



# → From net-zero cities to green cities: Strategies to promote sustainable urban development

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## Summary

Despite global efforts to curb greenhouse gas emissions (GHG), climate change is already wreaking damage around the world in the form of heat waves, droughts, and flooding. Cities, which account for a growing majority of GHG emissions, are feeling the brunt of many such impacts. This compounds their other pressing problems such as rural-urban migration, air, water and land pollution, poverty, and inequality. In this context, climate solutions like net-zero GHG emission strategies must also achieve other outcomes that increase resilience, reduce pollution, make governance more inclusive, improve access to services, and create new jobs in cleaner and more circular economies.

In this paper, we lay out an integrated green cities planning approach that serves multiple objectives, describes examples of this approach in practice, and distills lessons learned from the developing world.



## Why net-zero cities?

Cities are where climate change and other development goals meet, for better or worse. Many communities are changing their goals to include net-zero development strategies, and some progress is being made in meeting net-zero goals. At the same time, urban leaders face immediate challenges, often compounded by climate impacts, to address rapid growth, inadequate urban services, air and water pollution, rising poverty, and growing inequality.

***Net-zero means that emissions are reduced as much as feasible, and GHG capture and storage (capturing emissions at the source, or removing them from the air, and storing them for a long period of time) is used to compensate for the emissions that are not practical to eliminate. However, while GHG emissions for many human activities can be reduced to zero<sup>1</sup> (e.g., via adopting methods of renewably generating electricity), other activities are much more difficult, expensive, and disruptive to make fully emission-free.***

Today, many efforts to create net-zero communities are focused on urban centers. This is appropriate given that urban areas are currently responsible for 71%–76% of global carbon dioxide emissions<sup>2</sup> from final energy use. Much of the world's existing urban centers did not take GHG mitigation or future patterns of energy use into account when they were constructed. This existing infrastructure is thus “locked-in” to heavy reliance on carbon-intensive systems.

Unfortunately, GHG emissions from cities are expected to grow in the coming decades. That growth will happen mostly in developing countries where per capita emissions are “currently low but expected to increase with the construction and use of new infrastructure and the built environment, and changes in incomes and lifestyles,” according to the United Nations Intergovernmental Panel on Climate Change<sup>3</sup>.

Cities are also growing at a rapid pace. In 2020, over 55% of the world's population, about four billion people, lived in cities according to the UN's World Cities Report<sup>4</sup>. By mid-century, the World Economic Forum estimates<sup>5</sup> that the urban population will rise to 6.5 billion, about two-thirds of the growing global population, with much of that growth concentrated in low- and middle-income (LMI) countries.

As cities develop, they are also changing the landscape, with deforestation reducing natural carbon sinks and increasing energy demand. More than 60%<sup>6</sup> of the land projected to become urban by 2030 was not yet developed as of 2014. Given that cities are such a large contributor to GHG emissions, and that cities are growing rapidly, new urban areas have a unique and critically important role to play in keeping global temperature to 1.5°C above pre-industrial levels. In order to meet this rapid increase in demand for energy and space, urban areas should make careful decisions to balance economic development with climate risks. Net-zero development allows cities to grow their economies while reducing GHG emissions, and at the same time addressing cities' other pressing needs for cleaner, more resilient, and more equitable urban systems and services.

<sup>1</sup> National Academies of Science

<sup>2</sup> Climate Change 2022: Mitigation of Climate Change, The Intergovernmental Panel on Climate Change

<sup>3</sup> Climate Change 2022: Mitigation of Climate Change, The Intergovernmental Panel on Climate Change

<sup>4</sup> The Value of Sustainable Urbanization, UN Habitat

<sup>5</sup> Here's how rising global risks will change our cities, World Economic Forum

