



Financing Sustainable Urban Development: An Introduction

This introduction to financing sustainable urban development covers the need for this type of finance, new funding sources, and examples of how cities around the world have developed and financed projects to reduce the use of fossil fuel energy and resulting emissions, while improving their livability and inclusivity.

This guide will help city officials and local decision-makers:

- Understand the urgency of financing sustainable urban growth
- Examine challenges and barriers to obtaining financing
- Identify new sources of earmarked financing called sustainable urban finance
- Follow a pathway to selecting and financing projects
- Explore examples of potentially replicable and scalable sustainable projects

Course Content

Introduction

Financing Sustainable Urban Development

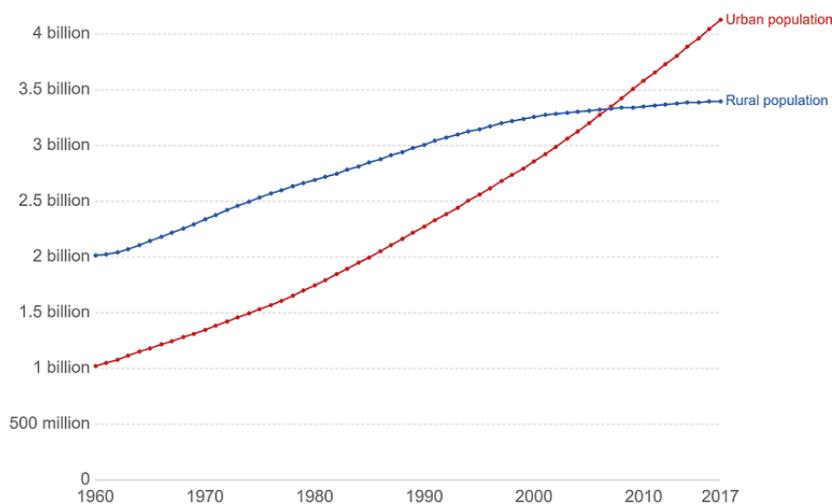
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Note: This version is a DRAFT. We welcome feedback to help us improve the content.

Why do we need sustainable urban development?

Urban Population Surpassed Rural Population in the mid-2000s



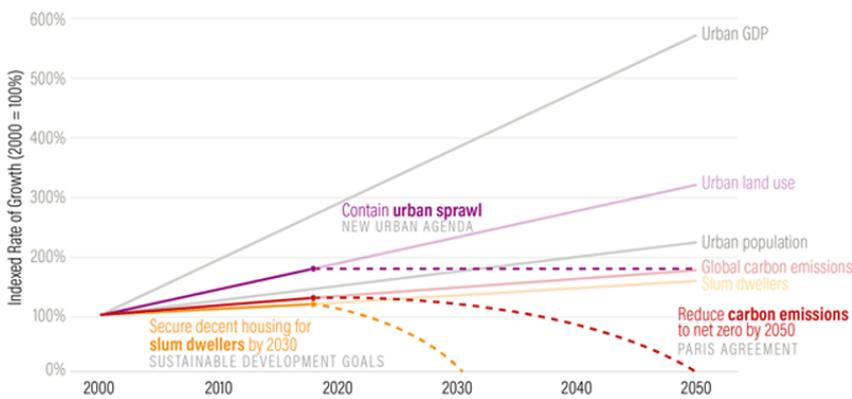
Source: World Bank, based on UN estimates

- Over 4 billion people live in cities.
- Cities account for more than 80 percent of global GDP ([McKinsey Global Institute 2011](#)).
- Cities consume more than two thirds of global energy and account for 70 percent of global emissions ([World Bank 2010, p.15](#); [UNFCCC 2017, p.8](#)).
- Cities provide basic infrastructure and services, but often lack the fiscal resources to maintain and expand them.
- Curbing the negative impacts of climate change depends on cities providing sustainable urban infrastructure and services.

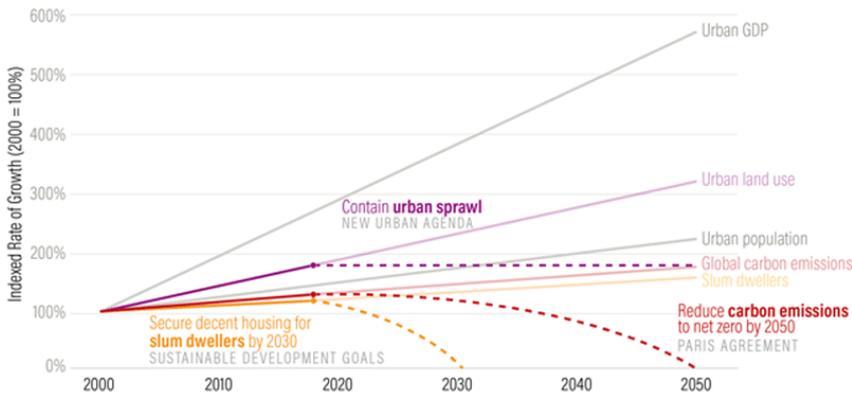
Now is the time to transition to more sustainable development

Containing urban sprawl, securing decent housing for low-income residents, and reducing carbon emissions will require major changes in urban investment patterns. As the graph shows, 2020 is an inflection point. If investment practices continue as usual, it will be even more difficult to “bend the curve.”

Illustrative Trajectories for “Bending the Curve” toward Sustainable Urban Goals



Contain urban sprawl = reduce acreage needed for housing per capita by constructing denser, transit-oriented developments.
 Secure decent housing = reduce the number of people living in informal settlements.
 Reduce carbon emissions = through more efficient buildings and transit systems.



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Source: [Colenbrander & Dasgupta 2018](#)

Cities are at the heart of creating a more equitable and sustainable world as envisioned by global agreements such as the [Sustainable Development Goals](#), the [Paris Climate Agreement](#), and the [New Urban Agenda](#). Business-as-usual investment practices will not achieve the goal of reducing climate change. To “bend the curve” toward greener, more inclusive development, sources of funds to pay for these investments must be found.

Transitioning to sustainable services and infrastructure involves:

- **Reducing carbon emissions**

- 60 percent of the buildings that will exist in 2030 are yet to be built. Two thirds of them will be in the global south ([WRI 2016, p.24](#)). This presents a huge opportunity to reduce energy waste by constructing efficient new buildings.

- 70 percent of greenhouse gas emissions come from cities ([GHG Protocol 2015](#)). Reducing emissions will lead to more livable cities.

- **Containing urban sprawl**

- US\$5.11 trillion is lost each year due to traffic congestion and air pollution, which were also linked to 7.6 percent of deaths worldwide in 2016 ([World Bank 2016](#); [WHO 2016](#)). Sustainable development can reduce health-related costs.

- Urban growth leads to expansion of the road networks which enable urban sprawl, but high costs

and land availability can constrain this. Building appropriate densities through transit-oriented development strategies allow for more concentrated economic activity.

- **Securing housing and basic services**

- Too many people lack access to basic services. More appropriate housing densities allow for better cost-effective energy and water investments and better connectivity of transportation systems.

More investment in sustainable infrastructure and services will lead to more efficient use of financial resources, reduced capital costs over time, and greater economic activity that will expand the tax base.

A faster transition will help cities adapt to and mitigate the effects of climate change while providing basic infrastructure and services.

