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Ensuring adaptation and resilience to climate change

It is necessary to implement a prioritized approach to protect urban residents, and the infrastructure that supports them, from climate risk.



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A friendly green oasis in the bustle of central Singapore, Bishan-Ang Mo Kio Park was long defined by a three-kilometer concrete canal that ran along its southern border. The canal often overflowed, flooding nearby roads.

In 2009, Singapore began stripping away the concrete, converting the canal into a meandering river. The result not only is more beautiful but also provides better drainage and water quality.¹ Even the local wildlife approves. The new waterway has brought more biodiversity to the park, including otters and a wide variety of birds.

This effort is an example of a growing trend in cities around the world: the use of natural features to manage the movement of water and reduce the risk of flooding. More broadly, it is an example of how cities are adapting to the realities of a rapidly changing climate.

Situated on the front lines of climate change, cities are already home to most of the world's people—and they're still growing. Moreover, they are often sited on coastlines and the floodplains of major rivers. That makes them vulnerable to rising seas and flooding.

At the same time, urban buildings and roads absorb and reflect the sun's heat, making cities considerably hotter than surrounding areas. Historic decisions to pave over streams and green spaces have reduced the protection offered by trees, plants, and natural drainage. As the most recent Intergovernmental Panel on Climate Change report noted, "ongoing urbanization together with more frequent, longer and warmer heat waves will make cities more exposed to global warming."²

The impacts of climate change are not felt equally by all residents. Poorer communities, the sick, and the elderly are more at risk. For example, rapid urbanization is leading to bigger, more crowded informal settlements,³ which often lack the

resources to withstand the cyclones or flooding that climate change could bring. The challenge of ensuring that those who contributed least to climate change don't suffer the most is both global and local.

In just the past few months, we have seen the immediate threats posed by climate change. Extreme heat and wildfires have claimed hundreds of lives in Western Canada and the United States. Hundreds have died, and there has been major property damage due to unprecedented floods in Belgium and Germany. There is no question that protecting urban residents and the infrastructure that supports them requires urgent action.

Ensuring successful adaptation requires going beyond simply executing new projects; there is also a need to incorporate resilience into existing projects, develop innovative financing structures to unlock adaptation investment, and plan the built environment for improved adaptation. While infrastructure players are beginning to invest in building resilience, many are looking for guidance on where to begin. With this in mind, C40 Cities—a network of 97 global cities dedicated to addressing climate change—and McKinsey Sustainability set out to identify a starting set of 15 high-potential actions for cities to consider.⁴

Some of these actions build "systemic resilience," meaning they improve a city's ability to withstand and recover from a range of hazards (exhibit). Almost all cities should develop a basic understanding of climate risks and their impact, incorporate these risks into planning, develop early-warning systems, and ensure financial backstops for damages.

Other actions are specific to certain hazards, meaning they reduce the impact of a particular threat, such as heat or floods, or enhance a city's ability to recover from it. Examples include installing cool roofs, restoring wetlands, planting street trees, and managing river catchment.

¹ Nathalie Badaoui et al., *Integrating climate adaptation: A toolkit for urban planners and adaptation practitioners*, C40 Cities, October 2020, c40knowledgehub.org.

² For the full report, see "AR6 climate change 2021: The physical science basis," IPCC, August 2021, [ipcc.ch](https://www.ipcc.ch).

³ "AR5 climate change 2014: Impacts, adaptation, and vulnerability," IPCC, 2014, [ipcc.ch](https://www.ipcc.ch).

⁴ For the full list of 15 actions, see Brodie Boland, Elizabeth Charchenko, Stefan Knuemper, and Shivika Sahdev, "How cities can adapt to climate change," July 2021, [McKinsey.com](https://www.mckinsey.com).

The focused-adaptation report aims to help leaders embark on adaptation journeys.

