH AFRICA DUE TO CURRENT AIR-QUALITY LEVELS

"WE NEED TO RECOGNISE THAT INVESTING IN NATURE SUPPORTS HEALTH, SUPPORTS QUALITY OF LIFE AND CREATES JOBS."

José Ángel Gurría, OECD secretary-general, speaking at a webinar on nature-based solutions and the post-COVID recovery, jointly organised by the OECD and WWF.

"OUR DIRECT EXPERIENCE SHOWS ... THAT, WHERE WE CORRECTLY APPLY THIS TYPE OF LOCAL, RESOURCE-BASED APPROACH ... LABOUR INTENSITY CAN BE INCREASED BY UP TO 35% – THERE IS A VERY IMPORTANT POTENTIAL ALIGNMENT OF NATURE-BASED SOLUTIONS WITH SUSTAINABLE JOB CREATION AND THE IMPROVEMENT OF ECONOMIC AND SOCIAL CONDITIONS."

Guy Ryder, director-general of the International Labour Organization

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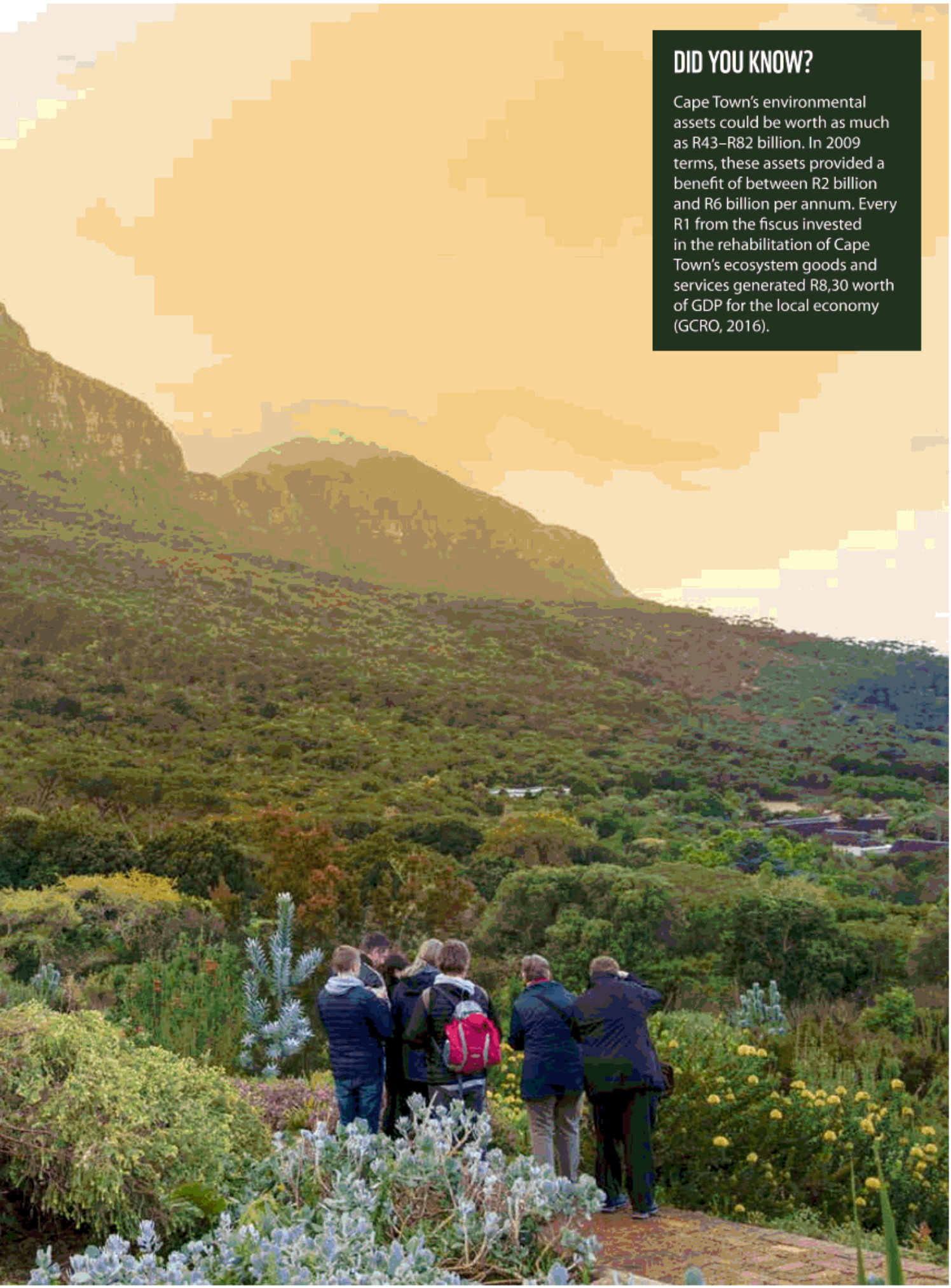