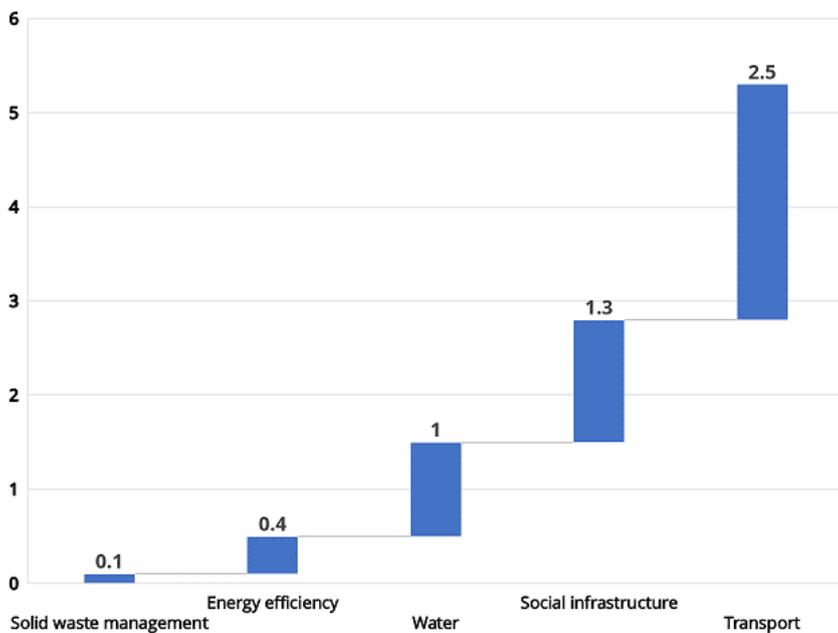


Photo by Mariana Gil/[Flickr](#)

How much sustainable urban investment is needed?

Cities represent 70 percent of global investment needs ([CCFLA 2015, p.3](#)) and our analysis shows they will require roughly US\$5.3 trillion per year (or US\$159 trillion by 2050) in sustainable urban infrastructure investments. From 2000 to 2016, city and state/provincial governments were responsible for 64 percent of environmental and climate-related investments ([OECD 2018, p.20](#)). Note that cities are also engines of economic growth, generating 80 percent of global gross domestic product ([UN Habitat 2016, p.27](#)).

Annual Needs of Five Urban Sectors Globally (trillions of US dollars)*



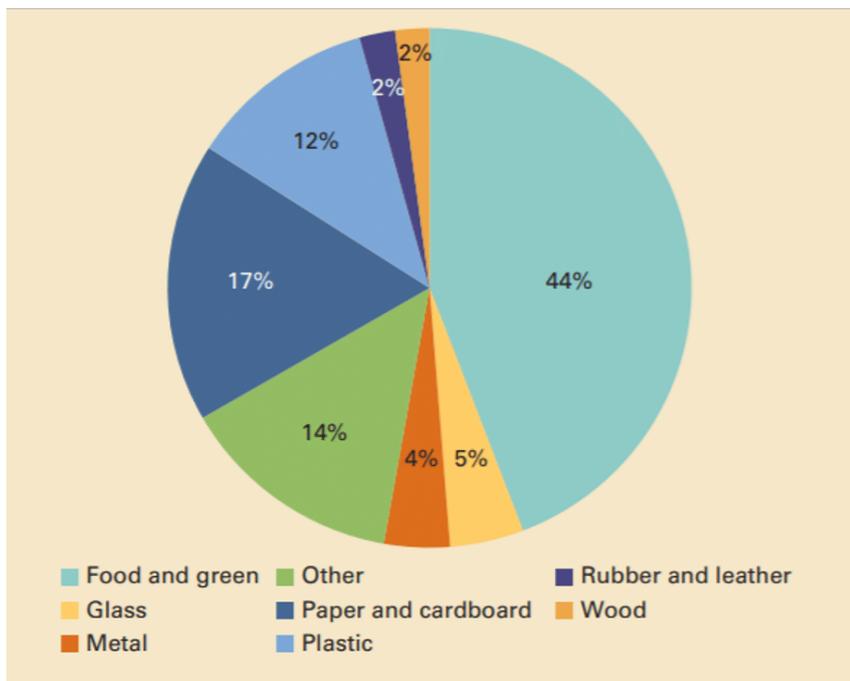
*Sectors such as power/electricity and telecommunications were not included because they are not considered “urban” since generation of electricity takes place mostly outside urban areas.

Sources: Authors based on data from [OECD 2017](#); [World Bank Group 2018](#), and [McKinsey Energy Insights 2019](#).

Investing in solid waste management

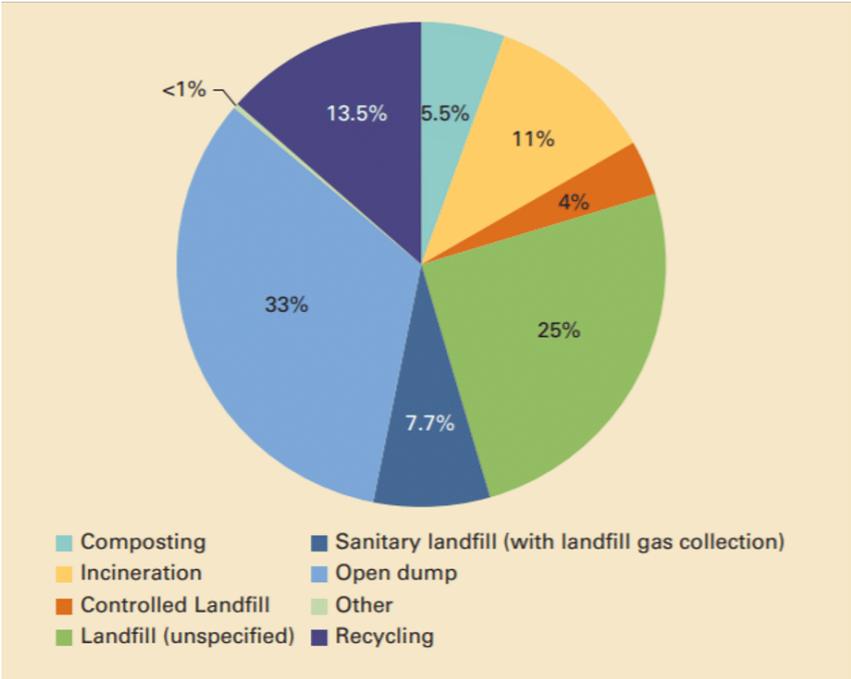
The world’s cities produced 1.3 billion metric tons of waste in 2012 and will produce 2.2 billion metric tons by 2025. Almost half (44 percent) of this waste is plastic. Managing this waste will involve reducing, reusing, and recycling a good portion of it. Currently, recycling accounts for only 3.5 percent of global waste treatment and disposal, leaving the majority of waste unrecycled with 33 percent going to open dumps, and 25 percent going to “unspecified landfills” ([World Bank Group 2018](#)).

Global Waste Composition



Source: [World Bank 2018](#)

Global Waste Treatment and Disposal



Source: [World Bank 2018](#)

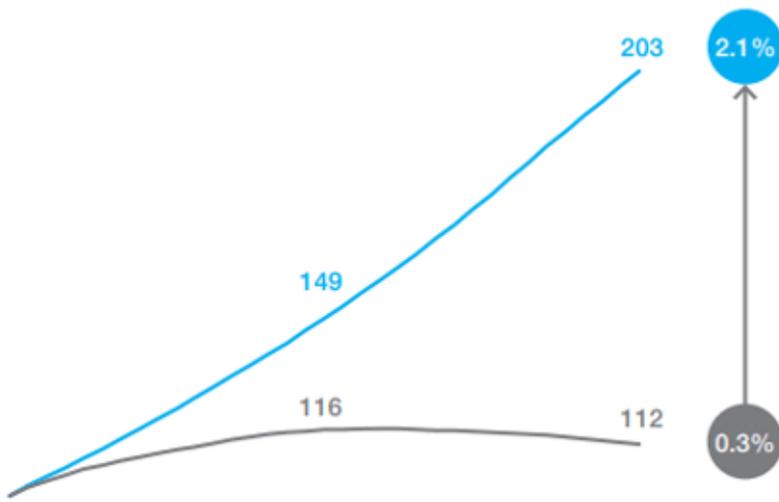
Investing in energy

Improving energy efficiency and increasing the use of renewable energy sources requires investment. Buildings, transport, and industry on average represent 70–80 percent of greenhouse gas emissions. Investments in electricity transmission and distribution are also needed to extend access and reduce losses ([UN Environment 2017](#)).

