Clean Air and Urban Landscapes Hub

National Environmental Science Programme

RMIT University
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Nature-based solutions for resilient cities

Urban green-blue spaces, such as parks, waterways, street trees, gardens and nature reserves are essential elements of resilient and liveable cities. As well as being aesthetically pleasing, green-blue spaces provide many functions and benefits for people and the other species that call our cities home. They cool our urban landscapes, treat air and water, provide space for recreation and connection, and habitat for biodiversity.

Cities are facing increasing environmental, social and economic challenges that together threaten the resilience of urban areas and the residents who live and work there. Urban challenges include both chronic stresses and acute shocks, and these are amplified by climate change. The ability of cities, their inhabitants, their systems and structures to withstand these depends on their resilience: their ability to adjust and adapt in the face of change.

Urban resilience

Cities can be vulnerable to both chronic stresses and acute shocks. Chronic stresses include lack of access to essential services and employment, social isolation, changed hydrological regimes and other ongoing issues. Acute stresses are sudden disruptions and abrupt changes, including environmental events such as heatwaves, bushfires, floods and severe storms. When responding to shocks and stresses, rather than a focus on 'bouncing back' to the previous state, resilience thinking supports us in 'bouncing forward' to increase the resilience and liveability of our cities.

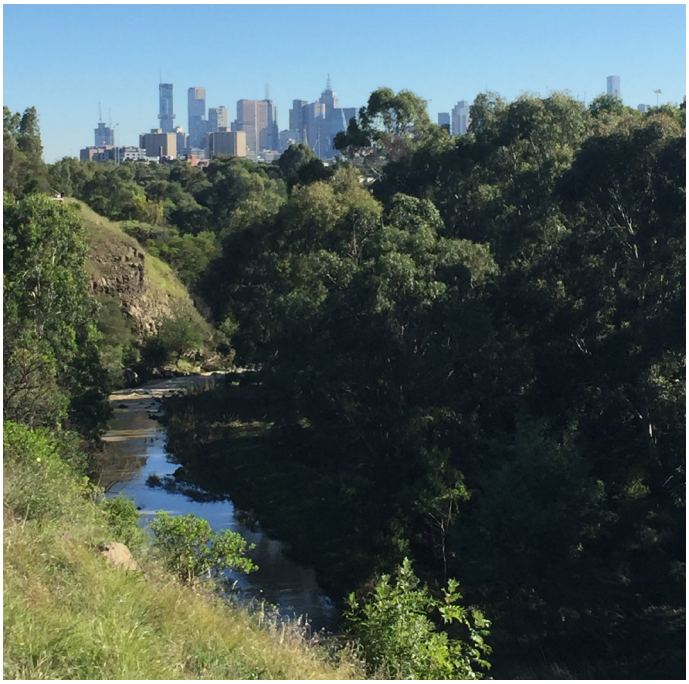

Image: Merri Creek, Melbourne provides important urban green-blue space. Credit: Judy Bush

The contribution of nature-based solutions to resilience

Increasing urban resilience is in part supported by ***nature-based solutions***. Nature-based solutions are ecosystem-based approaches for addressing a range of societal challenges including climate change impacts, food and water security, human health and well-being, and economic and social development. Urban nature-based solutions include the diversity of green-blue spaces in cities, including water-sensitive urban design treatments and nature-based coastal defence systems such as replanted mangroves and artificial reefs. The green-blue spaces in our cities and urban areas are part of the essential infrastructure of cities. They provide us with the 'breathing space' to reconnect with nature and with each other.

A range of elements together increase the resilience of urban systems, and nature-based solutions can support the provision of these elements. The elements of resilience, and the ways that nature-based solutions contribute are summarised in Table 1.

How lakes, rivers and creeks support urban resilience

Urban waterways can contribute many of the elements of urban resilience. Urban waterways, such as Merri Creek in metropolitan Melbourne, create linear habitat corridors, provide recreation and breathing space for residents, contribute to urban drainage systems, and cool neighbouring suburbs. They can slow water flows during floods and trap sediments and nutrients. Urban waterways, with their linear form, provide more access to green space for residents across many suburbs, than a single large parkland area. They provide wonderful opportunities for local communities to learn about local ecosystems; participate in planning, management, rehabilitation, maintenance and stewardship, as well as learning about ways to address and reduce ecosystem degradation associated with pollution and habitat degradation.

