



FEATURE

# Building climate-resilient cities

Exploring the five lenses of climate action

Irena Pichola, Mahesh Kelkar, and Mateusz Bratek

Cities should take a multidimensional approach to climate change. Based on insights gleaned from our survey, we recommend that cities view climate action through five lenses: governance, innovation, risk reduction, operational sustainability, and climate equity.

**B**ACK IN 2012, Copenhagen, the capital of Denmark, declared its intent to become completely carbon-neutral by 2025. If successful, Copenhagen will not only be the first capital city in the world to achieve this goal but will likely beat other major cities by more than a decade.<sup>1</sup>

Key to this initiative is the Copenhagen 2025 Climate Plan (CPH 2025). This multidimensional approach to climate change was co-developed with more than 200 stakeholders, including businesses, academics, and citizen representatives. The plan sets specific targets and outlines carbon reduction initiatives in four key areas—energy consumption, energy production, mobility, and city administration.<sup>2</sup>

- **Energy production and consumption:** Copenhagen has already installed 62 wind turbines with a total capacity of 158 megawatts—enough energy to fully power more than 30,000 homes.<sup>3</sup> They aim to increase it to 460 megawatts by 2025. The city has also commissioned a new power plant that converts trash into energy and repurposed an existing powerplant to run on wood pellets instead of coal.<sup>4</sup> Through efforts such as these, Copenhagen has already cut its emissions by 42% from 2005 levels and reduced heat consumption by 15%.<sup>5</sup>
- **Mobility:** Copenhagen aims to establish a new transportation model that will facilitate 75% of all trips in the city being made on foot, by bike, or via public transport. To do this, it is

installing additional biking infrastructure, expanding the reach of public transport, and discouraging the use of private vehicles through measures such as higher parking fees.<sup>6</sup> As of 2019, about 66% of trips within Copenhagen were made either by bike, on foot, or via public transport.

- **City administration:** The city aims to make its operations and structures more sustainable by focusing on reducing energy consumption in municipal buildings by 40%, transitioning administrative vehicles to alternative fuels, and installing solar panels in administrative buildings. It is making buildings more energy-efficient by retrofitting old structures with green technology and designing new ones to be more sustainable. Furthermore, the city is creating a “living lab” in its new district of Nordhavn by embedding sensors in the buildings. Researchers can use the data from these sensors to develop new insights on energy management.<sup>7</sup>

Moreover, these achievements did not hinder the city’s economic growth. Despite the climate plan’s high price tag—it is estimated to cost US\$4 billion in total—and shifting business models, Copenhagen’s GDP has increased by nearly 31% between 2010 and 2018.<sup>8</sup>

Copenhagen’s plan provides a view into the changing role of government in addressing climate change. It’s not just about setting ambitious goals but following it up with bolder actions and a collaborative approach toward

climate change. Copenhagen's ambitious goals around energy consumption and mobility cannot be successful without coordination and cooperation with different stakeholder groups.

Historically, city governments have looked at climate change in terms of mitigation and adaptation. While these are important concepts, cities should evolve a broader, more holistic approaches to climate change, such as the Copenhagen plan. They need to reimagine governance, relook at their climate innovation ecosystem, and be laser-focused on climate equity.

In this article, we deep dive into each of these key climate action areas to understand the progress made by cities globally. Recommendations and observations are informed by the ESI ThoughtLab and Deloitte global city survey. (Find more details about this survey in the “About the survey” sidebar.)

## About 97% of climate scientists agree that climate warming trends in the past century are likely due to human activities.

## Building climate resiliency needs a new approach to climate change

After years of heated scientific and political debate around climate change, the scientific community has now reached a near-total consensus on humanity's role. About 97% of climate scientists agree that climate warming trends in the past century are likely due to human activities.<sup>9</sup> This was made amply clear in 2020 when the pandemic-induced economic slowdown and lockdowns reduced global emissions by 7% (or nearly 2.4 billion tons of CO<sub>2</sub>) compared to 2019. But carbon emissions are expected to return to normal levels—and beyond—as economic activities resume globally.<sup>10</sup>

Postpandemic, climate change is likely to become a top policy agenda for cities globally for many years. A quarter of surveyed city leaders said they consider climate change and environmental threats to be a top external disruptor. Additionally, about half of the cities surveyed have made considerable progress toward the UN's “Climate Action” SDG. But there are large regional variations. Asian and European cities have made considerable progress toward the goal—67% and 65%, respectively. Europe's success is due in part to significant

### ABOUT THE SURVEY

ESI ThoughtLab, in collaboration with a coalition of business, government, and academic leaders, including Deloitte, surveyed 167 cities globally to understand their progress on UN Sustainable Development Goals (SDGs), how they coped with the pandemic, and how they are leveraging digital technologies, data, and other innovative solutions to drive progress in the postpandemic era.