The Share of Electricity in Energy Consumption Will Double by 2050

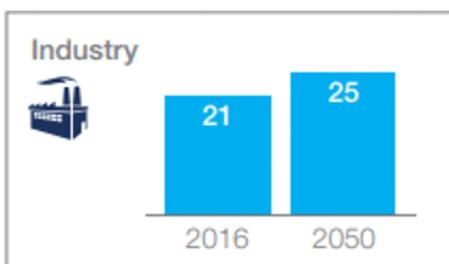
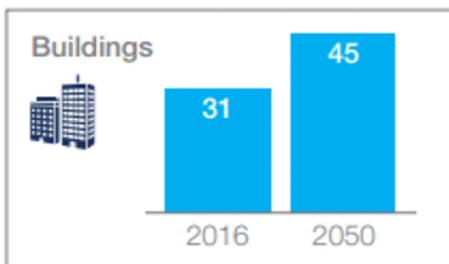
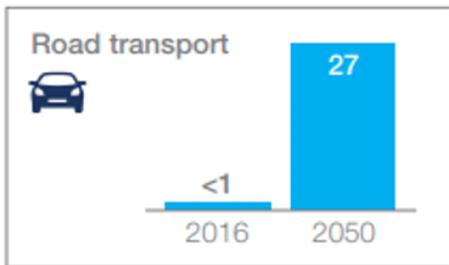
Final energy consumption
2016=100

— Electricity — Other fuels CAGR %



CAGR=Compound annual growth rate. Source: [McKinsey Energy Insights 2019](#)

Electrification¹
% of final energy consumption



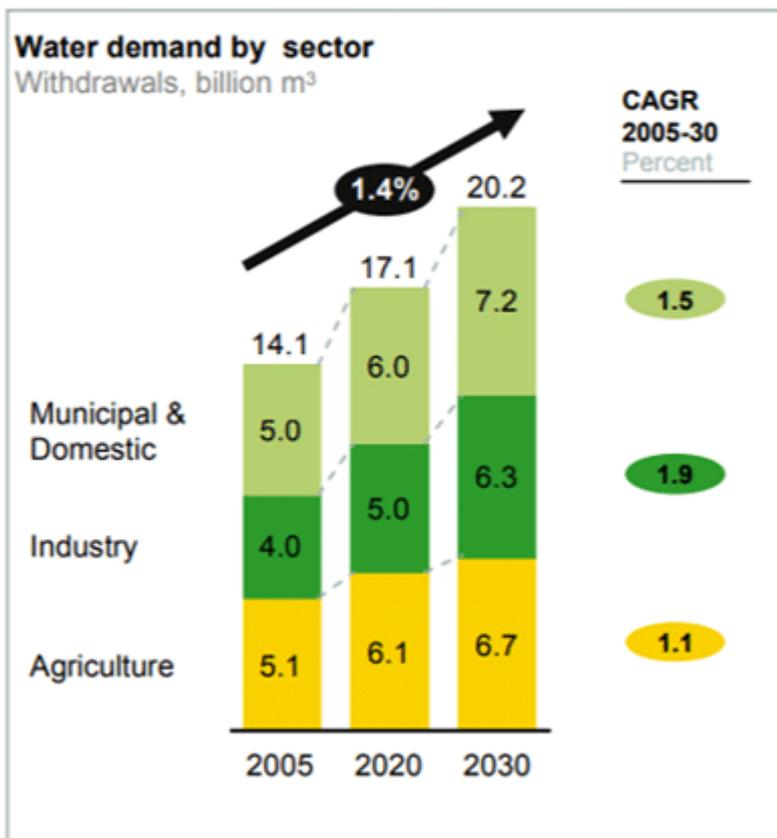
Source: [McKinsey Energy Insights 2019](#)

- Electricity consumption is projected to double by 2050. Cities must shift to renewable energy sources to generate electricity. They will also need to manage capital and lifecycle costs more effectively.
- Building retrofits and electric buses save energy costs over time. However, the initial capital costs of electric buses are currently higher than those of diesel fuel buses and the operation and maintenance costs are unclear for newer technologies.

Investing in water and wastewater management

About 700 million urbanites live without adequate sanitation and 156 million live without a source of clean water ([UN Water 2018](#); [Water Resources Group 2009](#)). No investment estimate is available for urban stormwater management, but it will likely be high because climate change is changing precipitation patterns across the globe, increasing both frequency and severity of rainstorms and flooding ([Wavin 2017](#)).

Urban Demand for Water in São Paulo, Brazil Will Increase to 7.2 Billion Cubic Meters by 2030



CAGR = Compound Annual Growth Rate. Source: [Water Resources Group 2009](#)

Investments Needed for Urban Stormwater Management



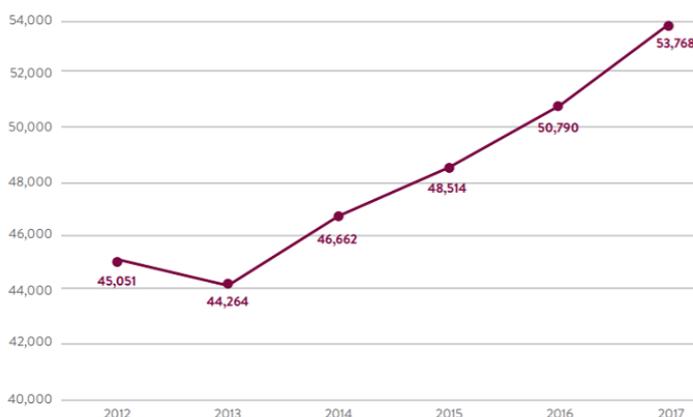
Source: [California Urban Water Agencies 2016](#)

Investing in transport

Transport investment includes costs related to roads, rail, and buses ([OECD 2017](#); [Lefevre et al 2016](#)). Major arterials and urban highways take up the majority of road spending, but are not a long-term solution for reducing congestion. Greater investments in public transport, walking and biking infrastructure, and electrification of vehicles will be needed.

- In the past six years, annual global metro ridership grew by over 8.7 million passengers (an increase of nearly 20 percent). Over the next five years, more than 200 new transit lines are projected to open around the world ([UITP 2018](#)).

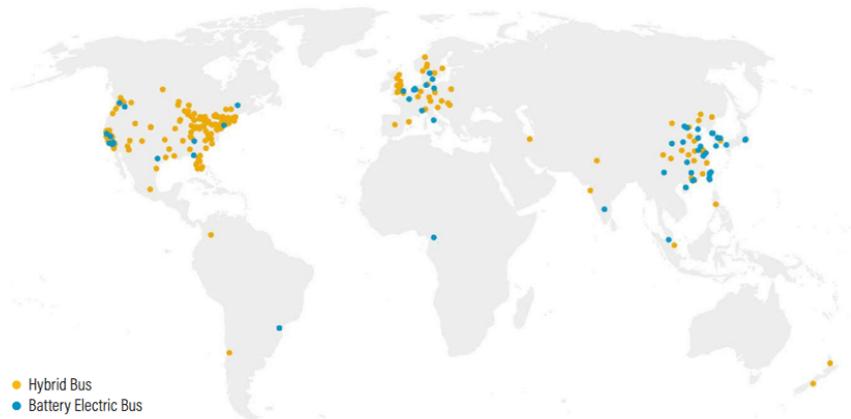
Global Metro Network Ridership (millions)



Source: [UITP 2018](#)

- Globally, there were approximately 370,000 battery-powered electric buses in 2017, more than twice as many as in 2015 ([IEA 2018](#)). These buses require new infrastructure such as charging facilities and new technologies.