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Resilience of and through ecosystems

Nature-based solutions are inherently multifunctional: they provide the location to create, strengthen, and reinforce a focus on interactions between different parts of urban systems. Nature-based solutions can strengthen resilience through interactions between social and ecological systems across multiple scales. However, the implementation of nature-based solutions in cities is inherently complex because nature-based solutions are multi-functional, and trade-offs between functions may be required if some functions are prioritised over others.

For nature-based solutions to improve urban resilience, the ecosystems themselves need to be resilient. This means we need to support healthy, functioning ecosystems that can adapt to the impacts of climate change and other environmental changes, as well as to the impacts of urbanisation.

The resilience of urban ecosystems can be supported with active management, selection of species with wider tolerance for increasing urban temperatures, creation of connected networks of green-blue spaces and control of habitat disturbance and destructive processes. Embedding the voices and wisdom of Aboriginal peoples, the Traditional Owners, as custodians of Country is critical for restoring and maintaining resilient ecosystems.

Table 1: The contribution of nature-based solutions to urban resilience *(adapted from Bush & Doyon 2019)*

Urban resilience elements	Nature-based solutions contributions
Flexibility	Nature-based solutions are multi-functional: they deliver a range of functions simultaneously. NBS can be implemented alone or in an integrated manner with other solutions to societal and environmental challenges (e.g., technological and engineering solutions such as water sensitive urban design treatments).
Connected networks	Nature-based solutions applied at a landscape scale (i.e. larger than precinct or neighbourhood scale) create connected networks; urban green-blue spaces and biodiversity support connectedness (both between places, people, biota, systems and so on).
Localised approaches	Adaptation to place-based conditions (i.e. responding to the specific conditions of local areas, such as drainage lines, exposed hot or windy sites and so on); determined by site-specific natural and cultural contexts that include traditional, local and scientific knowledge.
Social learning	Through monitoring and evaluation of nature-based solutions, people can learn about how ecosystems develop, change over time, across seasons and so on. As such, nature provides opportunities for developing shared understandings of how ecosystems survive and thrive.
Participation	Nature-based solutions provide opportunities for local participation in the planning, design and ongoing management of urban green-blue spaces, and biodiversity conservation and management.
Responding to disasters	Nature-based solutions, and the ecosystem services they provide, contribute to mitigation of disasters and climate change, as well as adaptation to and recovery from disasters and crises, for both biophysical and social systems.
Maintaining function	Continued delivery of ecosystem services despite variability, disturbance and management uncertainty. Nature-based solutions continue to operate during electricity disruptions and traffic jams!
Maintaining diversity	Nature takes many forms and functions; increased biodiversity fosters healthy and resilient ecosystems; nature-based solutions maintain biological and cultural diversity and the ability of ecosystems to evolve over time.
Reducing exposure and vulnerability	Ecosystem services and nature-based solutions can address underlying risk factors, decrease vulnerability and enhance resilience of cities to climate change impacts, including heat mitigation and runoff management.

More information

CAUL Factsheet: Adaptive governance and monitoring: https://nespurban.edu.au/wp-content/uploads/2020/09/Urban-nature-based-solutions-adaptive-governance-and-monitoring.pdf

CAUL Factsheet: Sense of place and stewardship: https://nespurban.edu.au/wp-content/uploads/2020/09/Urban-nature-based-solutions-Sense-of-place-and-stewardship.pdf

Citation: Bush, J, 2020, Urban nature-based solutions for resilient cities Project 3.8 Factsheet, CAUL Hub, Melbourne.

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Sources

Bush, J., & Doyon, A. (2019). Building urban resilience with nature-based solutions: how can urban planning contribute? Cities, 95, 102483.

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Cumpston, Z. (2020). To address the ecological crisis, Aboriginal peoples must be restored as custodians of Country. *The Conversation*. Retrieved from *The Conversation* website: https://theconversation.com/to-address-the-ecological-crisis-aboriginal-peoples-must-be-restored-as-custodians-of-country-108594

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