The survey was conducted between August and November 2020. It covered cities across 82 countries with varying income levels and population sizes. The survey also classified cities into three stages of smart city maturity—beginner, intermediate, and leader—based on their progress in harnessing technology and data across various urban domains, and their ability to foster citizen and stakeholder engagement. Based on the survey results, 29% of cities were classified as beginner, 49% as intermediate, and 22% as smart city leaders.

public support. The European Union’s 2021 Eurobarometer survey found about 93% of its citizenry considered climate change a serious problem.<sup>11</sup>

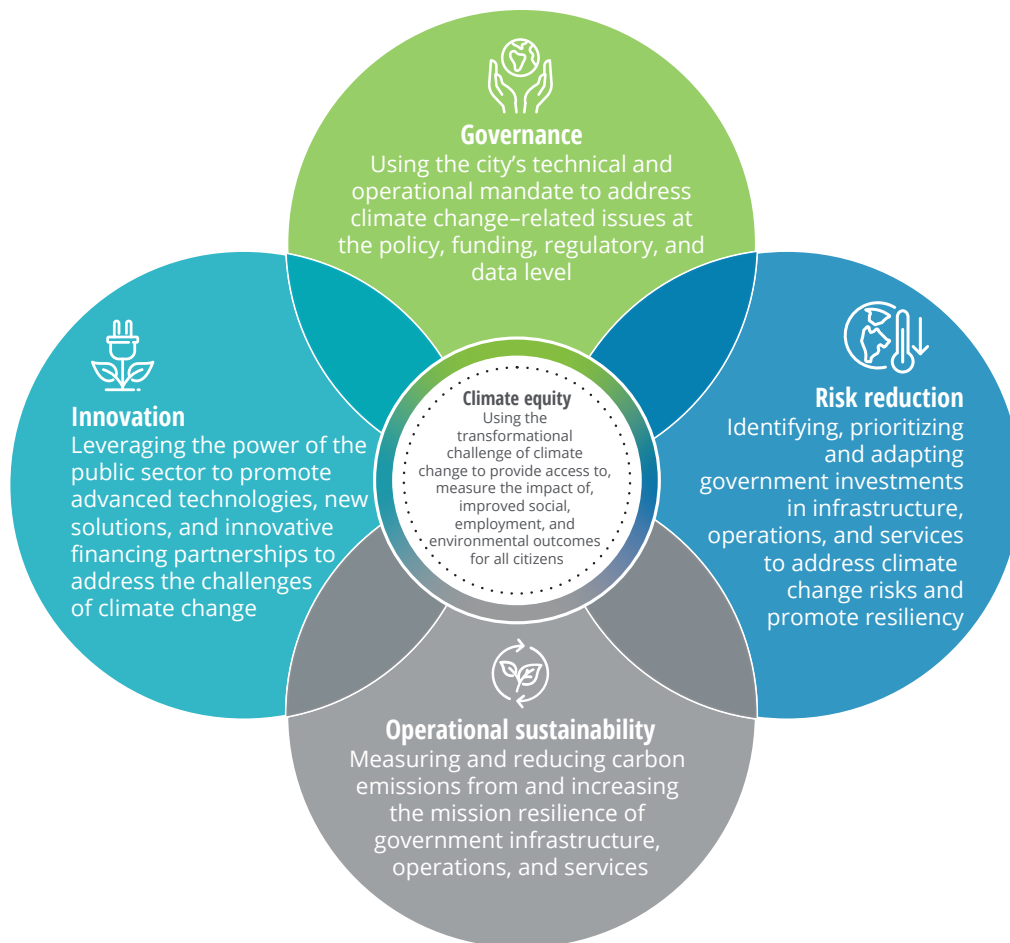
North America has lagged by comparison, with only 10% of cities surveyed in the region having made considerable progress toward their climate action goals. In the United States, the Biden-Harris administration has brought a new sense of urgency. The administration has taken an aggressive stance, issuing a series of executive orders addressing climate change and mandating a whole-of-government approach. These include actions from

transforming energy systems to supporting zero-emission transportation to encouraging innovation in clean energy technologies such as carbon capture and will have wide-ranging effects on urban planning and operations.<sup>12</sup>

There is no doubt that climate change and its effects will continue to be an important issue in the coming decade. And cities should evolve a different approach to address the challenge, something that we term as the five lenses of climate action. The five lenses expand on the traditional mitigation and adaptation approach to assist city leaders in identifying opportunities for action (figure 1).