DID YOU KNOW?

Cape Town's environmental assets could be worth as much as R43–R82 billion. In 2009 terms, these assets provided a benefit of between R2 billion and R6 billion per annum. Every R1 from the fiscus invested in the rehabilitation of Cape Town's ecosystem goods and services generated R8,30 worth of GDP for the local economy (GCRO, 2016).

DID YOU KNOW?

In 2010 and 2011, the city of Durban in the eThekwini Metropolitan Municipality, KwaZulu-Natal, initiated three large-scale community reforestation projects with the objective of sequestering carbon as part of its commitment to hosting a climate-neutral FIFA World Cup. Altogether 650 ha of the municipal-owned buffer zone around the new regional landfill site were reforested between November 2008 and June 2010. The project led to the creation of 220 temporary jobs and a total of R218 000 being earned by local community members. In addition, R228 413 worth of school fees and basic goods went to "Treepreneurs" in the local community in exchange for the seedlings they grew for the project. The reforestation is estimated to sequester around 20 000 tonnes of CO_2 over a 20-year period, 6,5% of the carbon footprint of the FIFA World Cup (Diederichs Mander and Roberts, 2010).

TREE PLANTING AT THE BUFFELSDRAAI LANDFILL SITE COMMUNITY REFORESTATION PROJECT.

HOW CAN MUNICIPALITIES USE NATURE-BASED SOLUTIONS TO CREATE JOBS AND EQUITY?

From a job creation and equity perspective, not all nature-based solutions are equal. Depending on the challenges they address and the scale at which they do so, nature-based solutions vary in their requirements for planning, skill and labour.

Various nature-based solutions will require different engineering solutions, planning and feasibility studies and cross-departmental integration. The scale at which nature-based solutions can be implemented (i.e. at building, street or city level), the costs and payback periods, and the ability to create jobs (including the types of jobs created) will also vary (see Table 1).

As highlighted above, South African municipalities need to opt for solutions that have the potential to rapidly generate jobs and provide accessible employment opportunities for lower-skilled workers at low cost to the city, while fostering greater equality and social coherence. Importantly, the cost of deployment has to be achievable within the increasingly constrained financial situation of municipalities. **Given that all nature-based solutions will deliver the short- to longer-term benefits of a green recovery, the choice ultimately comes down to the potential for immediate deployment to create jobs and enhance equity.**

TABLE 1: COMPARISON OF SELECT TYPES OF NATURE-BASED SOLUTIONS FOR MUNICIPALITIES

Type of nature-based solutions	Scale	Level of engineering or feasibility planning required
Trees: Planting and renewal of urban trees, shade trees, cooling trees, trees re-naturing, parking	Street level	Low
Removal of invasive alien plants	City level	None
Creating new woodland areas	City level	Low
Cycle and pedestrian green route	City level	Medium
Sustainable urban drainage	Building/ street/city level	Part of a sequence of management practices, control structures and strategies
Rain gardens	Street/city level	Required location and storage capacity of the garden must be determined first
Hard drainage flood prevention	City level	Nature-based solutions have to be delivered with a hard/built engineered approach to water management
Hard drainage pavements	Street/city level	Depends on climatic conditions, with areas of heavy rainfall requiring more layers to mitigate additional flow and time needed to dissipate
Green façade with climbing plants	Building level	None
Green roofs	Building level	Depends on whether the green roof is extensive or intensive