<sup>6</sup> Sustainable Urbanization, United Nations

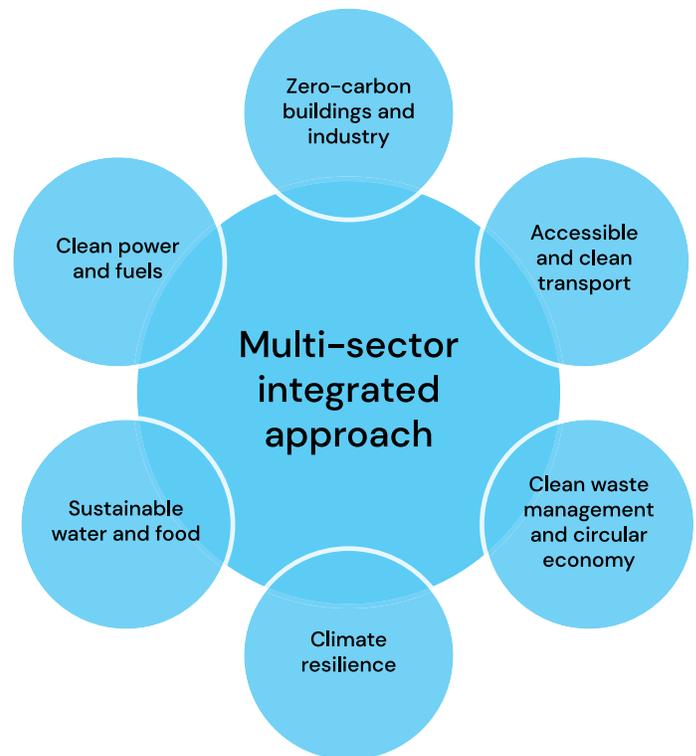
## An integrated planning approach

As city planners and leaders prepare for the new wave of urban development, they would be wise to take a multisectoral approach that incorporates the environmental, social, and economic impacts of choices in city planning (see Figure 1). Historically, much of the focus of net-zero strategies has been on energy efficiency, renewable energy, and energy storage. But integrated pathways look at GHG emissions from other sources, such as waste, and related environmental challenges in air and water pollution, and water and food supply systems. These non-energy sectors can hold the greatest potential for delivering local benefits to all citizens through cleaner air, water, and streets—and healthier lives. Leaders will therefore best prepare their cities for the future if they holistically consider environmental, economic, and social impacts in their decision-making.

These integrated green-city strategies have the potential to bring cost-effective, efficient, and politically appealing benefits to multi-dimensional societies. For instance, green infrastructure paired with nature-based solutions, such as coastal habitat restoration and reforestation, can provide good jobs for local populations—particularly in developing countries where opportunities are limited.

While local leaders are tasked with addressing the climate crisis by meeting national GHG emission reduction goals in accordance with the UN Framework Convention on Climate Change, as well as their own cities' climate goals, they must also meet their citizens' pressing needs. To be successful, climate mitigation and resilience investments should provide near-term benefits to all citizens by improving critical urban services and creating jobs, while also providing positive financial returns. Falling short on either front can undermine efforts to create green cities.

Figure 1: Multi-sector approach to green cities



*The triple bottom line is the concept that we should not only pursue profit and sound business decision-making, but also consider the impact of decisions on society and the environment. It can be summed up in the “three Ps”: profit, people, and the planet. This means that an organization shifts their focus to creating value for all stakeholders, including local populations, the local environment, and planetary health. This concept is important because it puts into practice the idea that doing good is not only ethical but also can be profitable.*

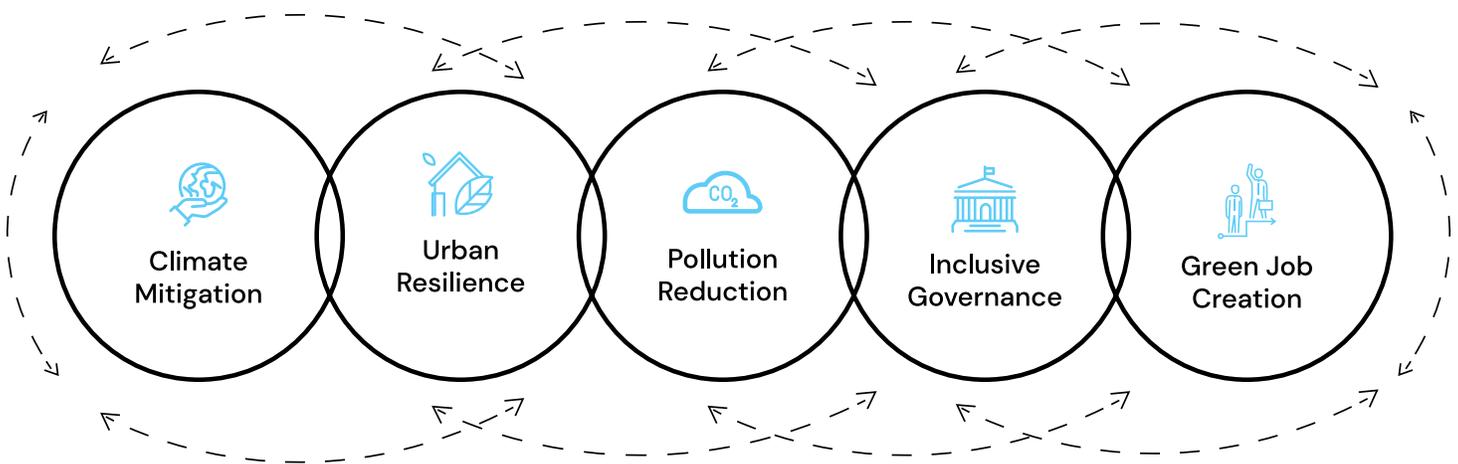
Such an integrated approach should also deliver integrated outcomes across multiple objectives (Figure 2) if green city urban development strategies are to succeed. Those outcomes should span climate change mitigation and adaptation, pollution reduction, effective governance, and workforce development for inclusive green jobs that improve local livelihoods. Dr. Steven Cohen, executive director of the Earth Institute at Columbia University, points out that environmental challenges are social, political, and technical in nature<sup>7</sup>.