FIGURE 1

### Cities shift to a multidimensional approach to climate change



Source: Deloitte analysis.

In subsequent sections, we will explore how cities are addressing climate change and map their progress in each of the five lenses. We will also explore regional differences and identify regions that are leading the way on climate change.

## GOVERNANCE

Climate change is one of the biggest global threats cities are facing today, and leaders need to adopt governance models that match the scale, scope, and complexity of the problem. One way to do this is to make climate change a focal point in everything that a city does and make meaningful changes to operational practices and processes.

Cities could evolve innovative governance and leadership models to tackle specific, hyperlocal climate change goals. The Miami-Dade County in the United States offers a view into how cities could evolve climate-focused leadership and governance to address local climate change issues.

In May 2021, the County appointed Jane Gilbert as its chief heat officer, a first in the world, acknowledging the impact of climate change on the city.<sup>13</sup> Gilbert was the city's chief resiliency officer for four years before taking up the new role. Gilbert will be co-chairing a heat health task force by bringing together a broader ecosystem, including municipalities, county departments, health care, community-based organizations, and academia. The role will allow the city to coordinate the implementation of heat reduction initiatives across departments. For instance, the Parks and Recreation Department is building tree canopies, and the Department of Transportation is focusing on materials that could help build cooler pavements.<sup>14</sup>

Gilbert also plans to start making small incremental changes in how the city functions to tackle the growing heat problem. This includes discouraging retail spaces from keeping their doors open when the air conditioning is on, changing work schedules to avoid extreme heat periods, educating citizens on taking shade breaks, and replacing palm trees with shade-giving trees, to name a few.<sup>15</sup>

As the focus on climate change increases, cities can get innovative with their governance and leadership models focusing on key areas such as dealing with sea level rise in coastal cities, addressing air pollution, and improving availability of clean water. For now, the survey suggests that cities have continued to evolve more traditional roles focusing on broader sustainability and resilience.

**Appointing sustainability and resiliency officers.** Over the last decade, cities have continued to appoint a chief sustainability officer (CSO)—or equivalent position—to oversee their climate efforts. According to our findings, 78% of all cities surveyed have an executive to oversee sustainability. Almost 97% of European cities and 88% of North American cities reported having a CSO or equivalent position (figure 2).

Another trend is cities' growing focus on building resiliency—a term that is not exclusive to climate change, but is certainly related. In simple terms, resiliency can be defined as an urban center's ability to prepare for, respond to, recover, and adapt from a disruptive event.<sup>16</sup> (Read [Four capabilities to build resiliency in cities.](#))

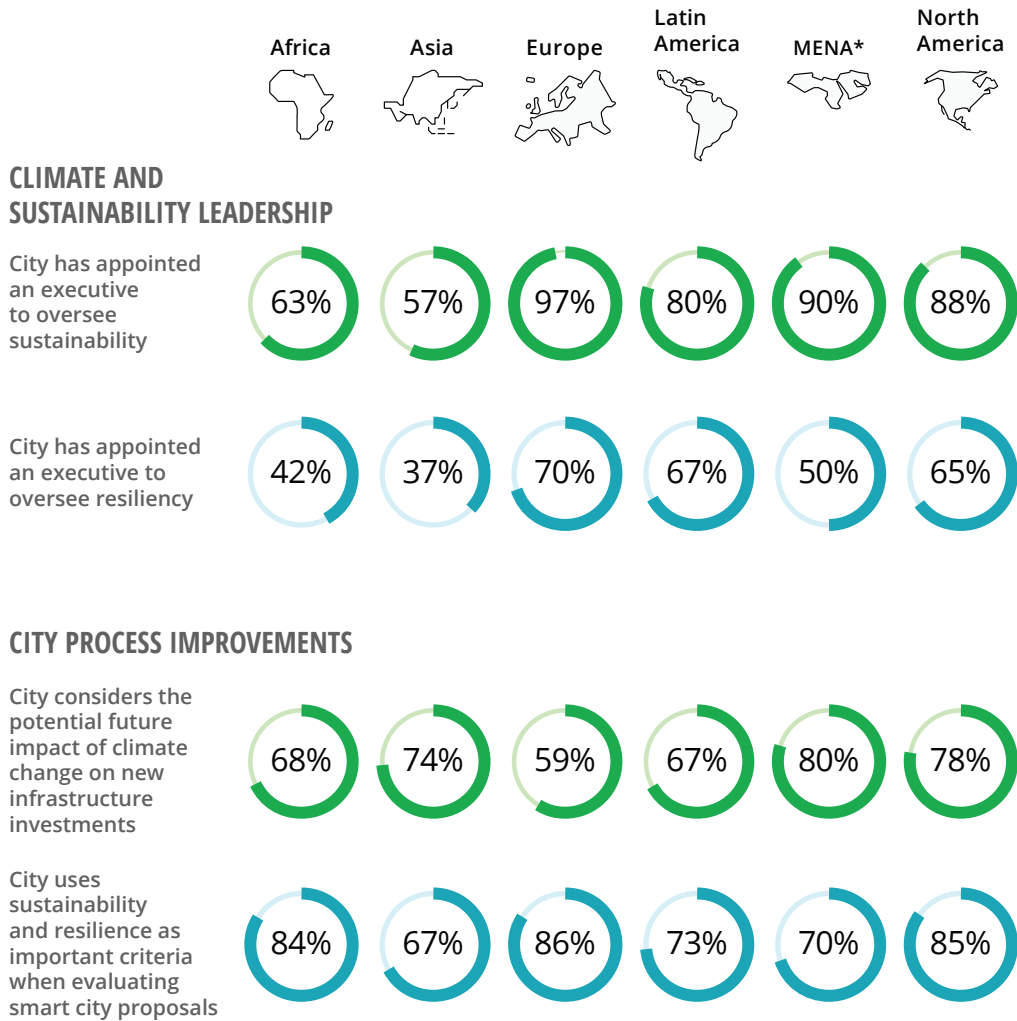
The survey found 55% of cities globally have appointed an executive to oversee resiliency, with European, North American, and Latin American cities taking the lead.

