Policy Brief
Nature-based solutions

Content

In June 2019, Inger Andersen, Executive Director of the United Nations Environment Programme, stated that capacity building with nature is "one of the most effective ways" to combat climate change. This vision was affirmed by Antonio Guterres, Secretary General of the United Nations, who explained the importance of "harmony between humankind and nature". Both were encouraging an increased use of nature-based- solutions: actions to protect, sustainably manage and restore natural or modified ecosystems, while also addressing societal challenges. While nature-based solutions are important on a global scale they also have applications on a micro-level, including within informal settlements.

Climate change is one of the gravest threats to cities today. In recent years, we have seen intense urban heat islands, as well as stronger and more frequent droughts, storms and floods. These extreme weather events are ravaging people's homes, destroying infrastructure, and jeopardizing access to essential services like clean water and functional sewage systems. The damage caused by such events disproportionally falls on the urban poor, especially in informal settlements.

Nature-based solutions to climate change, including urban trees and forests, are among the most cost-effective ways for cities to address the climate emergency. These measures, plus accessible urban green spaces, are vital for fighting climate change and central to improve the life quality of urban residents. Recent studies confirm that the frequency of visits to urban green spaces increased during the COVID-19 pandemic, and there is an increased prioritization of urban green spaces by residents and local authorities.[1]

This policy brief explains how integrating green urban spaces into COVID-19 recovery plans can improve resilience against climate change effects, stimulate economic recovery through local job creation, and contribute to increased property values in informal settlements.

Context

Informal settlements tend to be densely populated, face challenges in water and sanitation, have little or no waste management, overcrowded public transport, and limited access to formal health care. They have inadequate housing, and lack basic services as well as security of tenure. Urgent action is needed to enable residents to stay safe and healthy and so increase resilience to future pandemics and natural disasters. Informal settlements are vulnerable to disease outbreak impacts, particularly water-related

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[1] Zander S Venter et al (2020) Environmental Research Letters, 15, 104075: Urban nature in a time of crisis: recreational use of green space increases during the COVID-19 outbreak in Oslo, Norway. Available from https://iopscience.iop.org/article/10.1088/1748-9326/abb396/pdf.

diseases. This is because of lack of safe infrastructure: disease monitoring and containment can be challenging without adequate data to inform appropriate policy responses.

The *COVID-19 Recovery Action Plan for Informal Settlements in the UNECE Region* prioritizes informal settlements. Legalization of informal buildings is of prime importance. Integrating informal constructions into formal land markets provides clear ownership and security of tenure. This gives economic security to residents during recessions, via greater access to credit and mortgages. It also helps remove barriers to deeper inclusion of informal residents (human capital) and land (land capital) within formal employment and land markets. Security of tenure also encourages residents to invest in their homes. Formalization therefore promotes human rights, while aiding achieve growth targets for formal and informal markets.

During or following formalization, investment in infrastructural upgrades of informal settlements should be initiated to turn informal settlements in more inclusive, safe, resilient, sustainable and livable city neighbourhoods.

Taking action on COVID-19 recovery in informal settlements
This policy brief on nature-based solutions is one of a set covering different urban sectors including energy efficiency, accessibility and sustainability, urban mobility, water and sanitation, and innovative financing. These briefs should be read in conjunction with **COVID-19 Recovery Action Plan for the UNECE Region** as they complement and expand on Policy Areas, proposed goals, targets, and actions included therein.

**Sustainable Development Goals
for Nature-Based Solutions in Informal Settlements**

Air pollution is a major problem for cities in the UNECE region, especially in the Western Balkans. By filtering harmful pollutants, urban trees and forests contribute to cleaner air (SDG target 3.9). Urban sprawl and illegal settlements are also a problem throughout the Western Balkans and Central Asia, as is the degradation of local ecosystems. Integrating trees and forests into urban plans can help make cities more sustainable, resilient and livable (SDG targets 11.3 and 11.6). Urban trees and forests are key to climate change mitigation (SDG target 13.1) and to proper management of terrestrial ecosystems (SDG targets 15.1 and 15.2). These SDGs are all central to sustainable cities and habitats. To increase resilience to future pandemics the problem of overcrowded settlements must be addressed, as well as providing more open green spaces where people can gather at safe distances. Urban green space expansion can therefore contribute to long-term pandemic resilience, and increase the overall well-being and resilience of informal settlement populations.