	Maintenance	Modifications required to incorporate nature-based solutions	Period of recovery of the initial economic investment	Level of social justice and social cohesion	Level of public health and well-being
	Three-yearly cycle of inspection and maintenance; watering, pruning or pollarding if required	None to low	About 5 years	Medium	High
	Ongoing maintenance to prevent regrowth	None to low	Immediate	Low	Low
	Appropriate cycle of inspection (3–5 years) and maintenance; watering, pruning or pollarding if required				
	Clear drainage channels and culverts, sweep debris and surface, mow verges, cut trees and other vegetation, repair/ replace damaged/lost signs, maintain lighting, furniture, structures if required	None to low	Approx. 10 years	Medium	High
	Appropriate cycle of inspection and maintenance	None to low	10–20 years depending on solutions	Low	High
	Low maintenance	None to low	About 5 years	Low	High
	Appropriate cycle of inspection and maintenance	High	Difficult to get the recovery of the investment	Low	Low
	Appropriate cycle of inspection and maintenance	None to low	Depends on number and frequency of flood occurrences	Low	Low
	Low maintenance	None to low	Short	Low	High
	Depends on whether the green roof is extensive or intensive	None to low	0–10 years	Low	Low

THE MOST SUITABLE INTERVENTIONS

A comparison of the different types of nature-based solutions in the context of municipalities identify two interventions as most suitable:

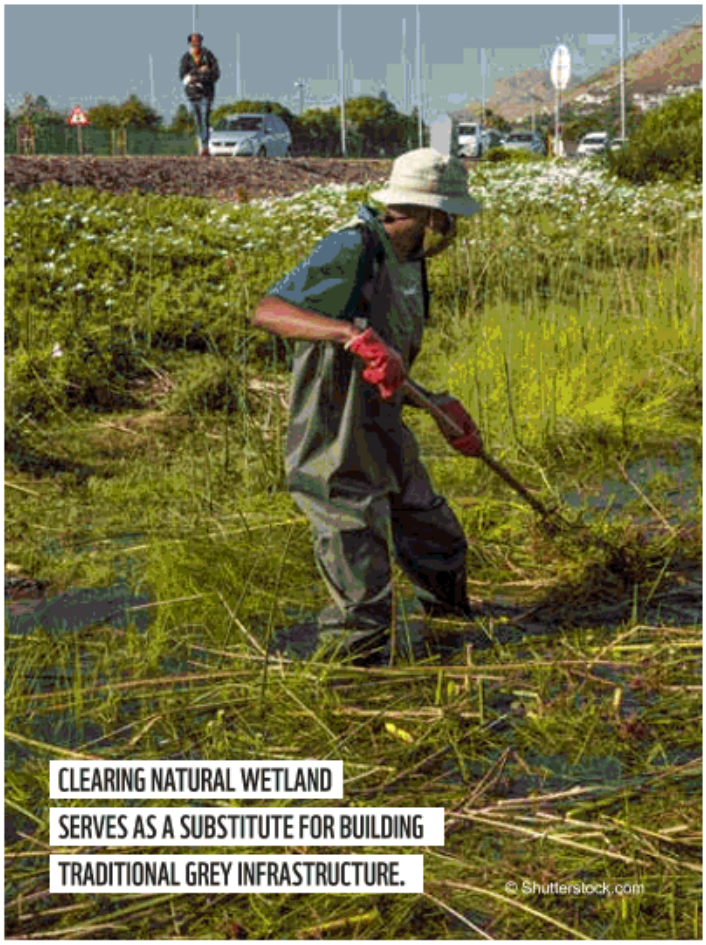
Trees

The option of planting trees can be exercised at street level. **Planting trees can be done at low cost while providing the highest level of benefits for social justice, social cohesion and public health and well-being.** We therefore recommend that municipalities consider tree-based nature-based solutions. Doing this can create immediate urban jobs for low-skilled and informal sector workers, improve environmental conditions, promote outdoor activities and active lifestyles, and provide physical and mental well-being – two issues that are emerging as critical concerns from the pandemic.

