

Working Paper

Financing the Urban Transition for Sustainable Development: Better Finance for Better Cities

Nick Godfrey and Xiao Zhao¹

Coalition for Urban Transitions: A New Climate Economy Special Initiative²

CONTENTS	Page
1. INTRODUCTION	1
2. LANDSCAPE FOR SUSTAINABLE URBAN INFRASTRUCTURE FINANCING	4
Demand for urban sustainable infrastructure investment	4
Supply of urban sustainable infrastructure investment	5
3. MARKET AND NON-MARKET BARRIERS TO FINANCING SUSTAINABLE INFRASTRUCTURE IN URBAN AREAS	8
Market failures	8
Institutional failures	9
Wider price distortions	10
4. FINANCING FOR URBAN INFRASTRUCTURE	12
Leveraging existing assets at the city level: land-based financing and user charges	12
Developing a city’s creditworthiness and bond financing	14
5. RECOMMENDATIONS	23
ENDNOTES	25

1. Introduction

The world is experiencing rapid urbanisation. Urban areas now accommodate over half of the global population,³ but generate approximately 82% of global GDP.⁴ Over the next 15 years, the urban population will increase by over 1 billion, reaching 60% of the total global population.⁵ The share of global economic output attributable to cities is expected to reach 88% well before 2030⁶ and the 750 largest cities are likely to account for up to 60% of global GDP growth between 2012 and 2030.⁷ This means that cities are at the centre of economic activity, affecting how economies grow, how resources are allocated, and how innovation takes place. At the same time, cities and urban infrastructure are also key energy consumers and emitters of greenhouse gases (GHG) cities and urban infrastructure are also key drivers of energy consumption and greenhouse gas (GHG) emissions. Around 70% of global energy consumption and over 70% of GHG emissions are associated with urban areas.⁸

The expected future growth in population, economic output, energy consumption and carbon emissions will be predominantly in emerging and developing countries, led by urban areas in China, India, south east Asia and sub-Saharan Africa. Asia and Africa now account for 90% of the world’s rural population, but by 2050 around 6 in 10 people in Asia (64%) and Africa (56%) will live in cities.⁹ Most advanced economies and some emerging countries in Latin America are already highly urbanised: their contributions to urban growth are expected to be relatively modest.

Cities are all about efficiency. It’s why they are there in the first place: to allow the effects of agglomeration, enable efficient access to goods and services, and encourage the spread of ideas. However, in many countries, new and expanding cities are based on a sprawling, car-dependent, resource-intensive model of urban development. This is not only an extremely inefficient model of urban development, but it is also highly carbon intensive.



Photo credit: Visty Banaji

About this working paper

This New Climate Economy Working Paper was written as a supporting document for the 2016 report of the Global Commission on the Economy and Climate, *The Sustainable Infrastructure Imperative: Financing for Better Growth and Development*.

Citation

Godfrey, N and Zhao, X, 2016. *Financing the Urban Transition for Sustainable Development: Better Finance for Better Cities*, Contributing paper for *The Sustainable Infrastructure Imperative: Financing for Better Growth and Development*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/misc/working-papers/>.

New Climate Economy
c/o World Resources Institute
10 G St NE
Suite 800
Washington, DC 20002, USA
+1 (202) 729-7600

New Climate Economy
c/o Overseas Development Institute
203 Blackfriars Road
London, SE1 8NJ, UK
+44 (0) 20 7922 0300

www.newclimateeconomy.report
www.newclimateeconomy.net



This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivative Works 3.0 License. To view a copy of the license, visit <https://creativecommons.org/licenses/by/3.0/us>.

However, an alternative model of urban growth is possible. The New Climate Economy (NCE) has demonstrated that compact, connected urban growth can create cities that are economically dynamic and healthy. Research by NCE has found that compact, connected, and coordinated cities are more productive, socially inclusive, resilient, cleaner, quieter, and safer. They also have lower GHG emissions, a win-win for the economy and the climate. Getting the scale and type of infrastructure right will be fundamental to encouraging this global urban transformation, to underpin future economic prosperity and poverty reduction, and secure a safe climate.

Adequate and high-quality urban infrastructure is essential to provide basic services for all urban dwellers, and is critical to enhancing the economic performance and competitiveness of national and urban economies. The rapidly increasing concentration of people and economic activities in urban areas creates significant demand for infrastructure, particularly in large and fast-developing cities in emerging and developing countries. Evidence suggests that an additional 1% of GDP earmarked for infrastructure investment can have a multiplier effect of 1.0–2.5 on the original investment, and this multiplier effect is likely to be more substantial in developing and emerging economies.¹⁰

The Global Commission on the Economy and Climate estimates that around US\$90 trillion will need to be invested in infrastructure globally by 2030:¹¹ around three-quarters of this will be related to urban areas.¹² This can be invested in a development pathway that is either high or low resource-intensive. Given the rapidity of urbanisation and the long-lived nature of urban infrastructure, the decisions relating to urban infrastructure that are made today by national and city decision-makers – in partnership with private investors – will determine our economic future and climate security for the second half of the century. Recent research shows that the urban infrastructure investment decisions taken just over the next five years will determine up to a third of the remaining global carbon budget.¹³ Atlanta and Barcelona, for example, each accommodate just over 5 million people and are similarly prosperous, but the latter generates around a tenth of the carbon emissions from the transport sector due to different decisions related to urban form and investments in connecting transport infrastructure.

In addition to enhancing economic performance and reducing GHG emissions and related pollutants, investment in better urban infrastructure in cities will also be fundamental to reducing poverty and strengthening resilience to climate change and extreme events. With growing numbers of poor people now concentrated in urban and peri-urban areas, providing affordable transport, access to electricity and clean water, and other basic services will be critical to building better livelihoods. Basic sanitation and sewerage build climate resilience because, when floods occur, a lack of adequate sanitation and sewerage is closely linked to disease outbreaks. Finally, improved flood management and drainage systems build resilience for all, but disproportionately benefit the most vulnerable populations who typically live in the most vulnerable locations such as on flood plains.

In short: the investment decisions – especially in critical urban infrastructure – taken today will shape tomorrow.

Despite the critical importance of infrastructure for urban development, financing to scale up smarter, more sustainable urban infrastructure remains an immense challenge, particularly in emerging and developing economies. The main impediment is a lack of investable projects due to a series of market and non-market failures that interact in complex ways and particularly impact urban infrastructure investment. These include market failures related to externalities, vested interests, imperfect information and related technology risks, the public good elements of many urban infrastructure projects, and governance failures related to capacity constraints and regulatory uncertainty. Moreover, financing for smarter, more sustainable urban infrastructure in the transport, buildings, energy, waste, and water sectors is even more challenging given its long-term nature, large upfront investment requirements and high risks.

These market and governance failures, such as lack of capacities and creditworthiness, are compounded by wider price and non-price incentives at the national and city levels which tend to discourage investment in smarter, more sustainable urban infrastructure.

This paper provides an overview of financing challenges and opportunities for urban infrastructure to support *The Sustainable Infrastructure Imperative: Financing for Better Growth and Development*, the 2016 flagship report of the Global Commission on the Economy and Climate. The full 2016 report makes the case for financing sustainable infrastructure as a means to spurring better growth that is in line with global development and climate goals.¹⁴ It sets out the landscape of urban infrastructure financing, identifies key barriers to delivering smarter, more sustainable urban infrastructure in cities, suggests policy levers and instruments that have been deployed successfully in various countries and cities, and concludes with some recommendations for decision-makers.

Box 1

Key definitions

Urban infrastructure is defined for the purposes of this paper as infrastructure that falls within the physical boundaries of an urban area or is designed to meet the needs of city dwellers and industry, including access to water, electricity, and heat, transport, and disposal of waste (including the contributions proportionally).

Sustainable infrastructure is defined for the purposes of this paper as infrastructure that is economically, socially, and environmentally sustainable:

- *Economically sustainable infrastructure* provides jobs and boosts GDP.
- *Socially sustainable infrastructure* is inclusive and designed to meet the needs of the poor by increasing access to economic opportunities and supporting poverty reduction.
- *Environmentally sustainable infrastructure* contributes to the transition to a low-carbon economy, improves resilience to climate risks, and addresses local environmental challenges, including unsustainable use of critical natural resources.

Sustainable urban infrastructure is defined as urban infrastructure that is economically, socially and environmentally sustainable, typically characterised by infrastructure that encourages more compact, connected, coordinated urban development, is consistent with a 2°C pathway or below, and is resilient to the risks of climate change. This includes transport systems, urban utilities, buildings, and basic infrastructure that are more connected, resource-efficient, low-carbon, and climate-resilient.

Source: CCFLA, 2015; Bhattacharya, 2016; NCE, 2014; LSE Cities, 2014; WWF and Z/Yen Group, 2015.¹⁵

2. Landscape for sustainable urban infrastructure financing

Robust estimates of global infrastructure demand and supply using consistent methodological approaches are limited. Even fewer estimates exist relating to urban infrastructure demand and supply or geographically specific investment, which is critical given that infrastructure investment needs vary across different cities, countries, and regions. More advanced economies need to upgrade and replace ageing and increasingly outdated infrastructure. Emerging and developing countries, where the majority of the anticipated urban growth will take place, need to build new infrastructure to meet the demands of growing urban populations, the rising middle class and expanding economic activities. China, for example, will need to invest close to 3% of GDP in urban infrastructure alone over the next 15 years.¹⁶

However, under business-as-usual trends, the estimates that do exist all have something in common: they agree that there is a significant gap between the demand for and the supply of global urban infrastructure investment, particularly in emerging and developing countries.

DEMAND FOR URBAN SUSTAINABLE INFRASTRUCTURE INVESTMENT

Massive infrastructure investment will be needed in cities over the next 15 years. Of the US\$90 trillion of infrastructure investment that NCE estimates is required globally by 2030 – US\$6 trillion per annum on average – roughly US\$4.1–4.3 trillion per annum will need to be invested in urban areas.¹⁷ A recent report by the Paulson Institute and Energy Foundation estimates that China alone will require approximately US\$1 trillion over the next five years for low-carbon buildings, sustainable transport, and clean energy in urban areas.¹⁸

The investment needed for sustainable urban infrastructure is even larger, although the pay-offs are significant. A variety of estimates have been developed in recent years. Work by the Cities Climate Finance Leadership Alliance (CCFLA), for example, makes a range of adjustments to work by NCE from 2014 and 2015, and estimates that the additional investment needed to make urban infrastructure sustainable is in the range of US\$0.4–1 trillion annually, excluding investments related to climate resilience.¹⁹ Similarly, WWF/Z Yen has estimated the incremental costs for global sustainable infrastructure investment to be US\$0.7–1 trillion per annum. Assuming around 70–75% of the sustainable infrastructure is relevant to urban areas,²⁰ the

additional investment needed to make global urban infrastructure sustainable is likely to be in the region of US\$0.5–0.8 trillion per year based on this estimate.²¹

The range of these estimates is relatively wide due to different assumptions around the scope of investments considered, the impacts of technology on capital costs, the scale of avoided investment costs, and the ambition of measures to reduce the environmental impact of infrastructure. For example, the middle and upper end of the CCFLA estimates - which are adjusted based on work from NCE in 2014 and 2015 - are likely to be on the high side because they do not account for avoided costs which could be significant in the urban context. For example, investment saved from vehicles not purchased due to sustainable transport investments are not accounted for. Nor do they factor in capital expenditure savings from more compact, connected urban growth.²² NCE estimates, for example, that the savings related to more compact and connected urban development could amount to US\$3 trillion from 2015 to 2030, offsetting about 0.2 trillion of costs annually.²³ Further, the upper end of these estimates are based on assumptions of highly ambitious low-carbon reduction measures versus Business-as-Usual, especially in the buildings sector, without taking into account potential cost savings related to advances in technology over time. If assets are used more productively or infrastructure productivity improves significantly over time, investment requirements could be dramatically reduced. Evidence suggests that following the right approaches to improve infrastructure productivity could reduce financing requirements by up to 40%.²⁴ These different assumptions are well recognised in the underlying analysis, which leads to a range of estimates reflecting the range of future uncertainties.²⁵