Challenges

**Challenges posed by informal settlements
and how they affect nature-based solutions**

Urban growth, including creation of informal settlements, is often contingent on deforestation and exploitation of natural ecosystems. Many poorer urban residents rely heavily on urban and peri-urban ecosystems and can over-exploit these for food, timber and fuel, resulting in their degradation. This, in turn, reduces precious biodiversity and creates food insecurity, as well as greater vulnerability to natural hazards and lowered resilience to climate change. Across the Western Balkans, Central Asia and the Caucasus, cities are particularly susceptible to floods, landslides and windstorms, as well as ecosystem degradation. Proper green space management and investment, including trees and forests, can help build resilience against such events in informal settlements.

In informal settlements there is also great competition for space. They are often densely populated, complicating introduction of green spaces – for example, leading to increased rents. Moreover, newly-created green spaces will have the challenges of maintenance, vandalism, and overuse. Finally, sustainability concerns should be integrated into plans for the expansion and management of green urban spaces. For example, caution must be exercised to avoid planting allergenic species, and ensuring safe walkways for disabled and elderly people.

Challenges on informal settlements amplified by the COVID-19 pandemic and how they affect the nature-based solutions

The outbreak of the COVID-19 pandemic hit cities particularly hard, with an estimated 90 percent of all cases occurring in urban areas. [2] This has foregrounded the challenges cities face, including degradation and over-exploitation of local urban and peri-urban ecosystems, and lack of accessible green urban spaces. This is particularly pertinent for the urban poor in informal settlements, as limited access to green urban spaces results in overcrowding, leading to increased transmission of COVID-19. Moreover, restrictions intended to reduce transmission of Coronavirus variants inhibit informal settlement resident access to resources provided by local ecosystems. This is a particular problem as these residents tend to disproportionately rely on local ecosystem resources for their livelihoods.

Furthermore, the pandemic has created multi-faceted challenges for mental health. With widespread lockdown restrictions, people have been kept indoors for extended periods. For informal settlement residents this has often meant the inability to travel outside their neighbourhood. Nature experiences contribute to improvements in cognitive functioning, emotional well-being, and other dimensions of mental health. [3] To contribute to this, whilst adhering to public health guidance on the pandemic, it is important nature-based solutions are utilized around informal settlements.

Emergency responses

Emergency responses are short-term actions to minimize spreading the virus as well as limiting the socio-economic impact of COVID-19 for informal settlements. These actions should be implementable within a few months and last for at most a few years.

While nature-based solutions cannot always be immediately implemented as an emergency response, many temporary installations can be easily deployed to improve outdoor space quality while awaiting long-term planning. The latter would require investment in sustainable management of urban trees and forests, data collection on canopy cover, and stakeholder involvement.

Identify

Environmental indicators which inform nature-based solutions.
- **Land Use:** Size and growth of built-up area, amount and accessibility of public green space and open space.
- **Urban Air:** Frequency of exceeding air quality standards, emission of air pollution by source.
- **Transport and Traffic**: Modal split, network length of public transport systems.
- **Climate Change and Energy**: Carbon emissions, intensity of energy and electricity. consumption by sector.
- **Environmental Health:** Number of residents exposed to noise.

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[2]   United Nations (2020): COVID-19 in an Urban World, available from
      https://www.un.org/sites/un2.un.org/files/sg_policy_brief_covid_urban_world_july_2020.pdf
[3]   Food and Agriculture Organization of the United Nations (2016), "Building Greener Cities: Nine Benefits of Urban Trees", available from http://www.fao.org/zhc/detail-events/en/c/454543/

For more information see the [Asian Development Bank publication on nature-based solutions.](#)[4]

Geographic assessment of heat island effect
- **Measurement of surface temperatures**: Heat energy given off the land, buildings, and other surfaces. Can be measured through satellites and airplanes.
- **Measurement of air temperature:** Measured through weather stations and monitoring instruments.
- **Seasonal and daily temperature patterns**: For example, night-time temperatures can pose higher health risks than daytime temperatures, and heat islands can exist in seasons other than summer.

For more information see the publication by the [United States Environmental Protection Agency on Measuring Heat Islands.](#)[5]

Immediate solutions

Temporary installations can be coordinated with transportation policy by closing some streets to create spaces which make it easier to maintain social distancing and contribute to reducing the heat island effect. Such outdoor spaces include:
- Plants in movable pots.
- Benches and tables.
- Playgrounds for children.
- Urban gardens with community spaces.
- Creation of public orchard/botanic gardens.