Removal of invasive alien plants

The clearing of invasive alien plants also provides opportunities at low cost. There is already a well-established Working for Water programme that municipalities can tap into for lessons (see Box 2).

Other forms of nature-based solutions can also be considered as part of the city-level response to recovery from the pandemic, as each municipality's circumstances demand or permit. Making nature-based solutions integral to the COVID-19 recovery response will boost the municipality's long-term green economic recovery.



CLEARING NATURAL WETLAND SERVES AS A SUBSTITUTE FOR BUILDING TRADITIONAL GREY INFRASTRUCTURE.

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© Western Cape Government

BOX 2: THE EPWP AND WORKING FOR WATER

At the national level, South Africa has demonstrated the benefits of nature-based solutions on a landscape scale as a means of addressing unemployment among less skilled people under the Extended Public Works Programme (EPWP). There is now the opportunity to do so at the city level.

Launched in the context of endemic unemployment as a multi-departmental public works programme, the EPWP provides income relief through temporary work in four sectors: environment and culture (e.g. environmental improvement programmes), infrastructure, social (home-based care and early childhood development), and non-state sectors. Since its inception, the EPWP has generated over 8 million work opportunities. In the most recently completed phase of the programme, 66% of beneficiaries were women, 46% youth and 1% people with disabilities. The EPWP has supported environment-focused programmes extensively through the Working for Water, Working on Fire, Working for Wetlands, and People & Parks programmes.

The Working for Water programme is directed at the removal of invasive alien plants from stressed catchments as a way of empowering people into small business. The programme involves clearing mountain catchments and riparian zones of invasive alien plants to restore natural fire regimes, the productive potential of land, biodiversity and hydrological functioning. In doing so, the programme enhances water security and invests in the most marginalised sectors of South African society, among other objectives. The programme sets definite parameters for contractors in the selection of workers, requiring that they give preference to single-headed households, women, the disabled and the youth. It creates about 50 000 jobs per annum, targeted at the most disenfranchised sectors such as ex-offenders, underprivileged women, the youth, disabled individuals and those living with HIV/AIDS.

Source: FuturePolicy.org, n.d.

DOROTHY NYEMBE PARK IN DOBSONVILLE, SOWETO, HAS WALKING TRAILS, SPORTS FACILITIES AND A GAMES AREA AND IS HOME TO A WIDE VARIETY OF BIRD LIFE.

DID YOU KNOW?

Urban trees hold many benefits for communities and individuals (GreenBlue Urban, 2016; FAO, n.d.), such as:

- Air particulate matter levels on tree-lined streets can be up to 60% lower than those without trees.
- Trees have a positive impact on health. A 10% increase in urban green space can postpone the onset of health problems by up to five years – conditions affected include asthma, skin cancer and stress-related conditions.
- When properly placed around buildings, trees can reduce air conditioning needs by 30% and save energy used for heating by 20–50%.
- Trees can cool the air by as much as 2–8 °C.
- Trees act as carbon sinks and therefore play an important role in carbon sequestration.

URBAN TREES

THE BENEFITS OF JOB CREATION, HEALTH, EQUITY AND SAVINGS

A growing body of evidence highlights the beneficial impact of urban trees on health and mental well-being; levels of physical activity, which is beneficial to population health in many respects; and social interaction, inclusion and community cohesion.

Planting urban trees provides opportunities for people who may not normally interact to come together, and help develop social ties and community cohesion. This is particularly useful in areas of high deprivation and for groups in society who are more vulnerable to social exclusion, such as older and younger people, ethnic minorities and people with disabilities.

URBAN TREES AS COVID-19 RESPONSE

INITIATIVES UNDER WAY

Across the world, from West Africa to the western United States of America, cities are investing in tree planting as part of their responses to the COVID-19 pandemic.