**Applying the climate and sustainability lens to operational processes.** Sustainability and resiliency executives can help coordinate a city’s efforts to launch a fully integrated response to climate and environmental disruptions.

For example, 78% of cities surveyed cited sustainability and resilience as important evaluation criteria for smart city proposals. This is true across geographies and smart city maturity levels. Additionally, 71% of cities reported considering the potential future impact of climate change when making new infrastructure investments.

FIGURE 2

### Climate governance initiatives in cities



Note: \*MENA stands for Middle East and North Africa. Source: Smart city solutions for a riskier world survey.

## RISK REDUCTION

As the effects of climate change become increasingly visible in the form of extreme weather events, sea level rise, and environmental degradation, climate risk disclosure is gaining momentum around the world. But it's not enough to identify and disclose risks. Cities should proactively manage the risks they identify—both preventable and unavoidable ones.

Consider Poland's national climate action plan. With more than 60% of the country's population residing in cities and urban areas, Poland's plan (Miejskie plany adaptacji do zmian klimatu, or MPA) aims to tackle climate change in 44 national cities, including the capital city of Warsaw.<sup>17</sup>

Among the initiatives outlined in the MPA, Poland plans to modernize flood warning and protection systems, build effective water management systems, increase green cover in urban areas, and develop solutions for growing heat waves. Warsaw, for example, has launched a Tree Crown Mapping

(TCM) platform that monitors 9 million trees in an area spanning 500 square kilometers. The platform uses data from remote sensors to understand the impact of climate change and urbanization on the condition of trees and enables city authorities to take targeted actions. Citizens can also access the data to understand the green cover in different areas and monitor the progress of tree plantations in different neighborhoods.<sup>18</sup>

**Planning for the future.** According to the United Nations, cities consume 78% of the world's energy and produce 60% of global greenhouse gas emissions.<sup>19</sup> As major contributors to climate change, it is incumbent upon cities to plan for the needs of the future and move toward sustainable development.

Air pollution, for example, has been a growing problem in cities globally—especially in developing nations. Annually, poor air quality kills almost 7 million people worldwide.<sup>20</sup> One of the primary sources of air pollution is mobility and growing



congestion in urban areas. Cities need to rethink the way people move within them by focusing on public transportation and multimodal mobility solutions and moving away from vehicles that rely on fossil fuel.