The installation process should involve residents, allowing for participatory decisions, deeper social involvement and more sustainable solutions. Through a works programme, employment of unemployed or underemployed informal settlement residents could also enhance project acceptance by the local population.

Building back better

Advanced solutions in the context of nature-based solutions often require longer-term planning. They include building back better: mid and longer-term solutions to be implemented when the emergency situation is under control.

Long-term planning and sustainable management of resources

Energy, heat, and greenhouse gas management
- **Green roofs and walls:** A green roof system is an extension of the existing roof using a high-quality waterproofing and root-repellant system, a drainage system, filter cloth, a lightweight growing medium, and plants.
- **Urban tree canopy:** Trees are grown to form a layer of leaves, branches, and trunks that cover the ground when viewed from above. Tree cover can mitigate climate change by reducing the levels of greenhouse gases in the atmosphere and help to reduce the urban heat island effect.

Water and flood management

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[4] Asian Development Bank (2016): Nature-based solutions for building resilience in towns and cities: Case studies from the Greater Mekong Subregion. Mandaluyong City, Philippines, available from https://www.adb.org/sites/default/files/publication/215721/nature-based-solutions.pdf

[5] United States Environmental Protection Agency (2020): Measuring Heat Islands, available from https://www.epa.gov/heatislands/measuring-heat-islands.

- **Permeable pavements**: Paved surfaces that infiltrate, treat, and/or store rainwater. They may be constructed from pervious concrete, porous asphalt, permeable interlocking pavers, and other materials.
- **Rainwater harvesting**: Technology for collecting and storing rainwater from rooftops, the land surface, or rock catchments, done simply using jars and pots or with more complex techniques such as underground check dams. The harvested water can be used for drinking, domestic needs and irrigation.
- **Urban river terracing**: Flood protection, master landscaping and the improvement of overall environmental conditions.
- **Drainage corridors:** Creating natural drainage corridors usually involves converting a ditch or storm drain into a natural creek flowing within a multipurpose corridor.

Scaling-up of outdoor spaces
- **Playgrounds** can be expanded to cater to more people.
- **Peri-urban spaces and brownfield sites** can be revitalized to become parks, greenways and corridors, incentivizing exercise and exposure to nature.
- Access to **woodlands** near to urban regions can be increased.
- Initiatives to increase **biodiversity, such as providing wildlife corridors and native plant palettes.**

Nature-based solutions in informal settlements can sometimes be created by demolishing homes in densely populated areas, such as those which constrain traffic patterns or are structurally or environmentally unsafe. The space than then be used for parks, road-widening or green space recreational areas. Relocating residents as compensation for land taken is vital for local community support.

The following factors must be considered:
- **Create a compensation framework**: When a resident relocates because of green solution construction, they should be provided with a financial incentive.
- **Consider implementing nature-based solutions in conjunction with housing**: Housing can be vertically scaled up to accommodate more residents, with the resulting space saving used to create green spaces. This can be a costly solution but if done in a sustainable manner it could gain local support.

It is important to inform people of the benefits of nature-based solutions and involve different stakeholders in the process. This helps promote interest in green spaces, limits social tension, and allows for more effective implementation. For more information, please see the publication by the [WHO on creating effective urban green spaces.](#)[6]

Communication strategies
- **Early and comprehensive engagement:** Involve residents in the design and construction of nature-based solutions, early and when all options are still open.
- **Societal relevance assessments of nature-based solutions**: Quantify the co-benefits and costs using multimetric indicators.
- **Awareness campaigns**: Illustrate to informal settlement residents how nature-based solutions can positively impact their livelihoods. In conjunction, subsidies and grants for communities and residents can be used to capitalize on awareness by encouraging implementation.
- **Stakeholder inclusion**: Establish working groups organized around mapping and outreach to provide an evaluation of opportunities.
- **Inform residents about the safety of green spaces**: If maintenance is infrequent and there are dangerous plants or insect species, relevant signals and educational strategies are needed.