Irrespective of the uncertainties related to incremental investment needs, these estimates need to be considered alongside the wider incremental benefits unlocked by sustainable urban infrastructure investment versus business as usual. NCE work in 2015 showed that even assuming relatively high-end incremental investment costs, investing in sustainable urban infrastructure, including public transport, efficiencies in buildings and better waste management, can reduce emissions and be a global economic opportunity worth approximately US\$17 trillion globally by 2050 (in net present value terms), based on energy savings alone, within relatively manageable investment payback periods.²⁶ Similarly, work by McKinsey demonstrates that, while new green districts in urban areas would incur an 8–10% increase in construction costs, this can be paid back in three to five years due to lower operating costs.²⁷

It is also important to recognise that many of the estimates do not take into account the additional investment required to adapt urban infrastructure to climate risks. With often large clusters of people living in marginal areas, cities - their population and assets - are highly vulnerable to the effects of climate change, particularly extreme weather events and rising sea levels. Of the world's large cities, 75% lie on a coastline and are thus exposed to sea-level rise and storm surges.²⁸ According to the World Bank, the capital costs required for urban infrastructure adaptation could be in the range of US\$11–20 billion per year for 2010–2050.²⁹ This is a conservative estimate when compared with estimates by the United Nations Environment Programme (UNEP), which suggest that the costs of urban adaptation could be up to US\$120 billion per year by 2025 to 2030.³⁰

Despite the wide range of estimates and uncertainty related to investment demand for sustainable urban infrastructure, what is clear is that there is a significant gap between the demand for and the supply of investment in this area, particularly in emerging and developing countries. Based on a business-as-usual scenario, the global urban infrastructure deficit in these countries - in terms of the gap between supply and demand - is estimated by the International Institute for Environment and Development (IIED) to be approximately US\$6.3 trillion cumulatively or about 400 billion per annum over the next 15 years.³¹ This is a conservative estimate when benchmarked against others which suggest this could be as high as 1.2-1.5 trillion per annum to 2030.³² Following the current pattern of urbanisation, some estimates suggest that China will have an urban infrastructure investment gap of US\$1.6–3.5 trillion cumulatively by 2030.³³ Similarly in India, the gap in urban infrastructure investment for basic services alone was conservatively estimated by the High Powered Committee on Urban Infrastructure at US\$827 billion cumulatively by 2030.³⁴ The short-term investment gap for sustainable urban infrastructure is likely to be even larger given the higher upfront costs associated with some categories of investment, tempered by the potential medium- to longer-term savings outlined elsewhere in this paper.

SUPPLY OF URBAN SUSTAINABLE INFRASTRUCTURE INVESTMENT

Meeting this massive urban infrastructure investment demand is a significant challenge for the public sector, including national governments, sub-national and municipal governments, local development banks, and international development finance institutions, given past trends of spending on infrastructure.

Direct budgetary contributions from national government - the major component of public finance - remains a key source of urban infrastructure finance, contributing to around 40% of infrastructure investment in developed countries and 60–65%

in emerging and developing countries.³⁵ However, large infrastructure investments, especially relating to urban transport systems such as bus rapid transit (BRT), light rail, metro systems, often require capital investments far exceeding the financial capacity of national governments on their own. Moreover, sustainability planning is rarely integrated into core financing decisions at the national and local levels, although there is an emerging trend to emphasise low-emission and climate-resilient infrastructure investments in some countries, with the provision of relevant technical assistance through international development finance institutions.

National and sub-national governments, and development banks: Many national and sub-national governments in advanced economies are reducing their spending on infrastructure, given their serious budgetary deficits and significant debt levels, and the competition for resources with many other social-economic policy priorities such as healthcare and education. For example, public infrastructure investment in Europe has dropped from approximately 5% of GDP in the 1970s to 2.5% of GDP in the 2000s, and austerity measures since 2008 have put further pressure on infrastructure spending in the Eurozone.³⁶ Similarly, in the United States, government expenditure on infrastructure has fallen to just 1.7% of GDP.³⁷ However, in emerging economies the allocation of public expenditure on infrastructure is much higher, around 6–7% of GDP currently.³⁸ It is also rising in low-income countries, where public expenditure on infrastructure has increased from around 4% of GDP in the mid-2000s to approximately 8% in 2012.³⁹ A large portion of this spending is on urban infrastructure. China, for example, invested 8.5% of its GDP in infrastructure in 2008–2012 (including investments in infrastructure outside its borders),⁴⁰ one-third to half of these investments being directed at its domestic urban centres.⁴¹ Development banks are also a particularly important source of capital. In BASIC countries⁴² domestic development banks provided well over US\$160 billion of loans for infrastructure projects in 2014.⁴³

Municipal budgets: Traditionally, cities rely on state/provincial or national governments or government-owned development banks and financial institutions for infrastructure financing. However, in some regions and countries, the responsibility for raising capital for urban infrastructure is shifting more towards municipal governments without the corresponding fiscal capacity to collect taxes or the ability to access debt or equity markets.⁴⁴ As a result, cities are often unable to raise funds by themselves to finance infrastructure. It is even more challenging for municipal governments to plan, finance, manage, and coordinate sustainable urban infrastructure projects given their often limited capacities.

International development assistance: Another source of public finance – multilateral, regional, and bilateral development institutions – also plays a significant role in financing infrastructure, together with technical assistance and other grant-funded support. The seven major multilateral development banks⁴⁵ (MDBs) and the International Monetary Fund (IMF) provide over US\$130 billion of infrastructure financing annually.⁴⁶ Some institutions have also been dedicating funds for urban climate finance, which is mainly channelled to low-emission and climate-resilient infrastructure projects in urban areas. The CCFLA carried out a survey of recent low-emission and climate-resilient infrastructure investments by eight development finance institutions. The eight institutions accounted for US\$54 billion in climate finance, representing 27% of their total financial commitments.⁴⁷ Of the US\$54 billion, US\$16.4 billion was directed at urban climate finance, accounting for approximately 30% of total climate finance.⁴⁸ This type of assistance can be particularly important for leveraging additional financing for urban infrastructure, particularly from private sector actors, as it can enhance the credibility of the infrastructure project, and technical assistance can help to strengthen and develop the capacity to execute of both local governments and the private sector. However, a key challenge here is that many international financing facilities are only directed at national-level governments, but are not accessible at the city level.

Private finance: Since public sector infrastructure expenditure is unlikely to be able to meet the urban infrastructure investment demand, using public financing to crowd in private finance or to create the enabling conditions for pure private finance, is critical. Corporate finance is the dominant source of private sector infrastructure investment, while project finance is less important due to the nature of long-term financing requirements for infrastructure assets.⁴⁹ Although there is an upward trend in private sector involvement in financing for infrastructure in certain regions of the world, most of the available global pool of private capital remains untapped. Infrastructure investment, for example, currently only accounts for a tiny portion of the asset allocation of institutional investors.⁵⁰ Despite the potential matching of asset and liability profiles between pension benefits and returns from infrastructure assets, pension funds, for example, typically only allocate 1% of their portfolio towards infrastructure investment on average. Of this 1%, only 3% is directed specifically to sustainable infrastructure.⁵¹ Looking at project finance, private participation in infrastructure (PPI) has been around US\$125 billion per annum on average over the past five years.⁵² Some estimates suggest that private sector investment has the potential to fill around half of the US\$3 trillion global infrastructure financing gap,⁵³ particularly in urban areas.

Table 1
Supply of sustainable urban infrastructure finance: drivers and trends

	Sources	Challenges, drivers and trends
Public sector	National governments and development banks	Serious budgetary deficits, significant debt levels, and reduced spending on infrastructure in advanced economies, but rising investment in emerging and developing economies Limited capacity and expertise related to sustainable urban infrastructure and land use planning Lack of clear policies or defined standards for sustainable infrastructure projects Limited policy alignment across national to local level. Where policy alignment and standards for environmental sustainability are not in place, this constrains viable funding models to ensure recovery of capital costs
	Municipal budgets	Constrained by limited institutional capacity to raise funds to finance infrastructure, including limited fiscal capacity to collect taxes and limited access to debt or equity markets
	Local, public access to capital markets and debt financing: <ul style="list-style-type: none"> • Municipal green bond markets • Investment platforms 	Intra-governmental partnerships to tackle challenges of creditworthiness Limited local public finance, sometimes combined with national or external public resources, to catalyse private investment (e.g. via investment platforms)
	International development finance, including official development assistance (ODA)	Demonstrated potential for provision of both financial and technical assistance in sustainable urban infrastructure Rising share of sustainable urban infrastructure in development portfolios, but still relatively modest. Growing engagement and awareness of development cooperation providers but capacity and expertise lacking within these institutions to constrain relevant investments and activities
Private sector	Private finance <ul style="list-style-type: none"> • Commercial banking and local capital markets loans • Green infrastructure bonds • Securitisation or equities • Public-private partnerships • Privatisation 	Limited participation from private sector investment in sustainable urban infrastructure but potential exists Participation constrained by limited expertise and experience with municipal infrastructure and unfamiliarity with local policies and business environments, which in turn requires extra due diligence and raises transaction costs (Mis)alignment of policy incentives for private engagement – for instance, taxation or pricing of resource use, land or assets that do not value energy or resource efficiency ranging from energy efficiency in buildings or watershed protection Absence of responsible investment codes or mandatory obligations to disclose the climate performance of infrastructure projects Difficulty to predict and guarantee revenue streams (e.g. public transport, regulated water markets)

3. Market and non-market barriers to financing sustainable infrastructure in urban areas

Urban infrastructure projects have a range of inherent characteristics, based on their long-term nature and high upfront capital requirements, which typically constrain investment, particularly from the private sector. Both these characteristics significantly increase the risks to potential investors, particularly due to limited liquidity of infrastructure assets and long pay-off periods, despite low recurrent expenditure. This prevents the *scaling up* of capital into urban infrastructure from other asset classes such as social infrastructure. Certain classes of sustainable urban infrastructure projects can have even longer timelines and require even larger amounts of capital in the initial stages. This hinders the *shift of capital* into sustainable urban infrastructure. However, the opposite can also be true; for example, certain high-carbon asset classes have higher capex requirements than low-carbon asset classes, and certain low-carbon asset classes have lower capex costs than other low-carbon asset classes. For example, in terms of cost per kilometre, a dual-lane highway is much more expensive than a bus lane or BRT system, and BRT can carry a similar number of passengers to a metro system, at less than 15% of the cost.

Table 2
Capacity and infrastructure costs of different transport systems

Transport infrastructure	Capacity Pers/hour/direction	Capital costs US\$/km	Capital costs/ Capacity
Dual-lane highway	2,000	10–20 million	5,000–10,000
Urban street (car use only)	800	2–5 million	2,500–7,000
Bike path (2m)	3,500	100,000	30
Pedestrian walkway / pavement (2m)	4,500	100,000	20
Commuter rail	20,000–40,000	40–80 million	2,000
Metro rail	20,000–70,000	40–350 million	2,000–5,000
Light rail	10,000–30,000	10–25 million	800–1,000
Bus rapid transit (BRT)	5,000–40,000	1–10 million	200–250
Bus lane	10,000	1–5 million	300–500

Source: LSE Cities, 2014.⁵⁴

What is true is that most urban infrastructure investments suffer from a range of market and institutional failures that impede the capacity of countries and cities to mobilise adequate financing for urban infrastructure compared with other assets classes. This contributes to a lack of bankable projects likely to deliver appropriate risk-adjusted returns.