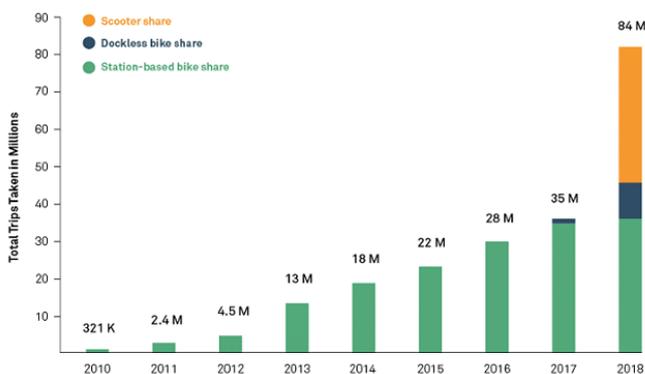
Hybrid and Electric Bus Adoption around the World



Source: [WRI 2019a](#)

- With 84 million trips in 2018 in the United States made through ride-sharing, scooter-sharing, and bike-sharing operations, there is a huge potential for healthier, more active transport that reduces congestion and greenhouse gas emissions ([NACTO 2018](#)). But these systems require new investment for infrastructure to ensure the safety of users and those around them.

84 Million Trips Made on Shared Micro-mobility Vehicles in the US, 2018



Source: [NACTO 2018](#)

Why isn't enough investment available for sustainable urban systems?

Most public funding for city services comes from taxes, fees, and transfers, which is not enough to meet demand. While some cities can obtain debt financing through bonds or loans, there are often legal restrictions and concerns about their ability to repay debt. Some reasons for underinvestment in sustainable urban infrastructure are:

Socioeconomic factors:

- Social and long-term economic benefits of sustainable services and infrastructure are usually greater than immediate financial returns, which makes it difficult to attract private finance.

- Social returns may take decades to accrue and are difficult to monetize.
- The risks of climate impacts are undervalued and dispersed.

Public funding factors:

- Many cities rely heavily on central government transfers and lack the fiscal space to develop sustainable infrastructure.
- Many cities lack the creditworthiness and legal authority to take on debt through bonds.
- Many urban services compete for a city's financial priorities.

Private finance factors:

- Sustainable investments often involve large up-front capital costs, though savings may accrue during operations.
- The private sector wants a faster payback period and requires higher returns given the risks related to new sustainable infrastructure.
- Many countries have underdeveloped capital markets and banking sectors.

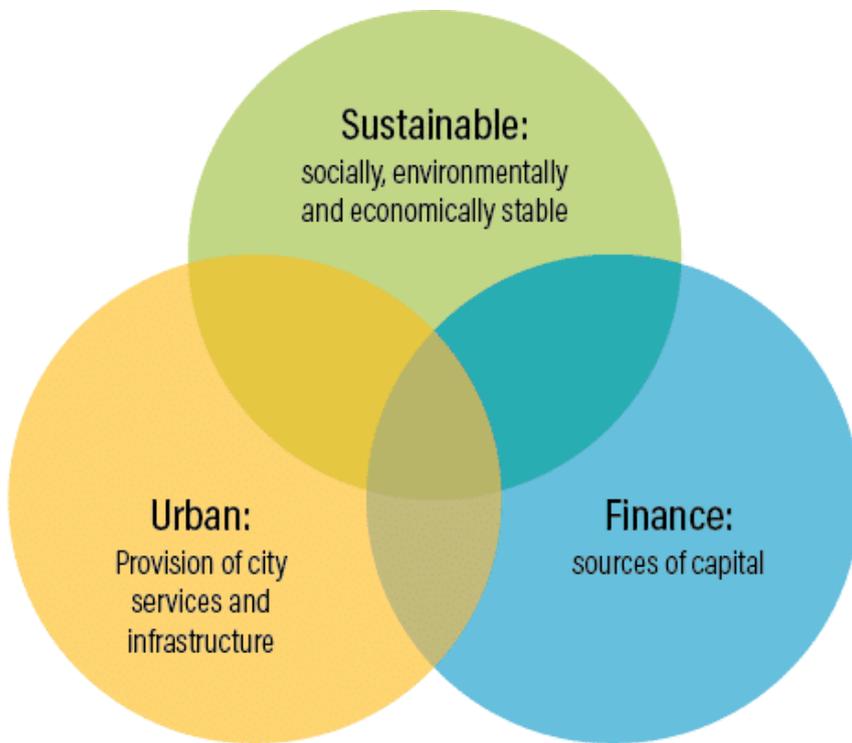
Different forms of public funding, blended finance, and private finance need to be explored to meet existing and future demand.

Source: Authors 2019

Sustainable urban finance is tied to international efforts to reduce climate change impacts

Sustainable urban finance refers to investments in urban development projects that meet social, environmental, and financial objectives ([Kim 2016](#); [European Commission 2018](#)). The term combines three concepts:

Sustainable Urban Finance



Source: Authors 2019

- **SUSTAINABLE:** Relating to the “triple bottom line” of social, environmental, and economic development, supporting the transition from brown (polluting) to green (clean energy) projects, and managing climate adaptation requirements ([Elkington 1997](#)). Urban sustainability objectives include:
 - **Social:** saving lives, improving health, providing education and opportunity.
 - **Environmental:** clean air, soil, and water quality. Water and sewer services.
 - **Economic:** growth of household income and GDP.

- **URBAN:** Relating to the provision of city infrastructure and services.

- **FINANCE:** Relating to sources of capital:
 - **Public funding:** Municipal and national budgets and government transfers.
 - **Blended finance:** Public, bilateral, concessional funding or finance, and private finance.
 - **Private:** Debt and equity.

Objective and strategy of sustainable urban finance

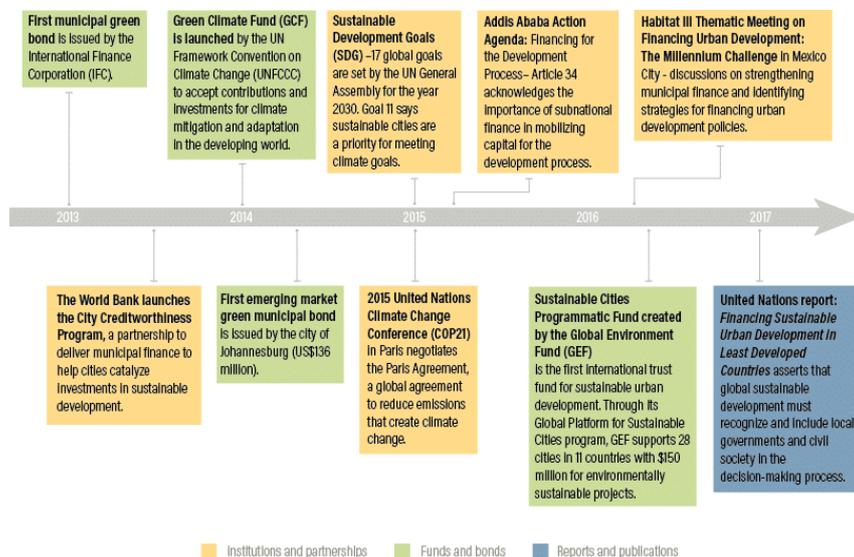
The objective of sustainable urban finance is to funnel capital toward services and infrastructure that help meet local sustainability goals, which may in turn have positive ripple effects at the regional, national and global scale. To reach this objective, the strategy is to:

- **Transition:** Move spending to sustainable urban development.
- **Increase:** Increase the absolute amounts spent on sustainable urban infrastructure and services.
- **Scale:** Expand coverage and service sustainably.
- **Allocate:** Disburse funds to meet demand

- **Maintain:** Provide adequate resources for maintenance.