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[6] World Health Organization (WHO) (2017) : Urban green spaces: a brief for action, available from https://www.euro.who.int/__data/assets/pdf_file/0010/342289/Urban-Green-Spaces_EN_WHO_web3.pdf%3Fua=1 (last accessed on 14 Dec 2020)

- **Have financing mechanisms in place for the implementation and maintenance** of green spaces in informal settlements. For more information see the Think Nature Handbook[7] and Green Infrastructure Valuation Tool Assessment.[8]
- **Understand the business drivers for nature-based solutions**: Consideration must be given to the business model, whether this is preventing climate change, addressing stakeholder concerns, adhering to new regulations or mitigating resource limitations.
- **Business applications**: Likewise, possible business applications should be considered, such as profitable opportunities to treat wastewater, reduce risk and build resilience infrastructure, or restore polluted areas.
- **Awareness of the business benefits and co-benefits**: Attention should be paid to possible direct financial benefits and reputational gains, as well as environmental and social co-benefits. Nature-based-solutions may also result in domino effects, such as job creation, tourism, or attraction of new talent.
- **Identify financiers**: The following business assessments should inform where finance should be sought. Investors may expect a financial return such as green bonds and capital investment, a return in kind like payments for ecosystem services, or returns in impact, including social impact bonds and philanthropy.
- **Consider the benefits of the private sector through Public-Private-Partnerships (PPPs)**: Involving the private sector in a project's early stages can keep design and maintenance costs lower, and align the project with residents' interests.

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[7] Somarakis, G., Stagakis, S., & Chrysoulakis, N. (Eds.). (2019): ThinkNature Nature-Based Solutions Handbook. Think Nature project funded by the EU Horizon 2020 research and innovation programme, available from https://platform.think-nature.eu/system/files/thinknature_handbook_final_print_0.pdf.

[8] Natural England (2013): Green Infrastructure – Valuation Tools Assessment (NECR126), Available from http://publications.naturalengland.org.uk/file/6567666554765312.

Policy goals, targets and actions.[9]

Goal: Provide for safer enjoyment of the environment, green spaces, recreational and social activities

Goal	Targets and actions	Time frame[10]			
		Emer-gency, short-term	Short term	Inter-mediate term	Long term
Provide for safer enjoyment of the environment, green spaces, recreational and social activities	**1. Ensuring outdoor recreation, sporting, music events, and social gatherings are safe for everyone**	X	X		
	• *Identify and analyze* what recreational and other public gatherings pose the greatest risk of viral spread. Use this to determine which should be banned, which can be adjusted for safe enjoyment, and what green spaces or recreational activities can be safely expanded.				
	• *Limit* public sporting and music venues that unsafely gather crowds, and adjust these to limited density and size. Consider online or televised sporting and music events.				
	• *Adjust or ban* outdoor group recreational and social gatherings that cannot be safely enjoyed in their current form. Local community leaders' support will be key for this.				
	• *Provide or make affordably available* handwashing stations, cash transfer stations, digital payment methods, vending, food/drink, and adequate personal protective equipment suitable for recreational and social gatherings commonly enjoyed by the local community.				
	• *Expand* and map green spaces that can be enjoyed safely while also enhancing the quality of life and environmental sustainability within informal settlements. Promote participatory mapping[11] and effective public participation to ensure that there are paths that can safely access natural areas, playgrounds and parks while also keeping safe social distancing. Also, adopt appropriate waste management plans and keep the public informed about safe and sustainable use of watershed and green spaces.				
	2. Recreational travel, hospitality and tourism services are provided to visitors and residents in a manner that puts no one at undue risk.		X	X	X

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[9]   For more information see UNECE (2022): COVID-19 Recovery Action Plan for Informal Settlements the UNECE Region (forthcoming)

[10]   **Emergency goals:** Categorized targets and action points to reach and secure short-term goals; Loosely defined as those to be accomplished in less than 6 months. **Short term goals:** Categorized targets and action points to reach and secure short-term goals; Loosely defined as those to be accomplished in less than 1 year. **Intermediate term goals:** Categorized targets and action points to reach and secure intermediate-term goals. The greater complexity is expected to loosely require 6 to 18 months to accomplish. **Long term goals:** Categorized targets and action points to reach and secure long-term goals. The greater complexity and nature of the solutions are expected to loosely require more than 1 year to accomplish, often 1 to 5 years.

[11]   "Participatory mapping" means the use of a growing toolbox of techniques that can help members of the public record and share spatial knowledge through the use of participatory methods and cartographic representations, often in a digital form.