MARKET FAILURES

Urban infrastructure projects are potentially profitable in the long term and have significant benefits to the economy as a whole. However, they are subject to a range of market failures, which create a significant undersupply of capital and provide a rationale for government intervention. These include:

- **Externalities:** Infrastructure, particularly sustainable infrastructure, has significant positive externalities for the whole economy, including positive impacts on growth and equality, which cannot be wholly appropriated and taken into account by private sector investors, thus reducing their risk–reward profile. Better public transport infrastructure has a positive impact on a city’s competitiveness and attractiveness while reducing congestion, air pollution, and carbon emissions.⁵⁵ Evidence suggests that spending an additional 1% of GDP on infrastructure has a multiplier effect of between 1.0 and 2.5 in G20 countries and much greater effects in developing economies. Other evidence suggests that a standard deviation improvement in the quantity and quality of a country’s infrastructure has the potential to reduce a country’s inequality.⁵⁶ On the other hand, the range of negative externalities associated with unsustainable urban infrastructure are rarely accounted for in their costs, encouraging oversupply.
- **Natural monopoly:** Due to the scale and complexity of some urban infrastructure, it is often less efficient or cost-effective to involve multiple actors. This can lead to abuse of monopoly power and entrenched vested interests, and limited competition. In the absence of effective regulatory frameworks, this can lead to chronic underinvestment. Public transport is a sector often subject to monopoly service provision, and effective regulatory reform can help to improve the flow of investment. For example, a series of reforms in the 1980s to London’s bus network led to service improvements, increased investment, and a reduction of over 50% in cost per kilometre by 2000.
- **Imperfect information (including limited knowledge on clean technologies):** There is often a lack of data on the financial and risk performance of long-term infrastructure projects making the investment evaluation process problematic and deterring potential investments. It is even more difficult to evaluate the economic, social, and environmental costs and benefits of sustainable urban infrastructure. The absence of long-term urban planning and uncertainty related to future regulatory policies can further complicate this issue, particularly for sustainable urban infrastructure that is subject to a range of energy or climate policies. Moreover, there is often limited knowledge on available clean technologies and their potential advancement, particularly in developing countries. As a result, it is often difficult to incorporate potential technological efficiencies in financial and economic analysis.
- **Public goods:**⁵⁷ Urban infrastructure often provides basic services to urban dwellers, such as transport, water, and electricity supply. Those who benefit from the infrastructure may have a limited ability to pay for infrastructure, and it can often be challenging to charge users enough to allow for full cost recovery because users are unwilling or unable to pay for the utility, particularly in developing countries. In some sub-Saharan countries, for example, up to 70% of water is unmetered or stolen, generating no revenue at all.⁵⁸

INSTITUTIONAL FAILURES

Most of the above market failures interact with a range of governance or institutional failures to compound the underinvestment picture.

Lack of capacities and expertise: Local governments, particularly in developing countries, often lack capacities and expertise related to urban infrastructure planning and financing. They often fail to set out long-term urban development plans, develop and communicate clear pipelines, secure funding commitments and sufficient guarantees, or manage infrastructure projects effectively. These limitations hinder the process of raising revenues for urban infrastructure projects from both private investors and public sector sources. Even if local governments successfully attract investment from the private sector, the deals may not be structured in the most appropriate way, combining both the best value for the city and acceptable risks for investors. This is largely due to the lack of skills in investment facilitation and capacities to develop and negotiate effective contracts, particularly at the local level in developing countries. Moreover, there is even more limited expertise and experience in planning, designing, and incorporating sustainability consideration into urban infrastructure projects, placing a premium on some level of standardisation where possible. Lack of synergy between local and national legislation on sustainable infrastructure and limited autonomy of local governments further complicate the problem.

Meanwhile, private investors often do not have expertise in or experience of financing or lending at the municipal level either. They are typically not familiar with local policies and business environments, especially where related to sustainable urban infrastructure. This means higher risks, thus requiring them to perform extra diligence, to expect higher returns, or to explore the use of aggregate investment platforms which can overcome some of the transaction costs. Moreover, the lack of responsible investment codes or mandatory obligations to disclose the climate performance of infrastructure projects can make it even more unlikely for private investors to consider sustainable urban infrastructure projects.

Lack of regulatory consistency and certainty: Besides limited capacities, there is often significant uncertainty when investing in cities. This can relate to the lack of consistent standards for infrastructure projects, the lack of viable funding models to pay back upfront capital costs, the lack of transparency in municipal operations, and the lack of clear investment regulations and policies.

Local governments often fail to provide consistent standards for investment procurement processes related to infrastructure projects. It is common for each individual project to have its own tailored bidding process and transactions. Such fragmented approaches potentially discourage investment as it is more time- and resource-consuming for investors to assess projects. Moreover, local governments often do not have consistent sustainability standards, such as energy efficiency standards for buildings or climate resilience standards for other types of critical infrastructure.

A lack of transparency in expenditure or project management in local governments can increase the risks of investment significantly, and thus potentially deter direct investment as well as the development of creditworthiness. Investors can then feel uncertain working with local governments, particularly a cash-strapped government, as it is difficult for them to monitor cash flow and project progress, thus creating uncertainty related to the expropriation and full recovery of their initial investment. The limited availability of useful and reliable information published by municipal governments makes it difficult to value a city's creditworthiness, impeding access to credit markets for borrowing to finance infrastructure.

Unstable regulations and policies on investment and taxes may also deter investments. For example, uncertain tax policies, particularly in emerging economies and developing countries, related to emission taxes, energy efficiency incentives, and fossil fuel subsidies, are often short term, and unpredictable in the longer term, significantly impacting the economics of a project.

WIDER PRICE DISTORTIONS

Compounding these direct market and non-market barriers to investment in urban infrastructure are often a range of economy-wide price distortions. These not only lead to significant losses in the available fiscal budget for infrastructure but also encourage aggregate investment flows away from sustainable urban infrastructure investment, especially in the transport sector. Fossil fuel subsidies, property and other taxes, and other price distortions often incentivise inefficient, high-carbon land use and infrastructure, for example by promoting urban sprawl and artificially reducing the cost of using private vehicles. This hinders the transition towards more efficient and sustainable urban infrastructure. More specifically, subsidies discourage the deployment of modern, energy-efficient technologies in the transport sector. In the Middle East, for example, the average passenger car uses 60% more fuel per kilometre than the average car in the Organisation for Economic Co-operation and Development (OECD) does, due to high subsidies for petroleum.⁵⁹ Similarly, in Germany, the commuter tax allowance scheme is estimated to cost €6 billion per year while incentivising commuters to travel longer distances.⁶⁰ The subsidies to company cars in OECD countries are even higher – estimated at between €19 billion and €34 billion.⁶¹ Evidence suggests that fuel prices which more directly reflect their wider net costs could lead to more compact urban development. For example, a recent study from the United States suggests that a 10% increase in fuel prices can lead to a 10% decrease in housing and infrastructure built on the urban periphery.⁶²

More sprawling, disconnected urban development increases urban infrastructure investment requirements as infrastructure and public service provision need to be extended into peripheral areas, leading to a significant reduction in available resources for core infrastructure, basic services, and public transport. A study for NCE estimated that in the United States, urban sprawl costs the US economy over US\$1 trillion per annum, greater than 5% of GDP in 2014.⁶³ This includes over US\$100 billion in public costs relating to increased infrastructure and service delivery, and over US\$600 billion in private costs relating to private vehicle use, with the remaining US\$300 billion related to the costs of air pollution, congestion, and traffic accidents.⁶⁴ If the United States followed an alternative growth pattern without urban sprawl, the savings could cover the country's entire funding gap in infrastructure investment.

Table 3

Barriers and solutions to investing in sustainable urban infrastructure projects

Barriers		Solutions
Risk–return imbalance	Market failures: unaccounted externalities which cannot be monetised; presence of disincentives and unfavourable subsidies	Fossil fuel subsidy reform or elimination Explicit price on carbon and other negative externalities, e.g. congestion or road charging Land-based financing models and user fees Well-designed funding models and/or public–private agreements that share risk and rewards between public and private sectors and achieve cash flow characteristics of investors, e.g. stable, long-term cash flows linked to inflation
High costs of due diligence	High upfront capital required and perceived risks, as compared with modest returns	Publication of city infrastructure pipelines to give investors' confidence Standardisation of financing approaches and business models Using tried-and-tested technical solutions Building a city's creditworthiness
Natural monopoly	Vested interests which perpetuate underinvestment in urban infrastructure	Regulatory oversight and reform of relevant sectors
Lack of information and data on the performance and key technologies related to sustainable urban infrastructure	Limited knowledge on available clean technologies to incorporate in risk analysis Lack of data on the financial and risk performance of sustainable infrastructure projects	Improve flow of information on performance and key technologies to investors Consider solutions that are low-carbon, but not dependent on new technology, such as trolley buses, instead of battery-powered buses
Public goods characteristics of sustainable urban infrastructure	Free riding with consumers unable or unwilling to pay for urban infrastructure services, and thus uncertainty around revenue streams e.g. renewable energy to urban residents	Explore innovative charging models or technology-based schemes that allocate the user charges
Lack of capacities and expertise in public and private sectors	Local governments have limited capacities and expertise related to urban infrastructure planning and financing Inability to prepare projects for investment Absence of national urban strategies or development plans Lack of expertise, experience or trust in financing or lending at the municipal level, leading to high development and transaction costs	Explore the set-up of urban infrastructure investment platforms to help overcome transaction costs for private investors Development of long-term urban infrastructure development and revenue management plans Development of clear and consistent investment regulations and policies Improved transparency in municipal operations Increase and rationalise donor funding for project preparation support
Potential misalignment with climate risks and the transition to a low-carbon economy	Lack of a responsible investment guideline or code, including on how to incorporate climate risk analysis into project appraisal Limited carbon disclosure of infrastructure projects	Development of responsible investment codes Mandatory obligations to disclose environmental and climate performance of infrastructure projects
Competition for capital with other asset classes	Competition with social-economic policy priorities such as housing or dealing with crime	Look for synergies between sustainable urban infrastructure investment and the objectives associated with social infrastructure

Source: NCE – Developed by authors with input from a range of experts

4. Financing for urban infrastructure

There is a need to overcome this potent mixture of challenges related to the inherent characteristics of sustainable urban infrastructure investment, fiscal constraints in the public sector, market and non-market failures, and wider price distortions. This section outlines some of the actions that national and sub-national governments can take to address the chronic shortage of capital for sustainable urban infrastructure investment. These fall into six categories:

1. Boost local resources and the ability of cities to access capital for investment
 - Leveraging existing assets at the city level: land-based financing and user charges
 - Developing a city's creditworthiness and bond financing
2. Coordinating public and private finance
 - Public–private partnerships
 - Investment platforms and redirecting existing financial flows
3. Leveraging international financing
4. Strengthening institutional capacity for investment planning at national and sub-national levels
5. Reforming wider price distortions
6. Strengthening investment in clean technology development and deployment

1. BOOST LOCAL RESOURCES AND THE ABILITY OF CITIES TO ACCESS CAPITAL FOR INVESTMENT

Leveraging existing assets at the city level: land-based financing and user charges

Cities can leverage the value of their existing assets, mainly land and property, to generate revenues for smarter, more sustainable infrastructure investment, and to address market distortions. Land-based financing is a particularly effective mechanism for raising large amounts of capital upfront.

Land sales and leaseholds: The sales and leaseholds of government-owned land are particularly helpful to generate upfront capital. In countries that do not have an effective land valuation system, land sales are mostly auction-based. For example, Cairo raised US\$3.12 billion through the auction of 3,100 hectares of desert land for a new town in 2007. The amount generated from this land-sales auction was about 117 times greater than Egypt's total property tax, and approximately one-tenth of Egypt's annual national revenue. In Cairo, these funds are being used to reimburse the costs of infrastructure and to improve road connectivity in the metropolitan area. Similarly, an auction of 13 hectares of land in the new financial centre in Mumbai in 2006 generated US\$1.2 billion, more than 10 times the total fiscal spending of the Mumbai Metropolitan Regional Development Authority in the previous year.⁶⁵ These funds are used primarily to finance metropolitan regional transportation projects.

While potentially a useful mechanism to raise upfront resources for smarter urban infrastructure, land sales only provide a one-off source of revenue. Land sales also require a coherent legal framework, strong institutions, and enforceable property rights to ensure they are effective as a financing instrument. Moreover, once the land is sold, it can be challenging to incentivise sustainable infrastructure development and incorporate its development into integrated city planning.

Leasehold is an alternative way for cities to leverage the value of land or existing infrastructure assets to generate initial capital. The primary principle of leaseholds is to leverage land for new infrastructure assets that are systematically tied to a city's land use plan, but with conditions attached to avoid inefficient allocations, particularly the creation of new or underused new cities. This has been used extensively in China. This approach also makes it possible to specify sustainability targets (such as energy efficiency targets) in the rental agreement, although monitoring progress can be difficult.