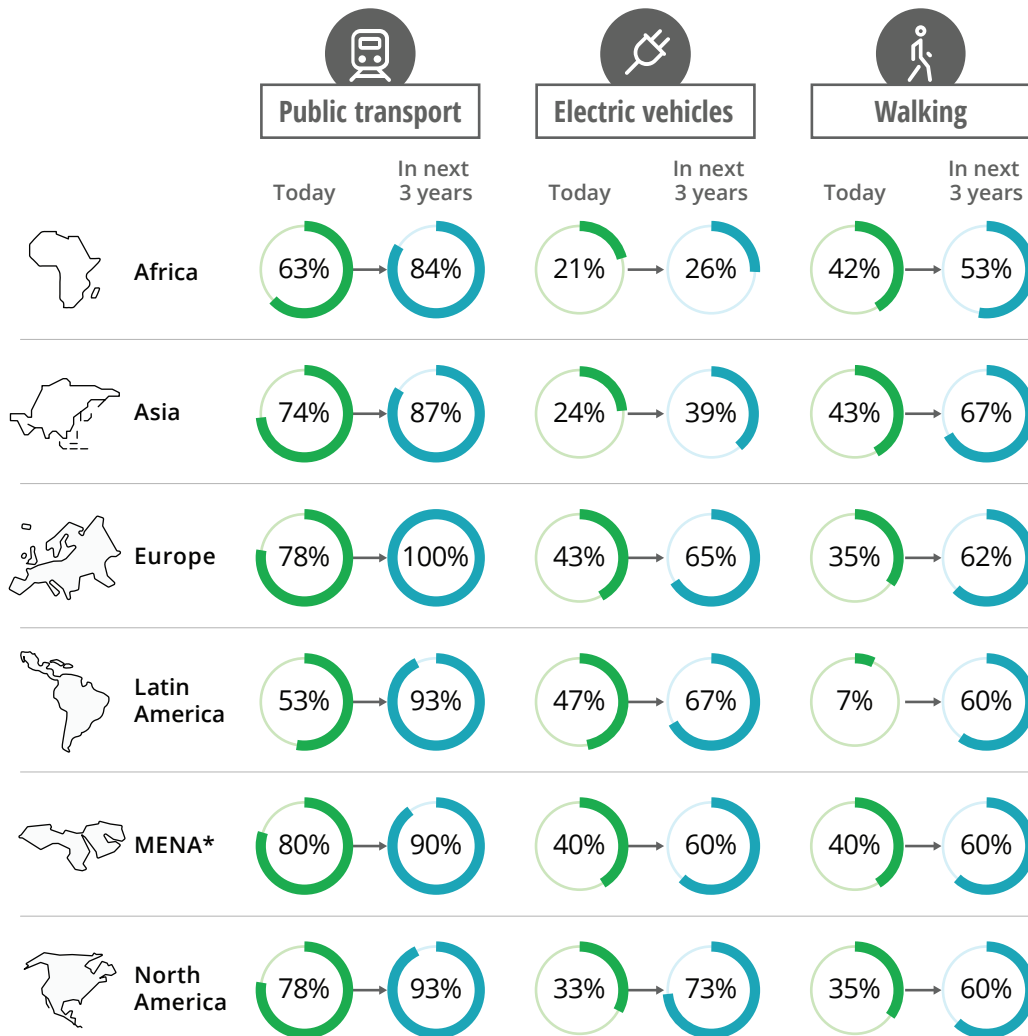
The survey suggests that cities are rethinking their current mobility models, from an uptick in public transportation options to an increase in walkability. While only 36% of cities surveyed consider walking

an important mode of transport today, more than 62% think it will be an important mode of transport in the next three years (figure 3). Additionally, the C40 Mayors' Agenda for a Green and Just Recovery—a COVID-19 recovery plan created by a network of 40 global megacities—recommends a “15-minute city” model, which focuses on making urban areas more welcoming for pedestrians to reduce greenhouse gas emissions.<sup>21</sup>

FIGURE 3

### Growing importance of sustainable transportation modes in cities

Percentage of cities today vs. over the next three years



Note: \*MENA stands for Middle East and North Africa. Source: Smart city solutions for a riskier world survey.



Another trend is the move toward electric vehicles (EV) and the development of EV infrastructure in cities worldwide. As EV technologies advance over the next decade, bringing increased battery capacity and range, cities will see a big uptick in EV mobility. The survey reports that cities expect a big move toward EVs in the next three years, from 33% to 55%. Additionally, 68% of cities surveyed are making large investments in public EV charging infrastructure, with European (92%) and North American (88%) cities betting heavily on electric mobility.

**Technology investments in risk reduction strategies.** Fortunately, new tools, technologies, and techniques give cities an unprecedented ability to avoid certain climate-related risks, such as air pollution, and reduce harm when climate risks, such as floods, are unavoidable. According to the survey, 93% of cities are making large investments in real-time air quality monitoring systems. Similarly, 88% of cities surveyed are investing in real-time water quality management systems, and 69% are investing in advance warning systems to predict problems caused by extreme weather events such as cloud bursts and hurricanes.

#### OPERATIONAL SUSTAINABILITY

Climate change and environmental degradation could impact the mission of almost every city department and domain. To address this, city leaders should consider bold and ambitious emission reduction and renewable energy goals. But cities need to drive action on the ground to ensure they are moving toward these goals.