	• *Locate, map and track* the density of use of tourism-related activities such as hotels, motels, rooms to let, cultural sights, transportation nodes and attractions. Use this to determine if either visitors or residents are being put at increased risk of viral spread in the current setup.
	• *Determine and regulate* if full or partial closures of attractions or tourism related activities is required to ensure public safety. If so, then *determine how long and in what form* these closures should be imposed.
	• *Provide* ways to encourage by communication and local engagement, or punish by fines or other penalties, businesses who violate safety measures and place people at undue risk.
	• *Develop* a policy including processes and responsibilities, which ensures safe transport for recreational and social travel such as taxis, mass transit, airport to hotel and shuttles, as well as cleaning and ventilation guidelines. Also, encourage safer and healthier modes of transport like walking or cycling.
	• *Redesign* travel and tourism related activities to minimize the potential for public harm, which will also limit necessary closures and minimize economic harm. This redesigned plan should be very detailed, as it is a core component to the community's economic and social function. Tourism-heavy areas suffer greatly and early in a pandemic, and operations must be designed to balance safety while continuing to adequately service visitors.
	• *Mandate* when and where recreational travel should or should not be allowed so that pandemic danger to the resident workforce and visitors alike is minimized.

Examples from around the world

Globally, there have been many initiatives to increase awareness of nature-based solutions. Grow Green is a global imitative which offers training programmes, a community platform for engagement, and educational materials to promote nature-based-solutions. Nature4Cities furthers this aim by encouraging peer-to-peer learning about nature-based solutions and evaluating practical implementation. It is funded by the European Union, and municipalities can request access through the website.

Nature-based solutions have been frequently applied in informal settlements for water management.
A partnership between the University of Cambridge, Monash University and Stanford University funded by the UK Wellcome Trust led to the RISE project. This helped 24 informal settlements use nature-based solutions to harvest rainwater and stormwater, recycle wastewater to prevent flooding, and construct wetlands and wastewater gardens. In South Africa, the existing infrastructure was repurposed to a nature-based treatment and recovery centre by creating biofiltration cells capable of cleaning 100,000 liters of water each week for irrigation.

Green spaces have been used to improve standard of living worldwide.
In Vienna, the innovative Austria Parc de la Distance encourages social distancing while promoting exercise and nature. Sao Paolo has invested into numerous green spaces, such as the "Corujas Park" to have green spaces close to densely populated informal settlements and also facilitate rainwater infiltration and drainage. In Rosario, Argentina, the construction of community gardens and green spaces in informal settlements was useful for children's educational development, resulting in social capital as well as food benefits. In Europe, the municipalities of Tbilisi in Georgia and Tirana in Albania have implemented large scale tree-planting programmes to increase biodiversity and living standards.

Nature-based solutions have also been used for climate control purposes.
In Lagos, Nigeria, an experimental green wall was created surrounding an informal settlement, leading to an ambient air temperature reduction of 0.5 degrees Celsius. Similarly, in informal settlements in

Bangalore, Bangladesh, tree planting is used to decrease local air temperature by as much as three to five degrees Celsius in the summer, and also improve air quality. In Dhaka, Bangladesh the environmental benefits of rooftop canopies and gardens are such common knowledge to informal settlement residents that it has become a regular practice.

For further information on case studies of nature-based solutions, please visit Nature-based solutions for building resilience in towns and cities, and the Urban Nature Atlas.

Conclusion

Nature-based solutions benefit informal settlements by increasing climate change resilience, improving mental health, and managing disaster risks such as floods. They are often cost-effective to implement, promote social cohesion, and foster better communities.
By following the recommendations of this policy brief, quality of life for residents in informal settlements can be improved, and sustainable development can be encouraged.

Further reading

Through the "Trees in Cities Challenge" implemented via Joint UNECE/FAO Forestry and Timber Section, UNECE supports efforts to increase forest cover and urban trees in cities in the region.

Food and Agriculture Organization of the United Nations (FAO) (2018): Forests and sustainable cities: Inspiring stories from around the world.

FAO (2018): Unasylva - An international journal of forestry and forest industry (18, 2018/1), edition on Forests and sustainable cities.

More FAO resources on urban forestry and COVID recovery.

FAO (2016): Guidelines for Urban and Peri-Urban Forestry.

The World Health Organization (WHO) (2017): Urban Green Spaces: a Brief for Action.