Property taxes and similar levies: Unlike the one-time income generated through land sales or leaseholds, property taxes and similar levies can generate long-term revenues for infrastructure's maintenance and expansion. Property or land taxes can be designed to encourage investment in sustainable infrastructure, such as those discouraging urban sprawl.

In most OECD countries, property taxes are local governments' main source of revenue, although in most North American cities (such as Toronto and New York City), the property tax rates favour residential single family homes over multi-residential

properties, providing disincentives to good urban density. In emerging economies and developing countries, property taxes only contribute a small percentage of local revenue in Tier II and Tier III cities. However, many municipal governments have started to prioritise the collection of their own-source revenues. For example, approximately 90% of Durban's total city budget is now provided from own-source revenues. Some local governments increase property tax collection significantly through property tax reform. Bangalore, for example, started a series of schemes to improve the assessment of property tax in 2000. Within the first year, its property tax collection increased by a third.⁶⁶ The property tax collection can be redirected to smart and sustainable urban infrastructure.

Development-based land value capture: Development-based land value capture (LVC) can help cities to generate revenues for transport infrastructure, both for the initial investment and long-term operation and maintenance, while also promoting compact and transport-oriented urban development. This can be done either by taxing the increased value of land due to public spending on the infrastructure servicing it, or through specific levies designed to recover the costs of infrastructure (e.g. betterment levies – see below).

There are successful examples in both advanced economies (including Hong Kong, Tokyo, London, and New York City) and emerging economies (such as Delhi, Nanchang, and São Paulo). One of the most successful case studies of development-based LVC is Hong Kong's "rail plus property" model. This model allows both government and developer/operator of the mass transit railway (MTR) network to capture the increase in property values along transport routes while maintaining the dense and efficient urban form. The MTR has over 4 million passenger trips a day, and in 2012 generated a net profit of US\$869 million for the operator (which has a 77% government ownership share) as a result of high ridership and efficient operation. The government also received significant financial returns on their investment overall – approximately US\$18 billion over 25 years from 1980 to 2005,⁶⁷ while maintaining a compact and connected city.

Many rapidly growing cities in emerging economies and developing countries, such as Nanchang and Delhi, have favourable conditions for development-based LVC, such as strong economic growth, an expanding urban population, rising incomes, and increasing motorisation and congestion. These conditions all cause land value to appreciate, particularly near transport stations. São Paulo, for example, has raised over US\$1.2 billion in six years using related instruments.⁶⁸

Besides the favourable conditions, effective development-based LVC schemes also require strong institutional capacities in local government to fulfil a series of enabling factors, including long-term integrated city planning, flexible zoning systems, multiple funding sources, intergovernmental collaboration, and clearly defined regulations, among many others. Moreover, a city needs to tailor development-based LVC schemes to fit its own geographic and development characteristics.

Betterment levies: Special property taxes that are collected from property owners in a designated area of infrastructure improvement can also be used. Such mechanisms can not only help to recover the cost of sustainable infrastructure after it has been built, but can also be used to fund expansion or upgrading of infrastructure. For example, Colombia established *contribución de valorización* (betterment levies) in the early 1990s. Since then, they have contributed significantly to the financing of infrastructure in Bogotá, including funding about US\$1 billion worth of public works between 1997 and 2007, and almost half of the arterial road network in the city,⁶⁹ where the bus lines and dedicated stations of the city's BRT system are located. Over the last few years, Bogotá has simplified the betterment levy into a general infrastructure tax by collecting a city-wide 'valorisation fee' to finance urban infrastructure improvements.

Betterment levies require local governments to have strong institutional capacity. Besides the capacity to collect taxes and manage projects, local governments also need to conduct detailed assessment with good data, and clearly communicate the potential economic and environmental benefits of any infrastructure project to property owners.

User charges and fees: User charges and fees can encourage the use of more sustainable infrastructure but are also a way to raise money for infrastructure maintenance and upgrades. They are most suitable for infrastructure amenable to the collection of charges and fees, such as transport and utility infrastructure. Congestion charges, for example, can effectively reduce vehicle use by charging for driving within a charging zone at a specified time period. This reduces the traffic flow, encourages public transport use, and reduces GHG emissions and local air pollution. London, Milan, Stockholm, Seoul, and Singapore have successfully implemented congestion charges. These have achieved some important results in reducing travel time, emissions, and accidents, while raising capital for improvement of public transport infrastructure (see Table 4). Beijing and other Chinese megacities are planning to implement similar congestion charges. Well-designed utility fees for energy, water, and waste will also raise finance for urban infrastructure, while incentivising energy savings and encouraging sustainability.

Table 4
Effects of congestion charging in London and Stockholm

	Travel			Emissions			Safety	Economics	
	Travel volume	Travel times	Public transit ridership	CO ₂	NO _x	PM ₁₀	Accidents	Surplus ⁷ per year (million US\$)	Hours saved per day
London ¹	-21% ³	-30%	+18%	-16.4%	-13.4%	-15.5%	-33% ⁵	110–150	12,000
Stockholm ²	-20% ⁴	-33%	+5%	-13%	-8%	-13%	-(9–18)% ⁶	80	30,000

Source: van Amelsfort and Swedish, 2015.⁷⁰ Notes: 1. The congestion charge in London is an £11.50 (US\$15) daily charge for driving a vehicle within the charging zone between 07:00 and 18:00, Monday to Friday. 2. The congestion tax is different depending on the time of day in Stockholm, but the maximum amount payable per day is SEK105 (US\$12) per vehicle on weekdays. 3. Change in travel volume over 2003–2008. 4. Change in travel volume across the cordon. 5. Change in number of accidents over 2003–2014. 6. Inconclusive from measurements, but from modelled impacts 9–18% reduction of accidents anticipated for different roads. 7. Surplus refers to how much worse or better off all travellers are when introducing charging for society as a whole – the charges are not lost, but become revenues and can be spent on creating benefits for citizens somewhere else in the economy.

Developing a city’s creditworthiness and bond financing

Improving creditworthiness can allow cities to access capital markets and special donor funds for loan-based finance for urban infrastructure investments. Moreover, the process of strengthening a city’s financial management and securing a credit rating demonstrates that the city has effective fiscal discipline and is potentially a trustworthy public or private partner for investment. However, only a small number of the largest 500 cities in developing countries are currently deemed creditworthy: around 4% in international financial markets and 20% in local markets.⁷¹ This is mainly due to the weak revenue bases that often characterise municipal budgets.

It is estimated by the World Bank that investing US\$1 in efforts to improve city creditworthiness can leverage more than US\$100 of private investment for sustainable urban infrastructure.⁷² For example, with technical assistance from the Public-Private Infrastructure Advisory Facility (PPIAF), Kampala’s government managed to set out a strategic plan to improve its governance and financial management. In successfully implementing the plan, Kampala has gained a reputation for being an effective, reform-minded and innovative authority, and improved its creditworthiness (and achieved an “A” rating (investment grade) on the national scale for long-term debt instruments), increasing locally generated revenue by 83% within a year and almost doubling its borrowing allowance for large-scale urban infrastructure.⁷³ This has helped to underpin its ability to develop viable sustainable infrastructure projects such as BRT.

Similarly, Lima improved its credit rating with technical assistance from PPIAF, and in 2010 obtained a commercial bank loan of US\$70 million, which is partially backed by International Finance Corporation (IFC). The maturity of this loan was double that of the city’s previous debts, allowing long-term investment in Lima’s urban infrastructure, including in Lima’s BRT system.⁷⁴ Following the example of Lima, other Latin American cities and regions have improved their creditworthiness and obtained credit ratings. For example, Barranquilla in Colombia also obtained some commercial bank loans to co-finance its BRT system.⁷⁵

Municipal green bonds are another way to attract capital. The municipal green bond market, valued at about US\$6 billion in 2015, is a relatively small (around 15%) part of the climate-related bond market, but it is fast-growing.⁷⁶ Issuing municipal green bonds can help cities to invest in sustainable infrastructure, particularly in emerging and advanced economies. Major players in these markets are the MDBs and investment banks. For example, urban projects account for an estimated 20–25% in the World Bank’s green bonds portfolio.

Most well-established examples of green municipal bonds come from more advanced economies. For example, the Qualified Energy Conservation Bond (QECCB) and Clean Renewable Energy Bond used in the United States collectively raised US\$5.6 billion between 2006 and 2011, to allow local governments to borrow to fund sustainable infrastructure projects.⁷⁷ Mainly driven by municipal green bonds, the green-labelled market in the United States continues to grow exponentially, with US\$10.5 billion in bonds issued in 2015, up 47% from 2014.⁷⁸

Emerging economies have begun to enter the market, and started to yield some good results. Johannesburg, for example, recently issued a green municipal bond with a target value of US\$136 million. The bond was oversubscribed and will earn investors a 185-basis-point return above sovereign bonds. The city now is working with C40 Cities and the Climate Bonds Initiative to share its successful model with other C40 cities.⁷⁹ Similarly, in Brazil, municipal governments in São Paulo, Rio de Janeiro, and Curitiba have obtained about US\$3.8 billion for urban redevelopment projects by issuing more than 10 million securitisation bonds known as CEPACs (*certificados de potencial adicional de construção/certificates for additional construction potential*) that permit additional building rights in special development districts and could potentially increase the density of those areas.⁸⁰ One of the key lesson learned is the importance of building the capacity to structure and issue bonds, including building the skills base, creating a positive and predictable issuing environment, and developing local capital markets.

Ahmedabad went through the process of obtaining a credit rating in 1995 using India's national methodology, and received a rating for bond offering. The city was then able to issue a municipal bond worth approximately US\$15 million (Rs 1 billion).⁸¹ This is India's first municipal bond without a state guarantee. With fiscal and management improvement, such as a credible accounting mechanism and improved tax collection, Ahmedabad achieved a fiscal surplus from a deficit position.

Cities can still run into obstacles even when they have established their creditworthiness for issuing municipal bonds. Dakar, for example, failed to raise a municipal bond recently, with the attempt blocked by the central government in Senegal.⁸² As indicated earlier, sometimes a lack of transparency makes it difficult to value the creditworthiness of local governments. National governments can act by helping to design a system to rate the payment capacity and creditworthiness of municipal governments. Colombia, for example, has published traffic-light ratings that reflect a combination of liquidity and solvency indicators to promote transparency. A municipality with a red light has a ratio of interest to operational savings of over 40% and ratios of debt stock to current revenues over 80%, and it cannot borrow. A yellow light means that a municipality can borrow after approval from central government. A green light indicates that the municipality can borrow directly.⁸³ Lessons from this example could be transferable to sustainable urban infrastructure financing.

Smaller cities, accounting for 35–65% of the urban population across various continents, typically face more significant challenges in access to long-term capital markets due to limited financial infrastructure and capacity. In such cases, there are opportunities for them to apply for short- or medium-term loans from municipal development funds or national development banks.⁸⁴ Colombia set up Financiera de Desarrollo Territorial (FINDETER) in 2009 as a quasi-public financial institution that facilitates commercial banks to finance municipal governments by lowering the costs of loans. It has an AAA local credit rating that enables it to access less expensive financing. FINDETER financed about US\$4 billion in loans in over 700 municipalities over the five years from 2006 to 2010, while maintaining bad debt below 2%.⁸⁵ In 2012, in partnership with Inter-America Development Bank (IDB), FINDETER created the Platform for Sustainable and Competitive Cities (CSC). Within two years of establishment, seven urban sustainability projects have received financial and technical assistance, and six more are in the pre-investment phase. This initiative demonstrates the potential for rapid scale-up of solutions through local-national-international partnerships.

Resource pooling is an alternative way for smaller cities to access capital markets. India, for example, has built on its use of a national methodology to rate municipal credit ratings, by releasing Pooled Finance Development Fund Guidelines. These include special mechanisms to pool smaller cities' resources and allow them to access credit jointly. In South Africa, municipal pooled financing mechanisms are also emerging as funding options.