**Set bold, ambitious targets.** According to survey results, only 47% of global cities have aligned their goals with the UN's Paris Climate Agreement. North American cities had the lowest participation, at 18%. However, with climate change as one of the top policy agendas for the



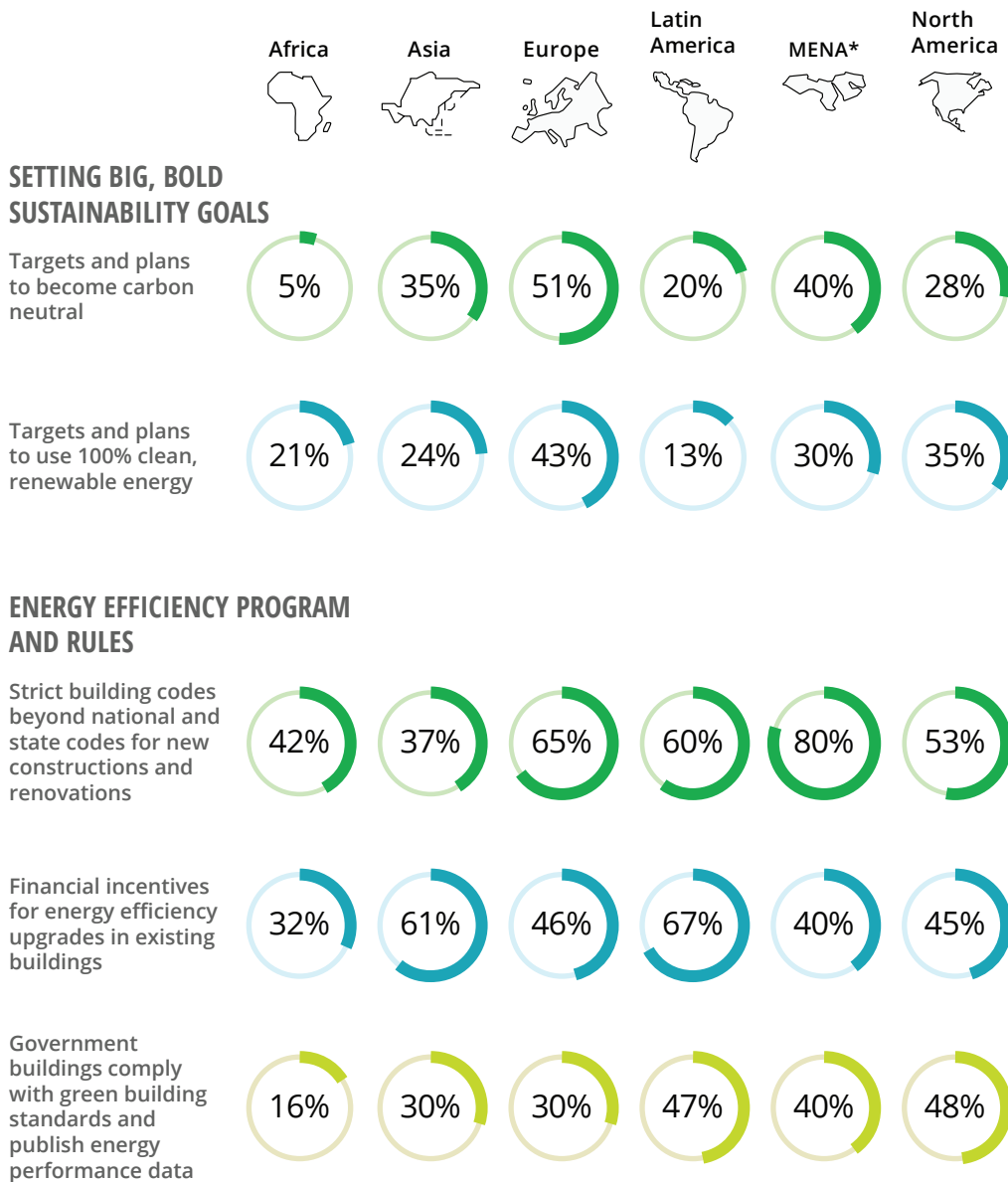
Biden-Harris administration, we can expect an uptick in US cities moving toward Paris Climate Agreement targets.

The survey additionally found only 32% of cities have set a target to become carbon-neutral, while

another 30% plan to transition to 100% clean and renewable energy in the coming years (figure 4). However, we can expect public pressure to increase these percentages in the coming years. According to a 10-city citizen sentiment analysis conducted as part of the survey, a majority of citizens were

FIGURE 4

### Operational sustainability goals and initiatives in cities



Note: \*MENA stands for Middle East and North Africa. Source: Smart city solutions for a riskier world survey.

unsatisfied with their local government’s climate action efforts. Moving forward, public sentiment and citizen activism will likely play an important role in pushing cities to take bolder action in this area. We have already seen this play out in the private sector, as shareholders, consumers, and employees have demanded meaningful corporate commitments to climate-related efforts.