1 MILLION
NEW TREES TO BE PLANTED IN SIERRA LEONE

In addition to the proven benefits to cities of past and present nature-based solutions (see Box 3), there are several examples of cities planning to invest in urban tree planting and other nature-based solutions in response to the COVID-19 pandemic (Cook and Taylor, 2020). Freetown, the capital of Sierra Leone, is planting a million new trees by 2021 as part of its recovery response to COVID-19 to help ease flooding and landslide risks as climate change brings more severe rainy seasons. Jakarta, Indonesia's capital, and Mexico City are also investing in massive tree-planting campaigns in an effort to improve poor air quality, which studies have shown is linked to higher death rates from COVID-19. Cities and states in the western USA are investing heavily in forest restoration for jobs and to reduce the risk of catastrophic wildfires, which threaten to overwhelm emergency response resources. Nairobi in Kenya has hired once-destitute families to clean up parks and waterways in the city. Besides preventing homelessness and supporting families through income earning, this initiative has helped the city reap environmental benefits through the removal of 1 200 tonnes of garbage, and fish returning to Nairobi River (UNEP, 2020).

65 000
DAILY WAGE JOBS CREATED IN PAKISTAN AS ENVIRONMENTAL CUSTODIANS

National governments are playing their part too. In cities in Pakistan, day labourers who became unemployed due to the lockdown resulting from the COVID-19 pandemic have been given new jobs as "nighabaans" or custodians of the environment, planting saplings as part of the national government's extension of its Billion Tree Tsunami programme (UNEP, 2020; Khan, 2020b). By June 2020, the initiative is estimated to have created 65 000 daily wage jobs across the country in nursery raising, plant care, protection of natural forests, honeybee farming and fire-fighting activities (Khan, 2020a). Women and young people who migrated from cities to their homes in rural areas as a result of the lockdown in cities have also benefited from these jobs. By employing these labourers to plant trees, the national government has prevented widespread hunger and poverty.

BOX 3: EVIDENCE OF THE BENEFITS OF NATURE-BASED SOLUTIONS FROM ACROSS THE WORLD

REDUCING AIR POLLUTION

In Atlanta, nicknamed "the city in a forest", trees remove an estimated amount of 19 million pounds of air pollutants each year, worth about $47 million a year (Southern Foresters, n.d.).

One study of 10 US cities found that urban trees remove enough particulate matter to reduce annual health costs by amounts ranging from $1,1 million in Syracuse to $60,1 million in New York (Nowak et al., 2013).

CREATING JOBS

The City of Rio de Janeiro's Mutirão Reflorestamento or restorative collective action programme works to restore landscapes that have been degraded and altered during the urbanisation process with massive dismount of hills and creation of land over wetlands, mangroves, the Guanabara bay and along the coast of Copacabana. Specifically, the programme's objectives are to prevent sedimentation of the drainage system and water courses, connect forested patches through ecological corridors to enable genetic flows, and prevent river banks and estuaries from eroding. The programme involves forest planting by residents from low-income communities (mainly favelas and slums). By 2016, the programme had reforested 3 100 hectares of land through 9 million trees. At the peak of the programme, more than a thousand jobs were created for community residents and 500 people are involved in regular management of afforested areas (EU, 2019).

The City of Zagreb engages long-term unemployed people to maintain the city's green spaces and clean them of the large amounts of illegal rubbish being disposed in these spaces, in exchange for education and training in fields that are in high demand in the local economy. This also helps to increase their competitiveness on the labour market and their chances of finding a job. Over 3 000 unemployed people have benefited from the programme. About 30% of the project participants subsequently found employment, which has had a positive effect on poverty reduction and has decreased pressure on the social budget and social services (Eurocities, 2015).

REDUCING ENERGY COSTS

It is estimated that London's tree cover of 14% reduces energy-related costs from buildings by almost £315 477 million annually and provides an additional £52 920 in value by reducing the amount of carbon released by fossil-fuel power plants (a reduction of 882 tonnes in carbon emissions) (Treenomics, 2015).