Timeline of sustainable urban finance initiatives

While municipal finance is a well-established topic, the focus on the sustainable aspect of urban finance has emerged only in recent years. This timeline is a nonexhaustive summary of some important milestones in the effort to direct international funds to green projects.

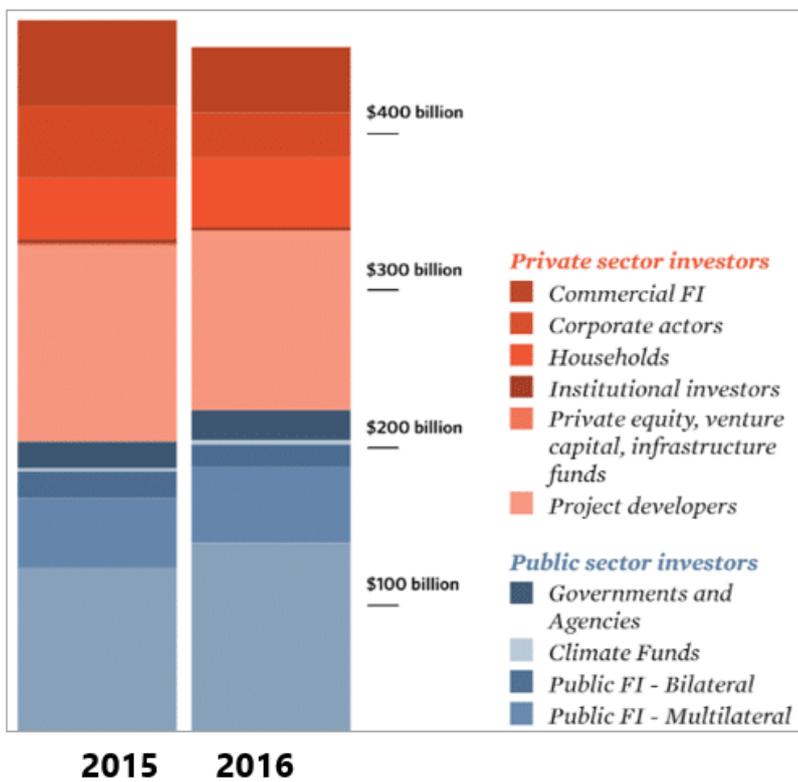


Source: Authors 2019

Sources of global climate investment

International funds dedicated to slowing or adapting to climate change are increasingly available to developing country cities for investment in urban transit and energy-efficient construction.

The [Climate Policy Initiative](#) (CPI), which produces the most comprehensive inventory of climate change investment available, reported that 54 percent came from private sources in 2016 ([CPI 2018, p.2](#)), with a growing amount from public entities like governments and bilateral or multilateral banks.



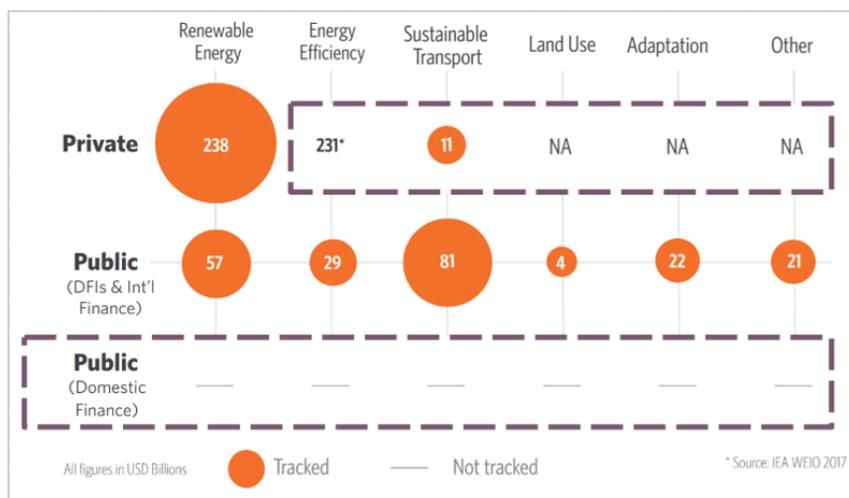
FI: finance

Source: [CPI 2018](#)

As noted earlier, about \$5.3 trillion are needed in sustainable urban investment globally. The Climate Policy Initiative's tracked data shows sustainable financing is growing but still falls short of need. In 2018, the \$464 billion to \$666 billion of tracked sustainable investment represented only 8.8 percent to 12.7 percent of the need ([CPI 2018, p.7](#)).

Accounting gaps in tracking sustainable finance

The Climate Policy Initiative identifies which types of private and public funds it can track and how the funds are used. Most of the private funding was used for renewable energy and most of the public funding for transit. Domestic finance is especially hard to track.



Source: [CPI 2018](#)

Private sources of sustainable investments

Private loans, the larger source of investment, are difficult to track. “Green tagging” is a process whereby banks identify the environmental attributes of their loans and the underlying asset collateral. Tagged bank assets can be tracked for loan performance providing greater transparency of climate risks and portfolio reliance ([UN Environment 2017](#)).

According to a [survey of lenders and regulators by UN Environment](#),^[1] the following investments are more likely to be considered sustainable and therefore more likely to be eligible for financing. Thus cities should consider asking lenders for assistance in these areas:

- Improving energy efficiency and use
- Reducing greenhouse gas emissions
- Reducing waste and increasing recycling and reuse

The 2017 UN report, [Financing Sustainable Urban Development in the Least Developed Countries](#), describes ways cities can access private financing.

[1] The survey included 10 European banks: ABN Amro, BBVA, Berlin Hyp, HSBC, ING, Lloyds, SEB, Suedtiroler Volksbank, Triodos, and UniCredit.

Green bonds / Climate bonds

[Green bonds](#), also known as climate bonds, are earmarked for climate or environmental projects. They have been labeled as “green” by the issuer according to [certain criteria](#) and 95 percent of the proceeds must finance green or environmental projects.

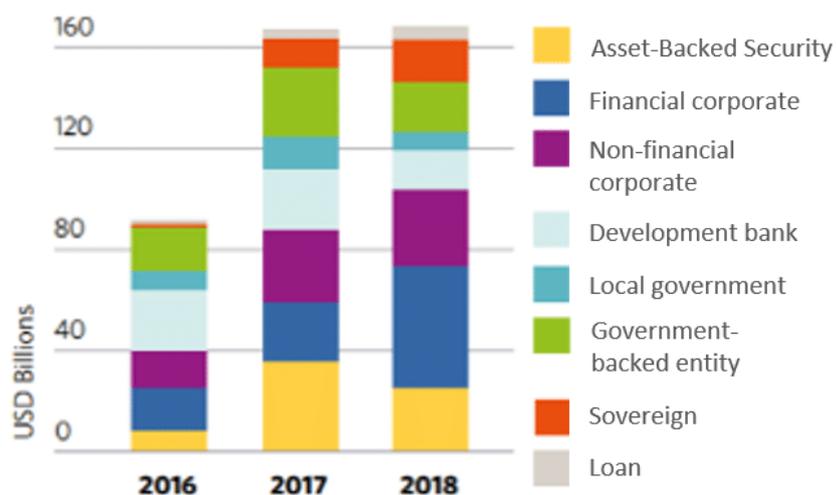
Wealthier cities can issue their own bonds for capital expenses. However, developing country cities often lack the creditworthiness to issue bonds; less than 20 percent of these cities have access to local capital markets through issuing bonds, and only 4 percent are deemed creditworthy enough to access international capital markets ([CPI 2016](#)).

Green bonds are usually issued by international development agencies or private entities and are backed by the issuer’s balance sheet and assets.