**Make and encourage infrastructure changes.** Because most cities don’t have the luxury of hitting a reset button and building something from the ground up, they have focused on retrofitting old infrastructure and buildings to make them more environmentally friendly and sustainable.

According to the survey, 52% of cities have building codes that are stricter than national and state regulations for new construction and significant renovations. Meanwhile, 50% of cities have created financial incentives to make energy efficiency upgrades to existing buildings. Additionally, almost 35% of cities adhere to green building standards when constructing and renovating government buildings—and publish the buildings’ energy performance data.

For example, Prague, Czech Republic, has been driving its Climate Change Adaptation Strategy since 2015. The city has set targets in multiple areas including developing green infrastructure, reducing the impact of floods and droughts, evolving sustainable mobility options, and improving the energy efficiency of existing buildings in the city.<sup>22</sup> It has introduced incentive programs to restore and retrofit old structures to improve energy efficiency in buildings by installing energy-efficient lighting systems, integrating intelligent building management systems and central energy management systems.<sup>23</sup>

Also, the city has been facing rising temperatures and heat waves in recent decades, leading to the creation of urban heat islands in the city, especially in downtown districts. Urban heat islands generally occur when cities replace natural green cover with dense concrete and other structures that absorb and retain heat.<sup>24</sup> To address the problem, Prague is planning to undertake a series of initiatives to “cool-off” parts of the city using green infrastructure and improving green cover. This includes developing sustainable mobility options, building new parks and restoring existing ones, planting trees in alleys, installing green roofs, and much more.<sup>25</sup>

## INNOVATION

The climate technology market is ripe for disruptive innovation. For instance, authors Peter Plastrik and John Cleveland have looked at locally grown climate innovations in 25 cities globally in their 2019 book.<sup>26</sup> Plastrik and Cleveland refer to these cities as “climate innovation laboratories.”<sup>27</sup> They examine how cities can leverage the power of the public sector to promote advanced technologies, new solutions, and innovative financing partnerships to address the challenges of climate change.

The book cites Vancouver, Canada, which has set an ambitious goal of moving to 100% renewable energy usage by 2050 by switching from fossil fuels to wind, solar, and hydropower. The city is doing this in multiple ways, including implementing stricter building codes to ensure that new buildings are energy-efficient and don’t rely on fossil fuels.<sup>28</sup>

Vancouver has become a major cleantech hub globally, with more than 140 cleantech companies in its metro area focusing on fuel cell solutions, power electronics, and wastewater treatment technologies.<sup>29</sup>

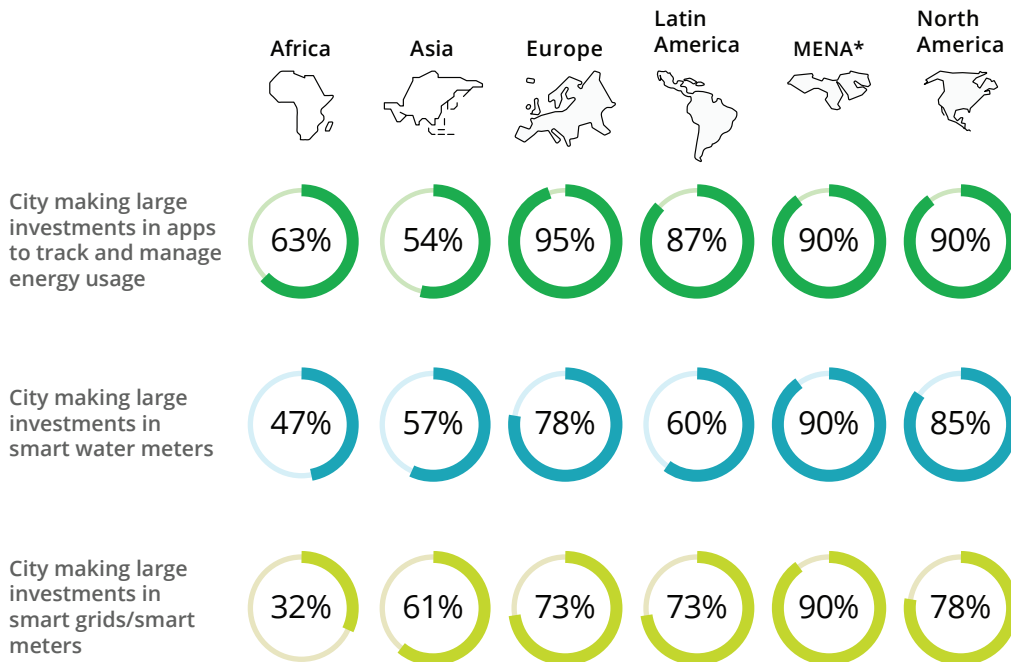
The city is also pursuing innovations in technology to establish a circular economy and create green jobs in key areas of food, textiles, and green buildings. For instance, one company called Unbuilders minimizes construction waste by upcycling materials from disassembled buildings, with a 99% salvage and recycle rate.<sup>30</sup>