In sum, municipal governments, national governments and international actors each need to do their bit – working together – in order to allow cities to establish creditworthiness. Municipal governments need to improve their fiscal management, national governments to provide sufficient and necessary support, and international development institutes need to strengthen and scale up for purpose technical assistance.

2. COORDINATING PUBLIC AND PRIVATE FINANCE

Public-private partnerships: Public-private partnerships⁸⁶ (PPPs) are a tool for mobilising private investment to raise finance for infrastructure. Cities in developing countries increasingly welcome PPPs as an instrument for bridging the infrastructure investment gap, particularly given their limited access to capital markets. For example, several mass rapid transit (MRT) PPPs have been developed or are under development in India, including for metros in Mumbai, Hyderabad, and Chennai. Bangkok's Skytrain and Bogotá's TransMilenio BRT system also use PPPs as a means of attracting private investment. Similarly, water PPPs are used in developing countries such as Colombia and various western African countries, and have significantly improved efficiency and service quality, especially by reducing water rationing.⁸⁷ There are further successful PPP projects in cities in OECD countries, such as bicycle sharing schemes in many European cities, waste management programmes in cities such as Sydney, and building energy efficiency projects in cities such as Berlin and London.⁸⁸ Indeed, in some countries PPPs account for around 5–10% of investment in national infrastructure (e.g. Australia and the UK with 5% and 10% respectively).⁸⁹ PPPs – when managed well – can present numerous advantages for local governments, including additional infrastructure financing, improvement in project selection allowing more sustainable urban infrastructure, and substantial savings from skills and economies of scale provided by private actors.

However, some challenges exist for PPPs. For private investors, one of the key challenges is cost recovery. Sometimes it is politically difficult for local governments to collect user fees that are high enough to cover the gap between the costs of operation/maintenance and savings from operational efficiency. In that case, ancillary services can help to raise some additional revenue. For example, when the cost of road maintenance cannot be covered by user fees, the right to operate roadside businesses can be leased to generate additional funding. Other challenges include political risks and weak governance that imply uncertainty around the contractual relationships and can mean that the public sector takes on an inordinate share of financial risk, absorbing high costs in the case of failure. This is particularly relevant in cities in developing countries. In this case, national government and international actors need to provide necessary support and sufficient technical assistance.

There is also a high level of associated financial risk for local governments on PPP projects. In particular, PPP projects can expose local governments to long-term commitments and guarantees. For example, due to the underestimation of demand and risks, the Korean government pays out millions every year for a privately financed road linking Seoul to Incheon airport.⁹⁰ Few governments – even in developed markets – have the capacity to do this well, except in areas where it has been tried and tested repeatedly. The use of PPP does have enormous potential, but it requires significant technical expertise, given the complexity of PPP contracts which need to provide both governments and private investors with sufficient protection against the risks.

In summary, effective PPPs, which work well for both the public and the private sector, are contingent on a well-designed framework and a well-implemented contractual agreement, with the fair transfer of risks and returns between local governments and private actors. It is also important explicitly to include “green outcomes” in contracts to ensure that smarter and more sustainable urban infrastructure projects are brought to fruition.

Investment platforms and redirecting existing financial flows: To reduce transaction costs for investors, investment platforms can be set up at both municipal and national level to facilitate cities to attract private finance at scale. Some megacities have set up exchanges or investment platforms that match infrastructure projects and potential private sector investors, while smaller cities can attract private sector investment from national investment platforms through resource pooling. For example, the Chicago Infrastructure Trust was set up in 2012 to match public infrastructure projects to private investors. The city administration is paying US\$2.5 million of running costs, while private financial institutions have committed to investing US\$1.7 billion in the scheme.⁹¹ London also set up the London Green Fund (LGF) in 2009 – a £120 million fund for investment in schemes that cut London's carbon emissions. The LGF invests in waste, energy efficiency, decentralised energy, and social housing projects through three urban development funds (UDFs). By mid-2015, the LGF has invested £97 million in 16 projects, valuing approximately £700 million.⁹² Smaller cities can also benefit from regional and national platforms, such as the West Coast Infrastructure Exchange in the United States and the Green Investment Bank in the UK.⁹³

National, regional and city-level infrastructure funding can also be redirected away from traditional high-carbon and sprawling urban development. This would significantly reduce the investment gap and release funds for more sustainable urban infrastructure, such as mass transit. For example, Bogotá's BRT system was partially financed by funds that were allocated for urban highway programmes. Similarly, Curitiba is funding the conversion of a highway into a BRT corridor, complemented by higher-density, mixed-use spaces and green areas – an investment of US\$600 million.⁹⁴

Table 5
Financing options

Option	Financing action	Short description	Enabling conditions	Key actors and stakeholders	Best practice
Developing a city's creditworthiness	Improve credit rating	Improve the estimated ability of a city to fulfil its financial commitments, based on previous dealings	Strong institutional capacities; strong political will; good track record; technical assistance from international institutions	Local governments, commercial banks, international institutions such as PPIAF	Kampala, Lima, and other Latin American cities
	Municipal bonds	A security issued by or on behalf of a local authority	Strong institutional capacities to structure and issue bonds; supportive national government	Private investment banks, international initiatives, local and national governments	Johannesburg, Washington DC
	Resource pooling	The grouping together of cities for the purposes of minimising risk for borrowing	Good coordination and trust among local governments; strong institutional capacities in both national and local governments	National and local governments, development banks	India, South Africa
Leveraging existing assets	Land sales and leaseholds	The sale or lease of government-owned land	A trusted and coherent legal framework; strong institutions; clearly defined and enforceable property rights	Local governments, private investors	Cairo, Mumbai
	Property taxes and betterment levies	Property tax: a levy on property that the owner is required to pay Betterment levy: a tax that the state collects on a plot of land that its actions have in some way made "better"	Strong institutional capacity of local governments to collect taxes and manage projects; the availability of good data to conduct economic analysis	National and local governments, general public	Bogotá, Durban

Option	Financing action	Short description	Enabling conditions	Key actors and stakeholders	Best practice
	Development-based land value capture (LVC)	Development-based LVC can be facilitated through direct transaction of properties whose values have been increased by public regulatory decisions or infrastructure investment	Strong institutional capacities in local government; tailored scheme to fit a city's geographic and development characteristics	Local governments, international development banks and initiatives, private investors	Hong Kong, Tokyo
	User charges and fees	Payments for infrastructure, whose provision in turn is (partly or wholly) financed by the charges	Sound policy design; reinvestment of the capital raised into maintenance of sustainable infrastructure	Local governments, general public, international initiatives	London, Stockholm, Singapore
Coordinating public and private finance	PPPs	A government service or private business venture that is funded and operated through a partnership of government and one or more private sector companies	Strong institutional capacities of local governments; a well-designed framework and a well-implemented contractual agreement; inclusion of sustainability into agreements	Local governments, private investors, international institutions/initiatives	Bogotá, Bangkok, Mumbai, Hyderabad, Chennai
	Investment platforms	Exchanges or investment platforms that match infrastructure projects and potential private sector investors	Strong institutional capacities of local governments to set up and manage investment platforms; consistent policy and regulations	National, regional, and local governments, private and commercial banks	Chicago, London

3. LEVERAGING INTERNATIONAL FINANCING

MDBs, international climate funds, and other development assistance providers – notably development finance institutions (DFIs) – can play a key role in shifting and scaling up sustainable urban infrastructure investment, mainly through supporting policy and institutional reforms in developing countries, building knowledge platforms of best practice, and establishing platforms for international cooperation. The eight largest MDBs have committed to investing US\$175 billion by 2029⁹³ in sustainable transport, which means accessible, affordable, efficient, financially sustainable, environmentally friendly and safe transport. Similarly, climate funds are also starting to work at the urban level. For example, the Global Environment Facility (GEF) started a new Sustainable Cities Integrated Approach – a US\$140 million programme that is expected to leverage US\$1.4 billion in co-finance – to encourage intelligent urban development in 22 pilot cities.⁹⁶

The MDBs, climate funds, and other channels of development finance – domestic and international, including concessional finance – can work together to enhance investments for large-scale infrastructure. For example, the Clean Technology Fund (CTF) recently approved a US\$100 million concessional loan through the Asian Development Bank (ADB) to finance improvements to a new metro line in Hanoi. The project includes station and depot facilities, infrastructure to ensure integration with non-motorised forms of transport and the existing public transport system, policy development to improve station access management, and ticket pricing. This funding is in addition to US\$1.43 billion in financing for the metro line itself from the Vietnamese Government, ADB, the European Investment Bank (EIB), the French government and a French development bank.⁹⁷

The MDBs, climate funds, and other DFI's are also able to incentivise private sector participation through financial intermediaries. This approach not only provides cheaper-than-market finance to private sector investors seeking to invest in a particular low-carbon urban technology, but also reduces the associated risks. The CTF EcoCasa project in Mexico, for example, is providing US\$52 million in concessional finance to provide incentives for private developers to invest in highly efficient and low-cost housing construction.⁹⁸

To further enhance their performance in investing in sustainable urban infrastructure, the MDBs and international climate funds can work closely with national development banks or local financial institutions (LFIs), which often have far greater local knowledge. An effective collaboration can be mutually beneficial for MDBs and LFIs when financing a sustainable infrastructure project: for MDBs, working with an LFI can reduce asymmetries of information at the national level, while LFIs can operate more effectively with financial and technical assistance from the MDBs.⁹⁹ A successful example is the Tamil Nadu Urban Development Fund – India's first financial intermediary with various innovative financing schemes (such as bond issuance) for smaller urban areas. Its success has been supported by various international players such as the World Bank, the ADB, the Japan International Cooperation Agency, and KfW (Germany).¹⁰⁰

In some cases, DFIs are the most viable sources of funding for sustainable and climate-resilient urban infrastructure, through their use of concessional official development assistance (ODA) as well as non-concessional development finance. DFIs also provide essential technical assistance to help with planning for sustainable urban infrastructure, particularly at the local level. This is partly because the resulting benefits include a large share of public good. For example, the ADB, in partnership with the US Agency for International Development (USAID), the UK Department for International Development (DFID), and The Rockefeller Foundation, has leveraged US\$150 million for the Urban Climate Change Resilience Trust Fund to support advanced resilience planning in Asian cities and help to ensure that resilience measures are implemented.¹⁰¹ Another example is a project in Haidong city, China, financed by a US\$150 million ADB loan. It aims to improve urban water resource and flood management by combining “grey” infrastructure with natural infrastructure in the Huangshui River watershed, including taller flood embankments that can accommodate projected climate change impacts, and a more integrated and holistic approach to flood management with riverside greenbelts, wetland rehabilitation, and forestry.¹⁰²

However, MDBs, international climate funds, and DFIs often provide support to cities on a sector-by-sector basis, rather than with a more strategic and coordinated approach. This leads to the limited resources of climate finance allocated to sustainable urban infrastructure. MDBs and international climate funds could put more emphasis on financing cities by providing more direct finance to cities and by involving cities in the development of national urban infrastructure strategies. National governments could provide greater leadership in establishing channels for funneling resources to cities and supporting local governments to improve access to international financing.

4. STRENGTHENING INSTITUTIONAL CAPACITY FOR INVESTMENT PLANNING AT NATIONAL AND SUB-NATIONAL LEVELS

Localising public investment decisions can unleash knowledge and creativity for change, but this can only be achieved if there is good coordination between governments and across levels of government, including on funding, financing, investments, and sustainable procurement. Often cities receive limited funding, and national and state- or province-level legislation may also restrict the city government’s power and its ability to raise revenue. When infrastructure challenges extend beyond a city’s administrative boundaries, collaboration is also crucial, as planning for and funding solutions will need to involve governments across the greater metropolitan area.

At the national level, a key first step to filling the finance gap for sustainable urban infrastructure is to align fiscal systems to ensure that they can respond to and meet cities’ needs. It is also essential to build capacity at the local level to support transformative planning approaches and private sector engagement.