- Historically, development finance institutions like the World Bank or the Asian Development Bank issued green bonds, but now an array of commercial banks and corporations (like energy utilities) are flooding into the green bond market.
- Green bonds grew from US\$2 billion in 2012 to US\$162.1 billion in 2017 and reached US\$167.6 billion in 2018 ([CBI 2019](#)). An estimated 60 percent of green bond issuance in 2018 was dedicated to urban infrastructure.
- Green bonds represent roughly 25 percent of sustainable investments. They are the most easily tracked private source of financing because of their disclosure requirements.

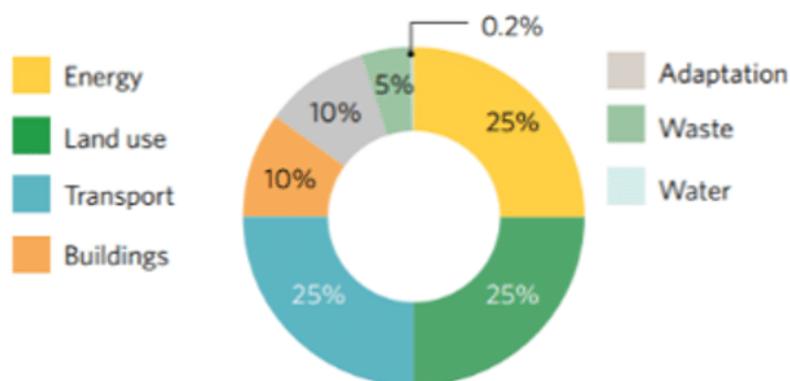
The [CPI report, Green Bonds for Cities: A Strategic Guide for City-level Policymakers in Developing Countries](#), explores long- and short-term strategies for cities in developing countries to unleash the full potential of finance from green bonds.

Green Bonds by Issuer, 2016–2018



Source: [CBI 2019](#)

Cumulative Use of Proceeds, 2018



Source: [CBI 2019](#)

Investments for which climate bonds can be issued

For climate bonds, investments must be compatible with the decarbonization trajectory of the Paris Agreement to hold global warming to 2°C.

The infographic below and the source explain how projects are classified and certified as eligible for climate bonds ([CBI 2018](#)).

Climate Bonds Taxonomy



Source: Climate Bonds Initiative 2018

Nature-based, IT & communications, marine resources, and certain industrial investments are also considered green investments but are not typically provided by cities.

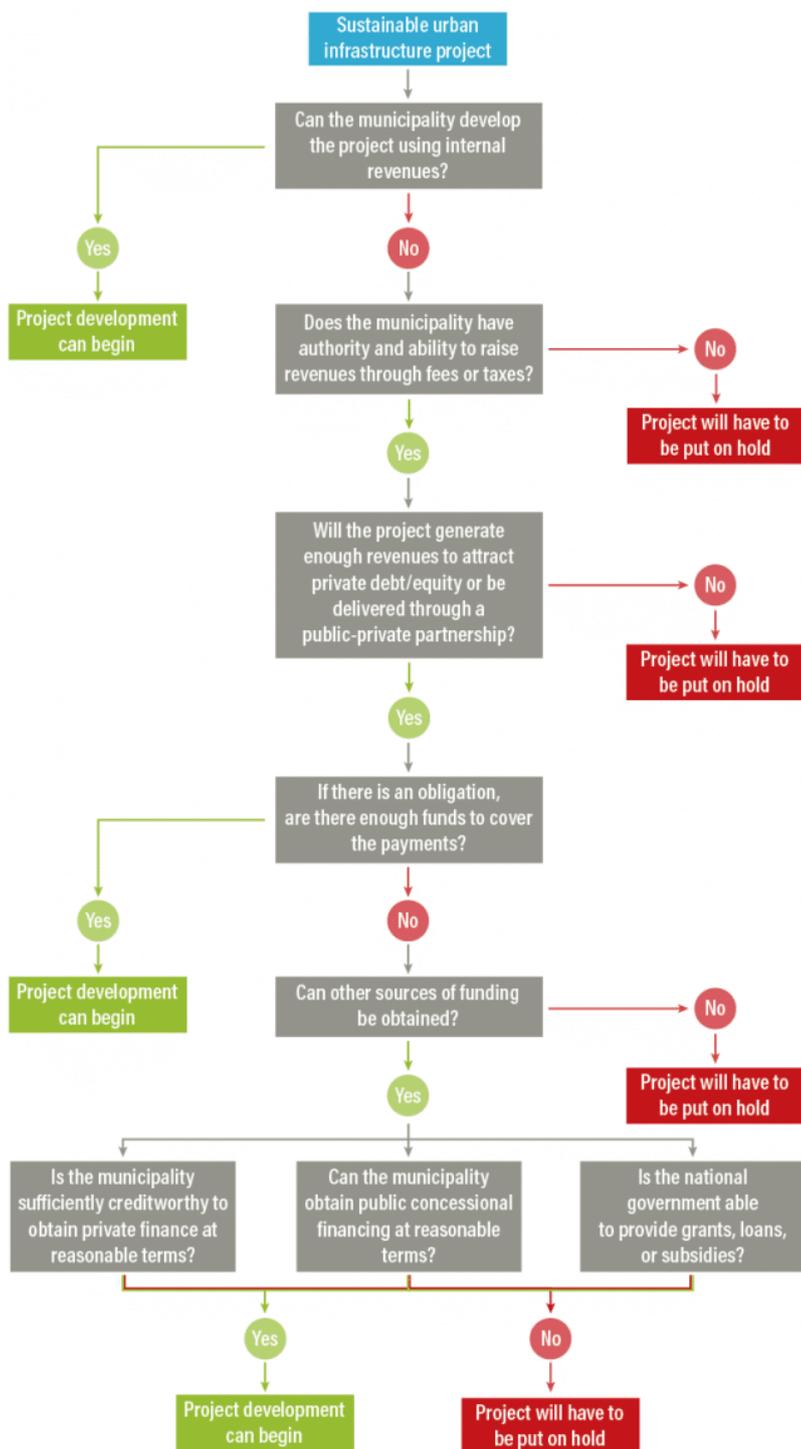
Planning for sustainable urban development

To transition from business-as-usual investment practices to sustainable urban investments, cities need to set targets, plan and strategize, and finance and implement the plan.



Source: Authors 2019

Decision chart for paying for and mobilizing investment



Source: Authors 2019

Note: This decision chart is a guide to organize planning, but any action plan should be adapted to local conditions and opportunities.

What sustainable investments are cities making?

Cities are investing in individual projects as well as portfolios of projects. Sometimes these are part of a city’s capital investment plan.

Some projects in important sectors are shown here. More detail on a few projects is shown in the next slides.



Transport:

- Mass transit: Urban rail, BRT, electric buses, etc.
- Cycling infrastructure, car-sharing, bike sharing, and other micro-mobility options
- Infrastructure for safe walking

Photo by Mariana Gil/[Flickr](#)



Water:

- Water supply and treatment (drinking)
- Wastewater treatment (sewerage)

Photo by Mariana Gil/[Flickr](#)



Energy:

- Shift to renewable energy sources
- Electrification of industry, buildings, and transportation sectors