Focused adaptation aims to reduce the complexity of adaptation for city leaders by identifying a short list of adaptation actions leaders could evaluate for their city. The report did the following:

- 1 Compiled more than 100 of the most common adaptation actions that build resilience to 5 physical climate risks
- 2 Assessed and scored the risk-reduction potential of all actions relative to each other based on quantitative case studies, peer-reviewed impact research, and expert perspective
- 3 Assessed and scored the relative complexity of implementation for all actions in terms of financial cost, infrastructure difficulty, and stakeholder complexity
- 4 Identified the actions with the highest potential that cities could consider adopting, using a benefit-by-feasibility matrix
- 5 Grouped cities into “typologies” based on economic, built-environment, and governance variables to assess whether the highest-potential actions differed based on these variables; concluded that roughly the same actions rose to the top for all typologies



Four high-potential systemic-resilience actions



Risk assessment: hazard maps, impact assessment, and spatial analysis



Incorporating climate risk into urban planning



Early-warning systems and protocols



Climate insurance provision and alignment

High-potential actions for each of 5 hazard types

● Nature-based solution

Extreme heat	Inland flooding	Coastal flooding and storm surges	Drought	Wildfires
<ul style="list-style-type: none"> ● Street trees Cool surfaces 	<ul style="list-style-type: none"> ● River-catchment management ● Nature-based sustainable urban drainage solutions (SUDS) 	<ul style="list-style-type: none"> ● Coastal nature-based barriers Coastal artificial barriers Flood- and storm-resilient buildings 	<ul style="list-style-type: none"> Water-conservation behavior programs Water-system efficiency 	<ul style="list-style-type: none"> Development planning Preventive forestry management

For each action, C40 and McKinsey offer real-life examples of how they can work. Many not only build resilience but also provide additional benefits, such as cutting greenhouse-gas emissions or air pollution:

- When Madrid's Mercamadrid fish market installed a roof painted white to reflect the sun, temperatures inside the building fell by 5 degrees Celsius.
- Planting street trees brings shade and reduces temperatures while making cities more beautiful; Medellín's Green Corridors project serves as an excellent example.
- Retrofitting public infrastructure can be expensive up front but can ultimately pay for itself. According to the US National Institute of Building Sciences, building retrofits to make structures more resistant to hurricanes can create \$6 in value for every \$1 spent.⁵

- Improving drainage reduces the risk of flooding and is also good for the creatures who live in and along riverbanks, as the otters in Bishan-Ang Mo Kio Park in Singapore display.

Effectively delivering on these 15 adaptation actions will require collaboration across the public and private sectors, including mobilization of both public and private capital. Some of these actions, such as building barriers to protect coastal areas, are expensive. Others, such as planting street trees and initiating behavioral-change programs, are relatively cheaper. Every city, regardless of wealth, can do something (see sidebar, "Five elements necessary for cities to implement climate actions").

During the 2017–18 water crisis, Cape Town, South Africa, introduced a creative campaign to encourage residents to curb water use.⁶ The campaign sponsored activities, such as school competitions, and used a series of nudges, such as promoting

Five elements necessary for cities to implement climate actions

1. *Governance structures* to build accountability that adaptation plans are integrated into a city's climate strategy
2. *Strategic planning* to ensure that climate adaptation is a core part of city growth and is updated regularly
3. *Monitoring and reporting* processes to illustrate adaptation progress and assess impact
4. *Capacity building and stakeholder management* to increase society's climate awareness, as well as the capabilities of government employees, citizens, and even firms
5. *Finance planning* to establish collaborations with different institutions and long-term, continuous funding

⁵"Natural hazard mitigation saves: 2019 report," National Institute of Building Sciences, December 1, 2019, nibs.org.

⁶Ammaarah Martinus and Faisal Naru, "How Cape Town used behavioral science to beat its water crisis," *Behavioral Scientist*, October 19, 2020, behavioralscientist.org.

two-minute songs to sing to limit time spent in the shower, to lower water use. It worked: Cape Town managed to cut water use by more than half.

The global climate crisis is under way. Lives, livelihoods, and infrastructure are already at risk. Cutting emissions is critical, but it is also a long-term effort. In the meantime, cities can act now to protect their people and create a more resilient and hopeful future.

Download *Focused adaptation: A strategic approach to climate adaptation in cities*, the full report on which this article is based, on [McKinsey.com](https://www.mckinsey.com).

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