Within municipal boundaries, it is often more effective to integrate transport and land use authorities at the metropolitan level. This is to avoid the problems of inefficient coordination and conflicts of interests among multiple administrative departments. One way is to merge or set up sector-specific, metropolitan-level agencies, such as Transport for London (TfL) and Land Transport Authority (LTA) in Singapore. Another option is to set up integrated multi-modal transport and land use authorities, such as through the Instituto de Pesquisa e Planejamento Urbano de Curitiba (IPPUC), which integrates all elements of urban growth. The IPPUC prioritises mixed-use development and dedicated high-capacity bus lanes, the backbone of the city’s successful BRT system. Key factors in the IPPUC’s success included an ability to leverage dedicated funding sources and a long-term vision that a succession of civic leaders followed.

Also at the city level, it is essential to build institutional capacity and expertise to prepare and package infrastructure projects into attractive bankable projects for private investors. International support and technical assistance can be particularly valuable in helping cities to strengthen infrastructure project preparation. For example, Cities Development Initiative for Asia (CDIA) is supporting mid-sized Asian cities to prepare bankable infrastructure projects and bridge the gap between their development plans and implementation. With CDIA’s assistance, approximately US\$5.8 billion of large-scale urban infrastructure investments are under development at a cost of around 0.25% of the investments under preparation¹⁰³. The ADB Future Cities Program is also looking to develop long-term engagement with cities in the context of an integrated plan that considers environmental, social, and economic infrastructure and investment priorities.¹⁰⁴ Similar support will be provided by the new C40 Cities Finance Facility (see Box 2). Through bilateral development cooperation, Germany has also made a strong commitment to climate-smart infrastructure and development.¹⁰⁵

Box 2

C40 Cities Finance Facility

The C40 Cities Climate Leadership Group recognises that a key challenge for cities in delivering on their climate change objectives is a lack of capacity to prepare projects for investment. Working with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) under the support of the German Federal Ministry for Economic Cooperation and Development (BMZ), the group has developed the C40 Cities Finance Facility (CFF) to support C40 cities in developing and emerging countries to prepare and deliver sustainable, low-carbon, and climate adaptation projects. The Inter-American Development Bank is supporting implementation of the CFF in Latin America.

The CFF aims to unlock US\$1 billion of new low-carbon and resilient infrastructure in developing country megacities, while simultaneously working to build the capacity and skills of city officials, and share new knowledge globally through the C40 city networks and beyond.

The CFF has been specifically structured to work with cities independent of any capital providers to develop and take to the market climate change solutions that provide the best value for the city.

Source: C40.

In addition, spatial and infrastructure planning needs to be significantly strengthened at both national and local levels, and coordinated between them. A large number of developing countries, where rapid urbanisation is taking place, often lack national urbanisation plans to manage or guide urban expansion. Similarly at the city level, the World Bank estimates that only 20% of the world's largest 150 cities have the basic analytics for low-carbon urban planning.¹⁰⁶ However, there are some encouraging trends, especially after increasing involvement by local leaders in the climate agenda. For example, almost all C40 cities are now creating climate action and resilience plans, mostly under the framework of the Compact of Mayors. Yet, still, the misalignment between national and local governments in urban planning further complicates the challenges related to lack of capacity for spatial and infrastructure planning.

Coordination between national and city policy frameworks (“vertical” governance) is critical to effective strategic land use and transport planning. India, for example, has recently developed a National Urban Transport Policy, integrating transport and land use planning as a single strategic goal. The central government covers half the costs of preparing integrated transport and land use plans.¹⁰⁷ South Africa has used national legislation to create an Integrated Development Plan (IDP) that provides an overall framework for development for a local municipality and coordinates national, provincial, and local government policy. The IDP takes account of economic, social, and environmental considerations for the area as a whole, including what infrastructure is needed and how the environment should be protected. This helps local municipalities to strengthen capacities in planning and delivering sustainable infrastructure projects while attracting additional funds from national government and private sectors.¹⁰⁸

National and city-level governments need to work together to carry out regulatory reforms in order to ensure the consistency in policies and regulations that is crucial to attracting finance for sustainable urban infrastructure. Such reforms include density standards, parking requirements, congestion charges, and fossil fuel subsidies/taxes. A good example is Denmark's Planning Act, where the “Station Proximity Principle” requires new offices over 1,500 square metres to be located within 600 metres of a railway station, reinforcing Copenhagen's efficient, compact urban form.¹⁰⁹

5. REFORMING WIDER PRICE DISTORTIONS

Addressing wider price distortions will be key to shifting investment from traditional high-carbon urban infrastructure to more sustainable infrastructure. For urban areas, important areas for reform include subsidies for car use, such as through congestion charges and parking tax credits, as well as reducing or eliminating subsidies for petrol and diesel. The resources saved from elimination of fossil fuel subsidies and collected from pricing the externalities related to congestion can be channelled for alternative uses, such as investing in sustainable urban infrastructure or research and development for clean urban technologies. Meanwhile, corrections of price distortions can also have positive impacts in addressing inequalities, improving air quality, and reducing carbon emissions.

Reduction or elimination of fossil fuel subsidies can significantly free up a fiscal space for sustainable infrastructure. The World Bank estimated that Indonesia could double its spending on infrastructure with a full phase-out of subsidies by 2018, which could save up to 3.3% of GDP.¹¹⁰ Indonesia has recently removed fuel subsidies and used budgetary savings to invest in infrastructure. As a result, it saved IDR211 trillion (US\$15.6 billion) on fossil fuel subsidies equal to 10.6% of all government expenditure. The fuel subsidy savings in 2015 were reallocated to major investments in social welfare and infrastructure through increased budgets for ministries, state-owned enterprises, and transfers for regions and villages.¹¹¹ Moreover, fossil fuel subsidy reforms are also strong signals for investment in smart and efficient urban planning and transport systems.

While fossil fuel reforms cut or remove the subsidies for petroleum, congestion and carbon pricing can further correct price distortions by pricing externalities. Of course, these pricing instruments make sense only if the funds raised are ring-fenced to reinvest in low-carbon infrastructure. London, for example, reduced vehicle traffic by 16% and journey times by 14% after the first three years of implementation of the congestion charge, while doubling cycling and bus use since 2001.¹¹² All the money raised from congestion charging, by law, must be reinvested back into London's transport system with emphasis on public transport upgrades and more recently the promotion of cycling. London's Low Emission Zone scheme is also in operation 24 hours a day to encourage the most polluting vehicles driving in London to become cleaner. As a result, London's air quality has improved significantly in recent years. London is looking to set up an Ultra Low Emission Zone in 2020, where all motorised vehicles will need to meet certain emission standards or pay a daily charge to travel.¹¹³

Some of these reforms require national-level action. As an encouraging sign, national and local governments in some countries are increasingly working together to align fiscal policies and reform regulations to attract financing for sustainable urban infrastructure. Adjusting policies can incentivise changes in both corporate and consumer behaviour, to take account of

sustainability. They can also give a much-needed boost to local revenues, and thus improve the local balance sheet, help close deficits, and boost local creditworthiness (see below). They can also directly enable increased public investment in sustainable urban infrastructure, including for upgrades and maintenance.

6. STRENGTHENING INVESTMENT IN CLEAN TECHNOLOGY DEVELOPMENT AND DEPLOYMENT

Cities are important test beds for numerous clean technologies that will facilitate the transition to a low-carbon economy. Cities, for example, are well suited for renewable energy deployment, particularly decentralised grids. This can bring significant savings in infrastructure and transmission costs, while increasing resilience and reducing emissions.

Small, decentralised solar systems built within cities, for example, can have lower transmission costs and provide more stable power in the face of extreme weather events. In Africa, ReadyPay (in Uganda) and Azuri PayGo Energy (operating in 11 countries in sub-Saharan Africa) are demonstrating new pay-as-you-go business models to power thousands of homes using clean distributed solar power, while also tackling the massive problem of energy access for the urban and rural poor. These affordable micro-financing solutions rely on innovative information technology platforms, working from smartphones, to build credit histories over time and scale up investments in a manner that is tailored to individual needs and financial capacity.¹¹⁴ While much of this activity currently targets rural village electrification, a large untapped potential exists for urban populations, including in rapidly growing cities in Africa.¹¹⁵ In South Africa, EnerGcare is a clean energy services model that is being tested in low-income urban areas and has, to date, introduced over 3,000 items from its range of renewable and energy-efficient products to residents of three townships, reaching over 50,000 people.¹¹⁶ A common feature of these initiatives is their use of partnerships and the blending of public development finance, private venture capital, and other private investors. In addition, local and national governments and businesses (such as state-owned utility companies, clean energy product suppliers) can partner to test and demonstrate new business models, including exploring microcredit opportunities, and to boost markets and deployment of clean energy products and systems.

California has also adopted community solar¹¹⁷ – an innovative solar energy deployment model that allows communities to own or lease solar systems jointly. It is estimated that if similar schemes or solar energy models are adopted in other US cities, shared solar could account for up to half of the distributed solar market in the United States in 2020. California has historically subsidised rooftop solar installed by individual homeowners and businesses, collecting funds through ratepayer charges that are then used to co-finance the upfront investment costs. Consumer investments in distributed solar and energy efficiency have become increasingly cost-effective, particularly as prices for solar have dropped dramatically in recent years. This has led to lower demand for centrally delivered power in the state, which has in turn saved ratepayers the cost of investing in new transmission and power generation capacity.¹¹⁸ The current solar subsidy programme – the California Solar Initiative (CSI) – was launched in 2007 and will run through 2016. The programme has a total budget of US\$3.35 billion or roughly US\$372 million per year, with a goal to encourage Californians to install 3,000 megawatts by the end of 2016.¹¹⁹ The California Solar Initiative also has a research and development programme, with a separate budget of about US\$9 million per year, aiming to boost the capacity to achieve the CSI goals and help keep the state at the forefront of the nation's technology for solar.

Smaller micro-grids could also be an option, particularly for dense urban areas. Beijing has launched its first pilot project on a new energy micro-grid in Yanqing county,¹²⁰ which has many new-energy power generation projects including wind, solar, and biogas. These micro-grids can be powered by cleaner and more efficient distributed energy resources, such as storage, wind, solar, and combined heat and power, improving both the economic and the environmental performance of the communities.

It is undeniable that there are challenges to the use of renewable energy sources. The most obvious one is the intermittency of solar, wind, and other renewables. However, city dwellers are often better equipped to deal with these issues through exposure to more advanced ideas and technologies, more specifically the rapidly emerging technology of energy storage.

Powering homes and business using clean energy is not only possible, but also economically and socially viable in urban areas. Some cities are already leading the transition with strong efforts focused on dissemination of sustainable urban infrastructure. Las Vegas committed to becoming a 100% renewable city by 2017, mainly powered by a massive utility-scale solar power system.¹²¹ Zhangjiakou in China, a host city of the 2022 Winter Olympics, has committed to achieving a level of 80% powered by renewables by 2030.¹²² Emerging and new cities in the developing world have particularly important opportunities to grasp clean energy deployment now and leapfrog to a new model for sustainable urban infrastructure development. Early engagement with the private sector, particularly the cleantech industry, is helpful for cities to accelerate the implementation of high-quality sustainable urban solutions. For example, C40 cities and leading businesses are working together via the City Solutions Platform to develop innovative and low-carbon solutions to large-scale urban energy challenges.

5. Recommendations

The economic, social, and environmental case for investing in better, more sustainable urban infrastructure is compelling. The investment decisions that national policy-makers and cities take within the next 5 to 15 years around key urban infrastructure will be critical to capturing these benefits. Financing this urban transition – including overcoming key market and governance failures impacting sustainable urban infrastructure investment – will be imperative to its success.

To facilitate this transition, we set out our recommendations as follows.

All countries should:

- Develop national urbanisation strategies in conjunction with city governments, with cross-departmental and assigned budgets, overseen by the centre of government and/or Ministry of Finance to help plan, design, and enable sustainable urban infrastructure country-wide, including creating the financial and legal infrastructure that favours sustainable urban infrastructure. This should also consider how to further empower cities, including providing greater fiscal autonomy for cities, linked to economic, social, and environmental benchmarks and appropriate fiduciary safeguards and creating channels for cities with accountable governance systems to engage directly with national development banks.

All cities should:

- Commit to developing and implementing low-carbon development strategies, using where possible, the framework of the Compact of Mayors,¹²¹ prioritising policies and investments in sustainable urban infrastructure including non-motorised and low emissions transport, building efficiency, renewable energy, and efficient waste management.