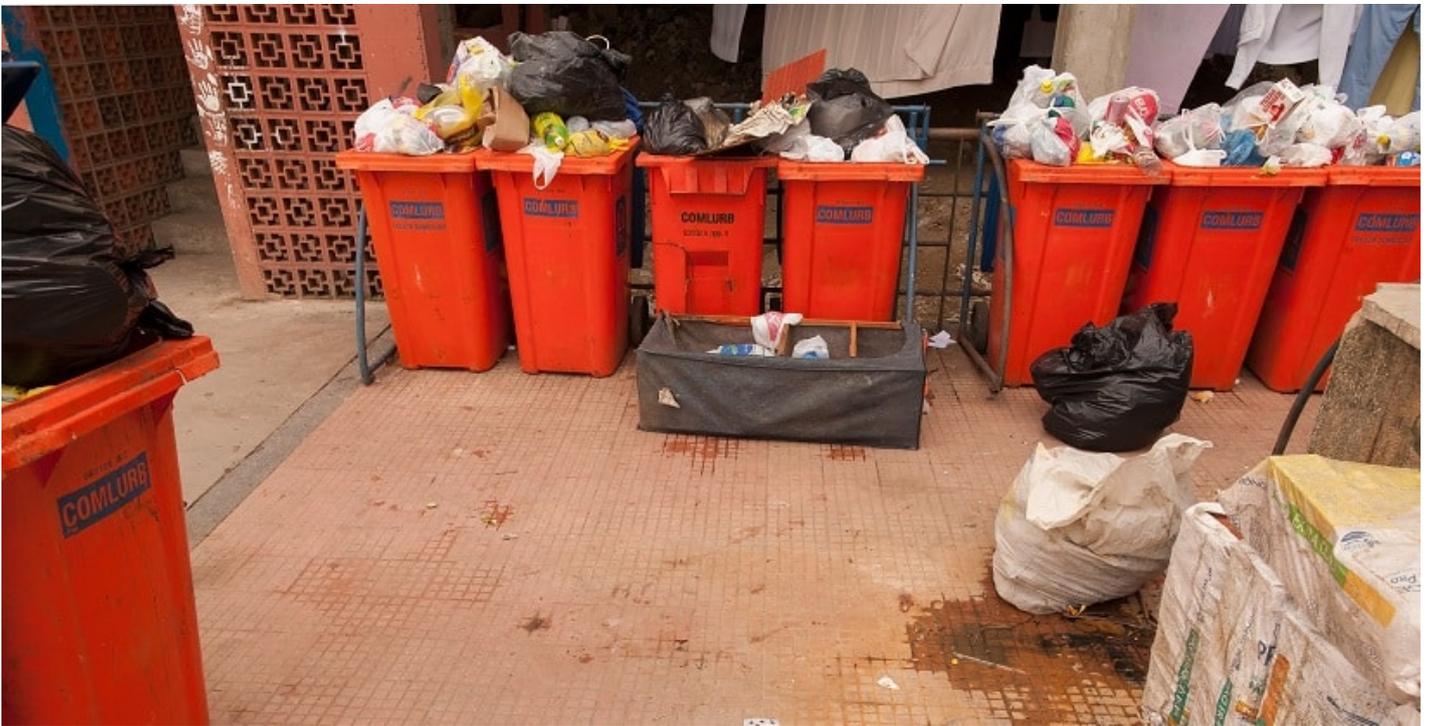
Photo by La Citta Vitta/[Flickr](#)



Buildings:​

- New builds and retrofits
- Efficient lighting, heating, cooling, ventilation, cooking, and building management technologies

Photo by Mariana Gil/[Flickr](#)



Waste:

- Waste-to-energy system
- Enhanced material sorting and recycling

Photo by WRI Ross Center/[Flickr](#)

Electric buses: Example of a sustainable urban project

Cities around the world are turning to electric buses to decrease emissions and sprawl while providing better service and reducing costs in the long term. Via WRI Ross Center for Sustainable Cities/Youtube

Cities around the world are turning to electric buses to decrease emissions and sprawl while providing better service and reducing costs in the long term. Via WRI Ross Center for Sustainable Cities/Youtube

Low-and zero-emission buses decrease environmental impacts while creating economic, environmental, and health benefits. Transitioning bus fleets to clean technologies can also improve quality of service and reduce costs in the long term.

In Bogota, Colombia, operators lease both buses and batteries. This innovation tackles two big challenges to electric bus adoption –the high initial cost of buying the bus and the risk of poor battery performance are transferred from the operator to the lessor. This addresses the reluctance of operators to bear the risk of transitioning to a new technology. In Bogota, the lessor is the bus or battery manufacturer, who is in a better position to take technology risks ([Li et al 2018](#)).

Bike sharing: Example of a sustainable urban project

Bike sharing is an attractive investment for sustainable cities. It helps address challenges such as congestion, poor air quality, high greenhouse gas emissions, and lack of transport options ([WRI 2019b](#)). WRI Ross Center for Sustainable Cities/Youtube

The fast-growing private vehicle ownership in Bhopal, India was causing an increase in traffic, noise, and air pollution. Bhopal had little cycle ridership, partly because of the lack of infrastructure to support and ensure the safety of cyclists. To make the city more accessible to residents and foster an urban bike culture, Bhopal provided India's first bike-sharing system along with dedicated bicycle lanes. "Chartered Bike" launched in June 2017, attracted more than 25,000 registered users within the first five months ([WRI 2017](#)).

Bhopal convened technology suppliers, operators, financial institutions, and public agencies to develop a public-private partnership. This allowed costs to be shared among the public and private agencies and directed all the revenue generated by the system back to the private agency, thereby ensuring its long-term financial feasibility. The city paid US\$442,500 capital costs for the project, with the remaining costs raised by membership fees (US\$14 per year), advertising, and parking revenues.

Building efficiency: Example of a sustainable urban project



In Brazil, the capital city of Rio de Janeiro has combined a green building certification scheme with tax incentives. Photo by Mariana Gil/[Flickr](#)

Rio de Janeiro set a target of reducing greenhouse gas emissions by 20 percent below 2005 levels by 2020 ([USGBC & C40 Cities Climate Leadership Group 2015](#)). In 2012, the city adopted the Qualiverde Program, a certification program that incentivizes green building projects. New commercial and multifamily residential buildings that implement sustainability measures and achieve Qualiverde certification can receive tax benefits. Qualiverde offers a flexible array of sustainability measures that must add up to 70 points for certification. Projects that receive 100 points are awarded Qualiverde Total certification ([WRI 2016, p.81](#)). Certified projects may be eligible for tax incentives, property tax reductions, or exemptions from certain local building regulations.

Qualiverde certifies water management, energy efficiency, and thermal performance aspects of a project.

Summary

- Sustainable urban finance refers to investments that offer social, environmental, and economic benefits while attracting public funding and leveraging private financing.
- With more than two-thirds of the world becoming urbanized by 2050, ramping up investments in sustainable urban services and infrastructure is crucial to meeting global climate goals.
- Domestic public funding and finance for sustainable urban investment at the national and subnational level has largely been untracked.

- International climate funds such as green bonds can help finance sustainable urban projects that save energy and reduce emissions. However, current investment in sustainable finance is meeting at most 13 percent of demand.
- Cities are finding innovative ways to invest in a range of sustainable urban projects, including but not limited to electrifying public transport, improving active mobility through bike-sharing and safe biking and walking infrastructure, and improving energy efficiency in buildings. However, many investment needs are still pending.

Coming Soon

The next guide in this series will take a deeper look into the barriers cities face to finance sustainable urban development, along with a few of the ways cities are overcoming them.

Quiz Yourself - 1

- They consume more than two thirds of the world's energy and produce 70 percent of the greenhouse gas emissions.
- Cities are centers of innovation.
- Cities generate most of a country's GDP.
- Cities are centers of finance.

Quiz Yourself - 2

- Solid waste management
- Energy efficiency
- Water and waste management
- Transport

Quiz Yourself - 3

- Private sector investments
- National governments
- Green and climate funds
- City taxes

Bibliography

References

California Urban Water Agencies. 2016. *A White Paper: The Potential for Urban Stormwater as a Water Supply*. [https://static1.squarespace.com/static/5a565e93b07869c78112e2e5/t/5a59717f08522942afe99a46/1515811240903/CUWA UrbanStormwater WhitePaper.pdf](https://static1.squarespace.com/static/5a565e93b07869c78112e2e5/t/5a59717f08522942afe99a46/1515811240903/CUWA+UrbanStormwater+WhitePaper.pdf).

CBI (Climate Bonds Initiative). 2018. *Climate bonds taxonomy: A guide to climate aligned assets & projects*. <https://www.climatebonds.net/files/files/CBI-Taxonomy-Sep18.pdf>.