livelihoods and promote equity, reinforce effective and transparent governance, and be technologically and economically viable. Too many early efforts have focused solely on the last point, technical and economic viability, and failed because they did not deliver tangible benefits to local communities. A multi-function approach yields a green-city strategy that meets the triple bottom line—bringing social, environmental, and financial benefits to local populations.

Accordingly, green-city strategies, especially in developing countries, must at once improve

<sup>7</sup> [Understanding Environmental Policy](#), Steven Cohen

Figure 2: Multi-function integrated approach to green cities



## Integrated planning in practice

Modeling of pathways that achieve multiple objectives, from net-zero GHG emissions to cleaner air and green jobs, is a core process in the multi-sector integrated approach for green cities. This approach is beginning to take hold in the U.S. and other developed nations. While it is important to recognize that what works in developed countries does not always work in developing countries, many of the principles of the multi-sector integrated approach for green cities apply to cities around the world.

In analyzing strategies for decarbonization of New York City's power sector, ICF employed its flexible CO<sub>2</sub>Sight analytics platform to quantify pathways to the state's climate goals. It showed that clean power, electrification of buildings and vehicles, and low carbon fuels can be used in various blends to achieve the city's carbon neutrality goal—with modest incremental investments beyond those that would occur in the city's buildings, transportation, and other capital stock. One of CO<sub>2</sub>Sight's virtues is its transparent and flexible design: it can employ multiple kinds of modeling tools, diverse datasets, and customized assumptions in an integrated framework that rolls up results to sectoral and citywide levels. This allows any city to use its preferred tools and localized data sources to assess a range of strategies across buildings, transport, industry, power, fuels, waste, and other sectors.

- **Key lesson:** An integrated multi-sector planning and analysis framework is foundational to credible pathways.

The earthquakes that devastated Nepal and India in 2015, leaving thousands dead and hundreds of thousands displaced, resulted in the creation of the [Nepal Urban Resilience Project](#), a 5-year program to ensure more resilient urban areas. ICF disaster management and urban development experts engaged an inclusive, integrated approach

to improve resilience, build local livelihoods, and strengthen governance in Nepal through planning analyses of risk-sensitive land use and overall spatial policies.

The ICF team worked with municipal leaders and from informal settlements. This inclusive process helped codify resilient building construction techniques improve analytics and implementation capacity at municipal and community levels. ICF used this approach to help seven of the largest urban centers outside the Kathmandu valley design more equitable disaster-resilient buildings, infrastructure, and services.

- **Key lesson:** An inclusive, bottom-up planning process achieves tangible results in the form of improved urban development policies and governance.

Successful green-city strategies must have a positive financial return and promote economic development. In 2018, the Ghana Energy Commission, with assistance from the U.S. Agency for International Development and ICF, developed an [Integrated Power System Master Plan](#) that guides future development of the country's electricity system. The Master Plan was developed using ICF's Integrated Resource and Resilience Planning (IRRP) framework, which uses an inclusive stakeholder process and an integrated analytics platform. The IRRP analytics platform performs load forecasting, resource assessments, cost optimization of supply and demand resources, and incorporates renewable energy and resilient system design and operation. The platform produces a "least-cost" as well as a "least-regrets" resilient power system.