National and city-level decision-makers should:

- Consider setting up special-purpose financing vehicles at the national level to support urban areas to become more compact, connected, and coordinated, with appropriate private sector and local government participation.
- Redirect existing infrastructure funding towards more compact, connected, and coordinated urban infrastructure development, including existing national urban infrastructure funds and other relevant funding vehicles.
- Reform fuel subsidies and introduce new pricing mechanisms such as congestion charges to reduce and eventually eliminate incentives to unsustainable urban infrastructure investment, including fossil-fuelled vehicle use. Also consider charges on land conversion and dispersed development. These reforms can raise revenue to invest in public transport and transport-oriented development.
- Introduce new mechanisms to finance upfront investments in smarter urban infrastructure and new technology. These may include greater use of ex-ante land value capture mechanisms, municipal bonds, and the creation of dedicated national, regional, or city-level investment platforms to prepare and package investments to attract private sector capital. These should be complemented by more effective and accountable city-level institutions.

The **International community** should:

- Set up a global city creditworthiness facility to help cities develop strategies to improve their own-source revenues and, where sovereign governments allow it, increase their access to private capital markets. This should build on and scale up the existing programme of the World Bank and donors, and assist cities in both developing and developed countries.
- Effective immediately, ensure that the bilateral and multilateral development banks (MDBs) work with client and donor countries to redirect overseas development assistance (ODA) and other concessional finance away from investments that lock in unstructured, unconnected urban expansion. Investment should support integrated city-wide urban strategies and investment in sustainable urban infrastructure and new technology. Greater consideration should also be given to redirecting overall ODA funding to account for the growing importance of cities in economic development in rapidly urbanising countries.
- Enable cities in developing countries to catalyse sustainable urban infrastructure investment by directly accessing concessional and non-concessional finance, including climate finance – for example, through dedicated windows in the Green Climate Fund and direct access to finance through the MDBs. This would help cities to cover increased upfront

costs of sustainable urban infrastructure investments and to leverage private capital, where cities have demonstrated sufficient fiduciary safeguards and where this is agreed in partnership with nation states. Access to such funding opportunities should be quick, efficient, and transparent, avoiding unnecessary administrative burdens for city authorities.

- Provide cities with increased technical assistance and capacity-building for project preparation to enable them to identify, develop, and implement “bankable” programmes and projects for sustainable urban infrastructure. This should build on existing facilities such as the C40 Finance Facility and the Cities Development Initiative for Asia.
- Create a lab or network of labs (in-key countries) to identify catalytic financial instruments and pilot new financing models for scaling up urban infrastructure investment.
- Support cities in developing frameworks to price urban infrastructure services and externalities, including carbon and air pollutants.
- Invest in better equipping national and city policy-makers with the evidence and tools to overcome the barriers to funding, scaling up, and shifting large-scale capital into smarter, more sustainable urban infrastructure.

Box 3

Financing the Urban Transition – Workstream of New Climate Economy (NCE) Cities Special Initiative

The Coalition for Urban Transitions, a New Climate Economy Special Initiative, is a major new international initiative to support decision-makers to unlock the power of cities for enhanced national economic, social, and environmental performance, by providing a trusted, independent, and objective basis for thinking about urban transitions.

To support decision-makers globally to take forward some of the findings of this paper, the Coalition for Urban Transitions will focus on the importance of placing effective urban infrastructure investment strategies at the heart of national economic development planning processes through its new *Financing the Urban Transition* workstream.

The *Financing the Urban Transition* workstream will focus on better equipping national decision-makers with an improved understanding of how to overcome the barriers to funding, scaling up, and shifting large-scale capital into smarter urban infrastructure for improved economic, social, and environmental outcomes. It will build on a range of NCE and other work that highlights areas where further research and analysis is required to overcome the financing barriers for smart urban infrastructure, such as national-level financing frameworks, leveraging and shifting private sector financing for sustainable urban infrastructure, and transforming the fiscal effectiveness of cities.

The workstream will be targeted at national leaders, Ministers, senior public officials, city Mayors, senior regional and municipal officials, ratings agencies, risk analyst providers, institutional or alternative investors focused on long-term infrastructure, MDBs and donors, political risk insurers, and major private sector infrastructure providers and developers.

The workstream is led by the London School of Economics and Political Science and PwC, with support from a range of other NCE contributors.

ENDNOTES

- ¹ Nick Godfrey is the Head of Policy and Urban Development and Xiao Zhao is a Research Associate at the New Climate Economy (NCE).
- ² The authors would like to express thanks to a wide range of NCE partners including Kookie Habtegabber (WWF), Sam Barnard (ODI), Tim McMinn (PwC), Helen Mountford (NCE), James Rydge (NCE), Jan Corfee-Morlot (OECD, NCE), Melissa Roberts (McKinsey), Dan Dowling (PwC), Maia Kutner (CDP), James Alexander (C40), and Andrea Fernández (C40), Ipek Gencsu (NCE), Joel Jaeger (NCE), Ferzina Banaji (NCE) who all provided valuable comments and input to a previous draft. Any shortcomings or errors are those of the authors alone.
- ³ UN, 2014. *World Urbanisation Prospects, the 2014 Revision*. United Nations Department of Economic and Social Affairs (UNESA). Available at: <http://esa.un.org/unpd/wup/DataQuery/>.
- ⁴ CCFLA, 2015. *The State of City Climate Finance 2015*. Cities Climate Finance Leadership Alliance, New York. Available at: <https://sustainabledevelopment.un.org/content/documents/2201CCFLA-State-of-City-Climate-Finance-2015.pdf>.
- ⁵ UN, 2014. *World Urbanisation Prospects, the 2014 Revision*.
- ⁶ CCFLA, 2015. *The State of City Climate Finance 2015*.
- ⁷ Author's calculation based on Oxford Economics data.
- ⁸ Seto, K.C., Dhakal, S., Bigio, A., Blanco, H., Delgado, G.C., Dewar, D., Huang, L., Inaba, A., Kansal, A., Lwasa, S., McMahon, J.E., Müller, D.B., Murakami, J., Nagendra, H., and Ramaswami, A., 2014. Chapter 12: Human Settlements, Infrastructure and Spatial Planning. In: *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. O. Edenhofer, R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, et al. (eds.). Cambridge University Press, Cambridge, UK, and New York. Available at: http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter12.pdf.
- ⁹ UN, 2014. *World Urbanisation Prospects, the 2014 Revision*.
- ¹⁰ Standard and Poor's, 2015. *Global Infrastructure Investment: Timing Is Everything (and Now Is the Time)*. Available at: [http://www.tfreview.com/sites/default/files/SP_Economic%20Research_Global%20Infrastructure%20Investment%20\(2\).pdf](http://www.tfreview.com/sites/default/files/SP_Economic%20Research_Global%20Infrastructure%20Investment%20(2).pdf).
- ¹¹ Global Commission on the Economy and Climate (GCEC), 2014. *Better Growth, Better Climate - The New Climate Economy Report*. Washington and London. Available at: <http://2014.newclimateeconomy.report>.
- ¹² CCFLA, 2015. *State of City Climate Finance 2015*.
- Maier, T. and Jordan-Tank, M., 2014. *Accelerating Infrastructure Delivery: New Evidence from International Financial Institutions*. World Economic Forum (WEF). Available at: http://www3.weforum.org/docs/WEF_AcceleratingInfrastructureDelivery_2014.pdf.
- Bhattacharya, A., 2016 (forthcoming). *Delivering on Sustainable Infrastructure for Better Development and Better Climate*. Brookings Institute.
- ¹³ Erickson, P. and Tempest, K., 2015. *Keeping Cities Green: Avoiding Carbon Lock-in due to Urban Development*. SEI Working Paper No. 2015-11. Stockholm Environment Institute, Seattle. A paper prepared for the C40 Cities Climate Leadership Group. Available at: <http://www.sei-international.org/publications?pid=2829>.
- ¹⁴ Global Commission on the Economy and Climate (GCEC), 2016. *The Sustainable Infrastructure Imperative: Financing for Better Growth and Development*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report>
- ¹⁵ CCFLA, 2015. *State of City Climate Finance 2015*.
- Bhattacharya, 2016 (forthcoming). *Delivering on Sustainable Infrastructure for Better Development and Better Climate*.
- Global Commission on the Economy and Climate (GCEC), 2014. *Better Growth, Better Climate: The New Climate Economy Report. The Global Report*. Washington, DC. Available at: <http://newclimateeconomy.report>.

- Floater, G., Rode, P., Robert, A., Kennedy, C., Hoornweg, D., Slavcheva, R. and Godfrey, N. (2014): *Cities and the New Climate Economy: the transformative role of global urban growth*. New Climate Economy Cities Paper 01. LSE Cities. London School of Economics and Political Science. Available at: <http://newclimateeconomy.report/2015/workingpaper/cities-and-the-new-climate-economy-the-transformative-role-of-global-urban-growth/>
- WWF and Z/Yen Group, 2015. *Financing the Transition: Sustainable Infrastructure in Cities*. World Wild Fund for Nature (WWF). Available at: http://www.longfinance.net/images/reports/pdf/Financing_the_transition_March2015.pdf.
- 16 World Bank, 2014. *Urban China – Financing Urbanisation*. Available at: <http://www.worldbank.org/content/dam/Worldbank/document/EAP/China/Urban-China-SRs4-7.pdf>.
- 17 CCFLA, 2015. *State of City Climate Finance 2015*. For the US\$90 trillion, see GCEC, 2014. *Better Growth, Better Climate – The New Climate Economy Report*.
- 18 Paulson Institute and Energy Foundation, 2016. *Green Finance and Financing for Low Carbon Cities*. Available at: http://finance.ifeng.com/a/20160607/14469408_0.shtml.
- 19 WWF and Z/Yen Group, 2015. *Financing the Transition: Sustainable Infrastructure in Cities*.
- 20 CCFLA, 2015. *State of City Climate Finance 2015*.
- 21 Author's calculation based on CCFLA, WWF/Z Yen and NCE estimates.
- 22 CCFLA, 2015. *State of City Climate Finance 2015*.
- 23 GCEC, 2014. *Better Growth, Better Climate – The New Climate Economy Report*.
- 24 Dobbs, R., Pohl, H., Lin, D.-Y., Mischke, J., Garemo, N., Hexter, J., Matzinger, S., Palter, R., and Nanavatty, R., 2013. *Infrastructure Productivity: How to save \$1 trillion a year*. McKinsey Global Institute. Available at: <http://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/infrastructure-productivity>.
- 25 See Annex 1 of Gouldson, A., Colenbrander, S., Sudmant, A., Godfrey, N., Millward-Hopkins, J., Fang, W. and Zhao, X., 2015. *Accelerating Low-Carbon Development in the World's Cities*. Contributing paper for *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/2015/misc/working-papers/>.
- 26 Gouldson, A., Colenbrander, S., Sudmant, A., Godfrey, N., Millward-Hopkins, J., Fang, W. and Zhao, X., 2015. *Accelerating Low-Carbon Development in the World's Cities*. Contributing paper for *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/2015/misc/working-papers/>.
- 27 Bouton, S., Newsome, D., and Woetzel, J., 2015. *Building the cities of the future with green districts*. McKinsey & Company. Available at: <http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/building-the-cities-of-the-future-with-green-districts>.
- 28 UNEP, n.d. *Cities and Coastal Areas*. *United Nations Environment Programme*. Available at: http://www.unep.org/urban_environment/issues/coastal_zones.asp. [Accessed 14 April 2016.]
- 29 Hughs, G., Chinowsky, P., and Strzepek, K., 2010. *Development and climate change: The costs of adapting to climate change for infrastructure*. Discussion Paper No. 2. The World Bank. Available at: http://siteresources.worldbank.org/EXTCC/Resources/407863-1229101582229/DCCDP_2Infrastructure.pdf.
- 30 CCFLA, 2015. *State of City Climate Finance 2015*.
- 31 Parry, M., Arnell, N., Berry, P., Dodman, D., Frankhauser, S., Hope, C., Kovats, S., Nicholls, R., Satterthwaite, D., Tiffin, R., Wheeler, T., 2009. *Assessing the costs of adaptation to climate change: a review of the UNFCCC and other recent estimates*. International Institute for Environment and Development (IIED). Available at: <http://pubs.iied.org/pdfs/11501IIED.pdf>.
- 32 See CCFLA, 2015. *State of City Climate Finance 2015*.
- 33 Liu, Y., Chen, T., and Song, X., 2012. *Relationship between Urban Form and Urban CO2 Efficiency with Policies and Recommendations*. Urban China Initiative (UCI) sponsored project 2012.