CBI (Climate Bonds Initiative). 2019. *Green Bonds: The state of the market 2018*. <https://www.climatebonds.net/resources/reports/green-bonds-state-market-2018>.

CCFLA (City Climate Finance Leadership Alliance). 2015. *The state of city climate finance 2015*. http://www.citiesclimatefinance.org/wp-content/uploads/2015/12/CCFLA_SoCCF2015_ExecSum_EN.pdf.

Colenbrander, Sarah & Dasgupta, Ani. 2018. [This one chart shows the radical changes needed to achieve sustainable cities](#). Blog.

CityFix. <https://thecityfix.com/blog/one-chart-shows-radical-changes-needed-achieve-sustainable-cities-sarah-colenbrander-ani-dasgupta/>.

CPI (Climate Policy Initiative). 2016. *Green bonds for cities: A strategic guide for city-level policymakers in developing countries*. <https://climatepolicyinitiative.org/publication/green-bonds-guide-city-policymakers-developing-countries/>.

CPI (Climate Policy Initiative). 2018. *Global climate finance: An updated view 2018*. <https://climatepolicyinitiative.org/wp-content/uploads/2018/11/Global-Climate-Finance-An-Updated-View-2018.pdf>.

Elkington, John. 1997. *Cannibals with forks: The triple bottom line of 21st-century business*. Capstone, Oxford, 1997. ISBN 1-900961-27-X.

European Commission. 2018. Sustainable finance: The EU is examining how to integrate sustainability considerations into its financial policy framework in order to mobilise finance for sustainable growth. Website. https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance_en.

GHG (Greenhouse Gas) Protocol. 2014. *Global protocol for community-scale greenhouse gas emission inventories*. https://ghgprotocol.org/sites/default/files/standards/GHGP_GPC_0.pdf.

IEA (International Energy Agency). 2018. *Global EV outlook 2018: 3 million and counting*. <https://www.iea.org/gevo2018/>.

Kim, J. 2016. *Handbook on urban infrastructure finance*. New Cities Foundation. <https://newcities.org/wp-content/uploads/2016/03/PDF-Handbook-on-Urban-Infrastructure-Finance-Julie-Kim.pdf>.

Lefevre, Benoit, Chadhury, Ahmad, Yavrom, Deeba & Srivastava, Aman. 2016. *The trillion dollar question II: Tracking investment needs in transport*. <https://www.wri.org/publication/tracking-investment-needs-in-transport>.

- Li, X., Castellanos, S., & Maassen, A. 2018. Emerging trends and innovations for electric bus adoption—A comparative case study of contracting and financing of 22 cities in the Americas, Asia-Pacific, and Europe. *Research in Transportation Economics*. <https://www.sciencedirect.com/science/article/pii/S0739885917302330?via%3Dihub>.
- McKinsey Energy Insights. 2019. *Global energy perspective 2019: Reference case*. https://www.mckinsey.com/~media/McKinsey/Industries/Oil%20and%20Gas/Our%20Insights/Global%20Energy%20Perspective%202019/McKinsey-Energy-Insights-Global-Energy-Perspective-2019_Reference-Case-Summary.ashx.
- McKinsey Global Institute. 2011. *Urban world: Mapping the economic power of cities*. https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Urbanization/Urban%20world/MGI_urban_world_mapping_economic_power_of_cities_full_report.ashx.
- NACTO (National Association of City Transportation Officials). 2018. *Shared micromobility in the US: 2018*. <https://nacto.org/shared-micromobility-2018/>.
- OECD. (Organisation for Co-operation and Development). 2017. *Technical note on estimates of infrastructure investment needs*. <https://www.oecd.org/env/cc/g20-climate/Technical-note-estimates-of-infrastructure-investment-needs.pdf>.
- OECD. 2018. *Financing climate futures: Rethinking infrastructure*. <http://www.oecd.org/environment/cc/climate-futures/policy-highlights-financing-climate-futures.pdf>.
- SBN (Sustainable Banking Network). 2018. *Creating green bond markets - Insights, innovations, and tools from emerging markets*. International Finance Corporation. <https://www.ifc.org/wps/wcm/connect/55e5e479-b2a8-41a6-9931-93306369b529/SBN+Creating+Green+Bond+Markets+Report+2018.pdf?MOD=AJPERES>.
- UITP. 2018. *World metro figures 2018*. https://www.uitp.org/sites/default/files/cck-focus-papers-files/Statistics%20Brief%20-%20World%20metro%20figures%202018V4_WEB.pdf.
- UN Environment. 2017. *Green tagging: Mobilising bank finance for energy efficiency in real estate*. Report from the Bank Working Group 2017. With Climate Strategy & Partners. http://unepinquiry.org/wp-content/uploads/2017/12/Green_Tagging_Mobilising_Bank_Finance_for_Energy_Efficiency_in_Real_Estate.pdf.
- UN Water. 2018. Water and urbanization. Website. <http://www.unwater.org/water-facts/urbanization/>.
- UNFCCC (United Nations Framework Convention on Climate Change). 2017. *Urban environment related mitigation benefits and co-benefits of policies, practices and actions for enhancing mitigation ambition and options for supporting their implementation: Technical paper by the secretariat*. https://unfccc.int/resource/climateaction2020/media/1308/Urban_Environment_17.pdf.
- United Nations. 2017. *Financing sustainable urban development in least developed countries*. <https://www.un.org/esa/ffd/wp-content/uploads/2016/09/Financing-Sustainable-Urban-Development-in-LDCs.pdf>.
- USGBC (U.S. Green Buildings Council) & C40 Cities Climate Leadership Group. (2015). *Rio de Janeiro. Green Building City Market Brief*. <https://www.usgbc.org/sites/default/files/Rio.pdf>.
- Water Resources Group. 2009. *Charting our water future: Economic frameworks to inform decision-making*. https://www.mckinsey.com/~media/mckinsey/dotcom/client_service/sustainability/pdfs/charting%20our%20water%20future/charting_our_water_future_full_report_ashx.

Wavin. 2017. *The role of urban stormwater management in building a sustainable, climate-resilient city*. White paper. <http://mb.cision.com/Public/16103/2305027/94b768895740cc89.pdf>.

WHO (World Health Organization). 2016. *Mortality and burden of disease from ambient air pollution*. http://www.who.int/gho/phe/outdoor_air_pollution/burden/en/.

World Bank. 2016. *The cost of air pollution: Strengthening the economic case for action*. <http://documents.worldbank.org/curated/en/781521473177013155/pdf/108141-REVISED-Cost-of-PollutionWebCORRECTEDfile.pdf>.

World Bank Group. 2018. *What a waste 2.0: A global snapshot of solid waste management to 2050*. <https://openknowledge.worldbank.org/handle/10986/30317>.

WRI (World Resources Institute). 2016. *Accelerating building efficiency: Eight actions for urban leaders*. https://wrirosscities.org/sites/default/files/16_REP_Accelerating_Building_Efficiency.pdf.

WRI (World Resources Institute). 2017. Bhopal introduces India's first fully automated bicycle sharing system with dedicated lanes. Website. <https://www.wri.org/our-work/top-outcome/bhopal-introduces-indias-first-fully-automated-bicycle-sharing-system>.

WRI (World Resources Institute). 2019a. *How to enable electric bus adoption in cities worldwide: A guiding report for city transit agencies and bus operating entities*. <http://wrirosscities.org/sites/default/files/how-to-enable-electric-bus-adoption-cities-worldwide.pdf>.

WRI (World Resources Institute). 2019b. *The evolution of bike sharing: 10 questions on the emergence of new technologies, opportunities, and risks*. Working Paper. Washington, DC: World Resources Institute. <http://www.wri.org/publication/evolution-bike-sharing>.

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