The Master Plan showed that Ghana's power sector could expand for a cost of \$300 million less than previously estimated, reducing future electricity rates while delivering a greener grid that will support low-emission sustainable development. In addition, the IRRP process supports other objectives, such as

increasing equitable energy access and building a greener economy by bringing power to underserved regions via mini-grids. Similarly, ICF's [recent low emission development strategies analysis](#) in Bangladesh revealed a cleaner energy mix could reduce GHG emissions by up to 20%, generate domestic employment of up to 55,000 full time jobs, and save up to 27,000 lives and over \$5 billion USD

- **Key lesson:** [An integrated analytics framework, applied in an inclusive planning process, can deliver large and lasting benefits by identifying opportunities to leverage existing infrastructure while improving efficiencies.](#)

## Takeaways

Green cities are resilient in the face of climate change because they incorporate adaptation into decision-making, bolstering their ability to withstand the intensifying impacts of climate change—from sea level rise to drought. An adaptation strategy thus ensures major investments in infrastructure will bring lasting benefits. Behavioral change will not bring sustained benefits unless climate resilient systems are in place for everything from clean waste management to water and food. Such systems will improve the quality of life by ensuring that communities have secure and lasting access to clean and affordable water, energy, healthcare, and transportation.

Green cities are vital to realizing sustainable economic development in developing countries and adapting to the worst impacts of climate change. For green cities to be sustainable, however, they must be based on sound planning and financial assessment. While upfront costs should be considered and mitigated through financing, lifecycle costs need to be considered when compared against business-as-usual. Actions that improve urban resilience, health, livelihoods, and equity can and should bring positive economic return. However, measures that only focus on the financial are doomed to fail as they do not bring social benefits to constituents.

Cities in developing countries have the opportunity to “leapfrog,” or skip, the lock-in to high carbon infrastructure by investing in technologies such as smart controls that increase energy efficiency and

renewable energy-powered microgrids. Achieving green cities will be challenging and require significant investment. A multi-sector, multi-function integrated approach that follows the principles below is vital to making green cities a reality worldwide.

- **Solutions must serve multiple objectives.** Cleaning up any one sector, like buildings or power or waste, should be planned and implemented with the goal of producing social, economic, and environmental benefits (the triple bottom line). Any one solution should achieve multiple objectives to realize sustainable and multi-sectoral benefits. For example, providing building occupants with waste collection bins is a positive step. But unless that action is coupled with inclusive job creation strategies for “waste pickers” whose livelihoods depend on this sector, and unless waste-to-energy and resource recovery infrastructure is built to reduce GHG emissions as well as air and water pollution, the strategy will not produce large or lasting impacts.
- **Data and analysis matters.** To be credible and impactful, green cities should use integrated analysis frameworks that calculate and report results consistently. These frameworks must be able to adapt to the varieties of data availability and quality, local preferences for modeling tools, and preferred methods of presenting and visualizing information.
- **Inclusiveness is critical.** Unless key stakeholders are engaged early and throughout the process, outcomes will have limited buy-in and may not last. This includes proactive outreach and engagement of women, youth, and other people who have been traditionally marginalized.

Ultimately, helping urban leaders and their constituents in the developing world create green cities will be critical to reducing global GHG emissions. This goal is achievable, but it will require a multi-function, integrated approach to deliver social, economic, and environmental benefits that increase equity and improve livelihoods around the world.

## About the authors



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Collin Green is a senior climate change and energy expert with more than 25 years of experience leading, designing, managing, and implementing climate change, energy, air pollution, and development partnerships and programs in developing countries. Over the past 15 years, Collin has held various positions at USAID with progressively increasing levels of technical and managerial responsibilities; most recently he was the Deputy Division Leader for the Green Cities Division and the Acting Deputy Office Director for the Global Climate Change Office.



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Laura is an urban planner with over 12 years of experience in the environmental services and climate adaptation fields. She provides technical leadership to evaluate climate change risks and advance inclusive and integrated resilience plans and adaptation actions. Laura has led policy advice, risk assessment, project development, and strategic planning processes related to climate adaptation with cities across the Balkans, Africa, and Asia and a variety of for a variety of public and private sector clients. She has worked in over 20 countries, supporting USAID, the UN Development Programme, and the UN World Food Programme.



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Bill brings more than 40 years of energy and environmental experience to the technical and business strategy leadership for our clean energy and climate services. He provides senior advisory support for federal, state, and local governments in the U.S. and overseas projects in Africa, Asia, and Latin America.

Bill harnesses his experience to testify before legislative and regulatory bodies, serve on nonprofit organization boards, and make media appearances as an energy and climate expert. Bill is also a senior fellow with the ICF Climate Center.



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ICF is a global consulting services company, but we are not your typical consultants. We help clients navigate change and better prepare for the future.

The ICF Climate Center offers compelling research and unique insights that help organizations establish clear, practical pathways forward through the combination of climate science and predictive analytics. The Center builds upon the work of 2,000+ climate, energy, and environment experts worldwide—making us one of the world's largest science-based climate consultancies. ICF works with business, government, and nonprofit organizations to design and implement programs and policies that drive low-carbon transitions and build resilience against the effects of climate change.