Based on Australian estimates, the shade from 100 000 trees in an urban forest can reduce electricity costs for heating and cooling, and lead to a saving of $1 million per annum (Moore, 2012). It was also calculated that the shade produced by one tree, which can produce the same amount of shade as four sun parasails, could have a replacement value of $2 000 per annum (Moore, 2012). In addition, this same service can also extend the life of tarmac and reduce maintenance costs over time (GCRO, 2016).

IMPROVING PUBLIC HEALTH AND SOCIAL COHESION

A study in the United Kingdom (UK), commissioned by the National Trust (National Trust, 2020) in the context of economic recovery from the COVID-19 pandemic, concludes that a £5,5 billion capital investment in greening the country's most left behind and greyest urban communities over the next five years from 2020 would bring £200 billion in physical health benefits through disease prevention and mental well-being benefits. It will also alleviate some of the strain on local health service providers and improve people's quality of life. The study estimates that these benefits would be spread across 20 million people, nearly a third of the UK population. In addition, the investments would create an estimated 40 000 jobs in initial construction. Over 6 000 of these would be created permanently for ongoing maintenance, particularly in urban areas facing high levels of unemployment. The health benefits are significant given that illness as an outcome of physical inactivity has been calculated as costing the UK's National Health Service close to £1 billion annually, with indirect costs being as high as £8 billion per annum. Even a permanent 1% reduction in the UK's sedentary population can deliver up to £1,44 billion annually in economic benefits to the UK's economy.

In the UK, a survey of schools that have improved their school grounds to include more greening indicates that 65% of schools have observed improved attitudes to learning; 73% of schools have experienced improved behaviour in pupils; 64% of schools reported reduced bullying; and 84% of schools reported improved social interaction among learners.

IMPROVING HEALTH BY MODERATING URBAN HEAT ISLANDS

Faced with rising temperatures, worsened by the urban heat island effect, Medellín transformed the verges of 18 roads and 12 waterways into a green paradise through tree planting. As a result, the city has managed to reduce temperature by more than 2 °C (Cool Coalition, 2019).

Planting three shade trees per building in US cities while making roofs and pavements reflective could decrease the country's cooling demand by a massive 20% (Gulati et al., 2020).

OBSTACLES TO IMPLEMENTATION

Planting trees, clearing invasive alien plants or using other nature-based solutions can be part of the set of solutions required to boost economic recovery after the COVID-19 pandemic while ensuring that the recovery is green.

Although nature-based solutions are no silver bullet for solving the unemployment problem exacerbated by the COVID-19 pandemic, it is a tool that municipalities can use to immediately boost low-skilled jobs, thereby preventing households from (further) slipping into poverty. These solutions can also support the long-term employability of these low-skilled workers. Although South African municipalities recognise these and the other benefits and opportunities, nature-based solutions are difficult to implement.

WHO WILL PAY, AND HOW?

First and foremost, there is the challenge of paying for nature-based solutions, including tree planting, both at the capital investment and the maintenance stages. Understanding who should pay for nature-based solutions and how to finance them can be complex because benefits accrue to multiple stakeholders and it is difficult to determine who should pay. Nature-based solutions tend to be funded largely through public sector budgets, philanthropic or corporate support, and other grants that may be available. But large-scale tree planting will require significant funding, which is currently beyond the reach of municipalities. The City of Tshwane, for example, has a city-wide tree-planting project to address heat islands and create green spaces for its residents, while at the same time unlocking entrepreneurial opportunities for women, but attracting the financial support for the project has proved challenging. The recent decrease in transfers to municipalities under the Medium Term Budget by R17,7 billion (Ensor, 2020) and competition with other public services at a time when there is extreme pressure on public finances are likely to add to this challenge. Funding tree planting is therefore likely to take a backseat unless other financing sources and models can be explored (see Box 4).