Beyond Vancouver, our survey found that environment and sustainability were cities' second biggest investment priority globally over the next three years. To improve the value of these investments, city leaders need to devise better ways to work with the growing climate and clean tech sector to pilot, test, and scale new technology solutions. For instance, 78% of cities have invested in apps to track and manage energy usage, 69% have invested in smart water meters, and 67% have invested in smart grids and smart meters (figure 5).

Like Vancouver's focus on circular economy technologies, cities must leverage their authority and resources to promote disruptive technologies and innovative financing partnerships to combat climate change. On the supply side, cities need to help innovators overcome obstacles—regulatory hurdles, industry economics, entrenched incumbents—to spur innovation at the speed and scale necessary to curtain climate change. For instance, nearly a third of the surveyed cities stated that they are encouraging submission of unsolicited proposals and open pitching sessions from partners to provide ideas to cities. On the demand side, cities may struggle to influence demand through purchasing, but can influence it with innovative financing methods. The survey shows that cities are trying to move away from the traditional government-based borrowing and private sector financing to more focused vendor

FIGURE 5

### Cities investing in smart energy and water management technologies



Note: \*MENA stands for Middle East and North Africa. Source: Smart city solutions for a riskier world survey.

financing models in the near future to fund smart city projects.

## CLIMATE EQUITY

Although the impacts of climate change will be felt globally, they will not be experienced equally. Climate change poses the greatest threat to those who are the most vulnerable, with the fewest resources to counter it. For instance, shifting monsoon patterns would impact the poorest farmers in developing nations the most, while rising sea levels would have the biggest impact on vulnerable populations in coastal towns and cities.<sup>31</sup>

As cities move forward with plans to combat climate change, they should consider their actions through an environmental justice lens—evaluating not just the environmental impacts of their decisions and programs, but also their likely social, health, and economic outcomes.

Bogota, Colombia, for example, has been trying to create mobility solutions that are both sustainable and inclusive. With a population of 7.8 million and 1.2 million vehicles, the city has been suffering from congestion and related pollution for the past three decades. In 2019, Bogota had some of the worst congestion in the world, with riders spending more than 191 hours stuck in traffic that year.

According to one mobility survey conducted in the city, the majority of residents felt the public transportation was unsatisfactory. Furthermore, the city's most vulnerable populations faced the most hardship due to low coverage in certain neighborhoods, varying frequency, long wait times, and multiple transfers required to reach a destination.

Bogota focused its energies on addressing these challenges through multiple mobility initiatives. First, it reduced the monetary burden on low-income families by providing more public transport options at cheaper rates. Second, it focused on reducing the time to access public transit—both the time it takes to walk to stations and stops and waiting time—by increasing the frequency of shuttles and launching new routes.

Bogota's public transport authority also increased its public transit capacity by adding more buses. The city added 596 electric buses to its fleet in early 2021, bringing its total fleet to 1,485—the largest in the world outside of China. This move is expected to allow Bogota to eliminate 83,433 tons of CO<sub>2</sub> and 9.63 tons of particle emissions each year.<sup>32</sup>

## Looking ahead

Cities will have to play a leading role in combating climate change in the coming decades. However, city governments don't need to fight this battle alone; in fact, they can't fight it alone. Climate change is one of the most challenging problems of our times and it will need a broad ecosystem—the private sector, technology firms, academia, citizens—to converge on this wicked problem.

We will see new governance models evolve in cities to tackle climate issues. But, more importantly, cities will have to play the role of a convener in this broader ecosystem—building consensus, improving coordination, and building collaboration. This can reduce the risk of different stakeholder groups working at cross-purposes and ensure that climate actions are focused on the key climate goals of the city.

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## Acknowledgments

The authors would like to thank **Jakub Kedziora**, **Akash Keyal**, and **Kannan D, Thirumalai** for contributing their time and critical inputs in drafting this report. The authors would also like to thank **William Eggers** and **Tiffany Fishman** for their insights and thoughtful feedback on the drafts.

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