ATTRIBUTING THE ECONOMIC BENEFITS

Second, it is often difficult to make the economic case for tree planting, and urban nature-based solutions more broadly, because it is so difficult to quantify the biophysical and monetary value (IISD, 2020) of trees and the services they provide. This is not unique to South African municipalities. Economic benefits of urban tree-planting projects are not

BOX 4: A MODEL TO ASSESS THE BENEFITS OF NATURE-BASED SOLUTIONS

Several frameworks and tools are now emerging to support assessment of the co-benefits of nature-based solutions and to quantify their monetary value. In order to address the existing lack of awareness, understanding and data, the International Institute for Sustainable Development (IISD) has developed a model that can be applied to nature-based solutions, on their own or in combination with grey infrastructure, to make the monetary case for the investment.

This model will improve the predictability and knowledge of the performance of nature-based infrastructure for climate adaptation and the provision of other infrastructure services through more comparable and credible evidence on capital and operating costs and the benefits of nature-based infrastructure. To put things into perspective, the performance of nature-based infrastructure will also be compared to grey infrastructure alternatives.

always clearly defined or data is difficult to obtain due to sporadic evaluations or even the challenge of how to attribute benefits. Benefits such as social cohesion, recreational value and public health are not assessed and if they are, they are often expressed in qualitative terms and not monetised. Even where experience with NBS projects is available, information emphasises the challenges that municipalities addressed through these solutions, the nature-based solutions themselves, and the potential climate benefits. Figures pertaining to health and equity benefits as well as job creation tend to remain sparse. In particular, the type and longevity of jobs are not described.

FINANCIAL VIABILITY

Third, understanding the financial viability of urban trees and of urban nature-based solutions is complicated by the fact that the cost of urban trees depends on location, species, maintenance required and variables like climatic conditions, landscape and project site (Mačiulytė and Durieux, 2020). Municipalities are not able to compare the capital costs, operating costs and (indirect) revenue streams of nature-based solutions with grey alternatives (IISD, 2020).

The challenges in assessing the financial viability of trees means it is difficult to put together a convincing business case for projects. Moreover, since nature-based solutions are living solutions, the benefits they provide tend to last for longer periods of time compared to traditional alternatives. This adds to the complexity of accounting for the full range of costs and benefits of these solutions (Mačiulytė and Durieux, 2020).

PROCUREMENT CHALLENGES

Municipalities face procurement challenges with all types of NBS projects. This is not peculiar to South Africa and is a concern for municipalities across the world (Mačiulytė and Durieux, 2020). Public procurement regimes are attuned to costs and accountability. Procurement officers in municipalities lack knowledge and/or skills and capacity to apply effective tools and methods to assess the range of benefits that nature-based solutions offer (Mačiulytė and Durieux, 2020).

Public procurement is also not suited to stimulate new innovations or markets for nature-based solutions (Connecting Nature, n.d.).

The barriers of public procurement could be addressed through an outcomes- or challenge-based approach to procurement that specifies only desired outcomes in the call for tenders and asks suppliers to come up with their ideas on how to address those. In this regard, WWF makes practical suggestions in its report *Moving towards sustainable performance-based procurement in the Western Cape: A guidebook for supply chain managers* (WWF, 2018), supported by nine case studies on how the barriers to public procurement can be overcome.

CONCLUSION

The challenges to implementing nature-based solutions as a COVID-19 recovery response are not insurmountable. But overcoming them will require practitioners and municipalities to work collaboratively in building the capacity and knowledge of municipalities to support the planning, financing and implementation of nature-based solutions.

As the personal, social and economic devastation of the COVID-19 pandemic runs its course, the economy needs all the help it can get to put bread on the table for those who have lost their jobs and cannot survive on the meagre social grant from national government (Perkins et al., 2020). A programme of nature-based solutions implemented at municipal level across the country could boost livelihoods and ensure long-term benefits on the path to more resilient urban environments.

DID YOU KNOW?

The City of Cape Town has developed a green infrastructure plan to protect and enhance existing natural assets and create new ones. This plan includes ecosystem expansion and optimisation in their Climate Change Policy as key interventions to reduce climate risk. Among the challenges identified by the City are the lack of knowledge of the extent, value and benefits of nature-based solutions.

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