Floater, G., et al., 2014. *Cities and the New Climate Economy: the transformative role of global urban growth*. Contributing paper for *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/2015/misc/working-papers/>.

34 Floater et al., 2014. *Cities and the New Climate Economy: the transformative role of global urban growth*.

35 Ahmad, E., 2015. *Infrastructure Finance in the Developing World: Public Finance Underpinnings for Infrastructure Financing in Developing Countries*. Working Paper Series. Washington, DC: Intergovernmental Group of Twenty-Four and Global Green Growth Institute. Available at: <http://g-24.psdwizard.net/wp-content/uploads/2016/05/MARGGK-WP05.pdf>.

36 WWF and Z/Yen Group, 2015. *Financing the Transition: Sustainable Infrastructure in Cities*.

37 WWF and Z/Yen Group, 2015. *Financing the Transition: Sustainable Infrastructure in Cities*.

38 Bhattacharya, 2016 (forthcoming). *Delivering on Sustainable Infrastructure for Better Development and Better Climate*.

39 Bhattacharya, 2016 (forthcoming). *Delivering on Sustainable Infrastructure for Better Development and Better Climate*.

40 WWF and Z/Yen Group, 2015. *Financing the Transition: Sustainable Infrastructure in Cities*.

41 World Bank, 2014. *Urban China – Financing Urbanisation*.

42 The BASIC countries are a bloc of four large newly industrialised countries – Brazil, South Africa, India, and China.

43 Author's calculation based on data from Bhattacharya, 2016 (forthcoming). *Delivering on Sustainable Infrastructure for Better Development and Better Climate*.

44 World Bank, 2013. *Planning, Connecting, and Financing Cities—Now: Priorities for City Leaders*. Washington, DC: World Bank. Available at: <http://siteresources.worldbank.org/EXTSDNET/Resources/Urbanization-Planning-Connecting-Financing-2013.pdf>.

45 The seven major multilateral development banks are the African Development Bank, the Asian Development Bank, the European Bank for Reconstruction and Development, the European Investment Bank, the Inter-American Development Bank, the Islamic Development Bank, and the World Bank Group.

46 The World Bank Group, 2014. Statement by the Heads of the Multilateral Development Banks and the IMF on Infrastructure. Available at: <http://www.worldbank.org/en/news/press-release/2014/11/13/statement-heads-multilateral-development-banks-imf-infrastructure>.

47 CCFLA, 2015. *State of City Climate Finance 2015*.

48 CCFLA, 2015. *State of City Climate Finance 2015*.

49 OECD, 2015. *Infrastructure Financing Instruments and Incentives*. Organisation for Economic Co-operation and Development, Paris. Available at: <http://www.oecd.org/finance/private-pensions/Infrastructure-Financing-Instruments-and-Incentives.pdf>. Corporate finance refers to getting finance for the project based on the balance sheet of the private operator rather than the project itself, whereas project finance normally takes the form of limited recourse lending to a specially created project vehicle (special purpose vehicle or “SPV”) which has the right to carry out the construction and operation of the project. For more details, visit <http://ppp.worldbank.org/public-private-partnership/financing/mechanisms#corporate>.

50 Institutional investors include pension funds, insurance companies, endowments and sovereign wealth funds, with approximately US\$120 trillion in assets under management.

51 Liebreich, M. and McCrone, A., 2013. *Financial Regulation – Biased Against Clean Energy and Green Infrastructure?* Clean Energy white paper. Bloomberg New Energy Finance. Available at: <http://about.bnef.com/white-papers/financial-regulation-biased-against-clean-energy-and-green-infrastructure/>.

52 World Bank Group Public-Private Partnerships, 2014. *Private Participation in Infrastructure: Global Update 2013*. Available at: http://ppi.worldbank.org/~/_media/GIAWB/PPI/Documents/Global-Notes/Global2015-PPI-Update.pdf.

53 Bielenberg A., Kerlin, M., Oppenheim, J., and Roberts, M., 2016. *Financing change: How to mobilize private sector financing for sustainable infrastructure*. McKinsey Center for Business and Environment. Available at: http://2015.newclimateeconomy.report/wp-content/uploads/2016/01/Financing_change_How_to_mobilize_private-sector_financing_for_sustainable_infrastructure.pdf.

- 54 LSE Cities, 2014. *Accessibility in Cities: Transport and Urban Form*.
- 55 PwC, 2014. *Cities of Opportunity*. Available at <http://www.pwc.com/us/en/cities-of-opportunity.html>.
- 56 Bielenbery et al., 2016. *Financing change: How to mobilize private sector financing for sustainable infrastructure*. In terms of the Gini co-efficient, there could be a reduction of 0.07 (out of 1.00).
- 57 Pure public goods are non-excludable and non-rivalrous in that individuals cannot be effectively excluded from use and where use by one individual does not reduce availability to others. The provision of sustainable urban infrastructure services, such as clean electricity and sustainable water supply, often have a public good nature making it hard to charge for and recuperate investments.
- 58 Bhattacharya, 2016 (forthcoming). *Delivering on Sustainable Infrastructure for Better Development and Better Climate*.
- 59 Zhao, X., Mahendra, A., Godfrey, N., Dalkmann, H., Rode, P., and Floater, G., 2015. *Unlocking the power of urban transit systems for better growth and a better climate*. Technical note for the New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/2015/misc/working-papers/>.
- Whitley, S. and van der Burg, L., 2015. *Fossil Fuel Subsidy Reform in sub-Saharan Africa: From Rhetoric to Reality*. Working paper for the New Climate Economy, London and Washington, DC. Available at <http://newclimateeconomy.report/2015/misc/working-papers/>.
- 60 Harding, M., 2014. *Personal Tax Treatment of Company Cars and Commuting Expenses: Estimating the Fiscal and Environmental Costs*. OECD Taxation Working Paper No. 20. OECD Publishing, Paris. Available at: <http://dx.doi.org/10.1787/5jz14cg1s7vl-en>.
- 61 Harding, 2014. *Personal Tax Treatment of Company Cars and Commuting Expenses: Estimating the Fiscal and Environmental Costs*.
- 62 Molloy and Shan, 2013. The Effect of Gasoline Prices on Household Location. *The Review of Economics and Statistics* 95, Pages 1212-1221, doi:10.1162/REST_a_00331
- Seto K.C., S. Dhakal, A. Bigio, H. Blanco, G.C. Delgado, D. Dewar, L. Huang, A. Inaba, A. Kansal, S. Lwasa, J.E. McMahon, D.B. Müller, J. Murakami, H. Nagendra, and A. Ramaswami, 2014: Human Settlements, Infrastructure and Spatial Planning. In: *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- 63 Litman, T., 2015. *Analysis of Public Policies That Unintentionally Encourage and Subsidize Urban Sprawl*. Victoria Transport Policy Institute. Supporting paper commissioned by LSE Cities at the London School of Economics and Political Science, on behalf of the Global Commission on the Economy and Climate (www.newclimateeconomy.net) for the New Climate Economy Cities Programme. Available at: <http://static.newclimateeconomy.report/wp-content/uploads/2015/03/public-policies-encourage-sprawl-nce-report.pdf>.
- 64 Litman, 2015. *Analysis of Public Policies That Unintentionally Encourage and Subsidize Urban Sprawl*.
- 65 World Bank, 2013. *Planning, Connecting, and Financing Cities—Now: Priorities for City Leaders*.
- 66 UN-Habitat, 2011. Chapter 8: Innovations in Property Taxation Systems in India. In *Innovative Land and Property Taxation*. United Nations Human Settlements Programme, Nairobi. Available at: https://www.ucl.ac.uk/qaser/pdf/publications/UN_HABITAT.
- 67 Hiroaki, S., Murakami, J., Hong, Y.H., and Tamayose, B., 2015. *Financing Transit-Oriented Development with Land Values: Adapting Land Value Capture in Developing Countries*. Urban Development Series. Washington, DC: World Bank. DOI:10.1596/978-1-4648-0149-5.
- 68 Hiroaki et al., 2015. *Financing Transit-Oriented Development with Land Values: Adapting Land Value Capture in Developing Countries*.
- 69 World Bank, 2013. *Planning, Connecting, and Financing Cities—Now: Priorities for City Leaders*.
- 70 van Amelsfort, D. and Swedish, V., 2015. *Introduction to Congestion Charging: A Guide for Practitioners in Developing Cities*. Asian Development Bank and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Manila and Eschborn. Available at: <http://www.adb.org/sites/default/files/publication/159940/introduction-congestion-charging.pdf>.

- 71 World Bank, 2013. Financing Sustainable Cities: How We're Helping Africa's Cities Raise Their Credit Ratings. 24 October. Available at: <http://www.worldbank.org/en/news/feature/2013/10/24/financing-sustainable-cities-africa-creditworthy>.
- 72 World Bank, 2013. Planning and Financing Low-Carbon, Livable Cities. 26 September. Available at: <http://www.worldbank.org/en/news/feature/2013/09/25/planning-financing-low-carbon-cities>.
- 73 PPIAF, 2015. *PPIAF Helps Kampala Capital City Authority Improve its Creditworthiness*. Public-Private Infrastructure Advisory Facility. Available at: <http://www.ppiaf.org/sites/ppiaf.org/files/publication/Uganda-Kampla-SNTA-Credit-Rating.pdf>.
- 74 PPIAF, 2011. *PPIAF Helps Peruvian Sub-Nationals Tap Financial Markets*. Public-Private Infrastructure Advisory Facility. Available at: http://www.ppiaf.org/sites/ppiaf.org/files/publication/PPIAF-Impact-Stories-Peru-SNTA_0.pdf.
- 75 PPIAF, 2011. *SNTA Program Summary of Results to Date*. Public-Private Infrastructure Advisory Facility. Available at: <http://www.ppiaf.org/sites/ppiaf.org/files/documents/Presentation-SNTA-Results.pdf>.
- 76 Climate Bonds Initiative, 2016. *2015 Green Bond Market Roundup*. Available at: <http://www.climatebonds.net/files/files/2015%20GB%20Market%20Roundup%2003A.pdf>.
- 77 Floater, G., Rode, P., Friedel, B., and Robert, A. (2014): *Steering Urban Growth: Governance, Policy and Finance*. New Climate Economy and LSE Cities. Available at: <http://newclimateeconomy.report/2015/wp-content/uploads/2014/11/Steering-urban-growth.pdf>.
- Rode, P., Floater, G., Thomopoulos, N., Docherty, J., Schwinger, P., Mahendra, A., and Fang, W. (2014): *Accessibility in Cities: Transport and Urban Form*. NCE and LSE Cities. Available at: <http://newclimateeconomy.report/2015/workingpaper/accessibility-in-cities-transport-urban-form/>
- 78 Climate Bonds Initiative, 2016. *2015 Green Bond Market Roundup*.
- Kidney, S., 2016. 2015 Year End Review - Climate Bonds Initiative. Available at: <https://www.climatebonds.net/2016/01/2015-year-end-review-tall-trees-many-green-shoots-evolution-green-bond-market-continues-2015>.
- 79 Floater et al., 2014. *Steering Urban Growth: Governance, Policy and Finance*.
- 80 Maier and Jordan-Tank, 2014. *Accelerating Infrastructure Delivery: New Evidence from International Financial Institutions*.
- 81 World Bank, 2013. *Planning, Connecting, and Financing Cities—Now: Priorities for City Leaders*.
- 82 Africa Research Institute, 2016. *Dakar's municipal bond issue: A tale of two cities*. Briefing Note 1603. Available at: <http://www.africaresearchinstitute.org/publications/briefing-notes/dakars-municipal-bond-issue-a-tale-of-two-cities/>.
- 83 World Bank, 2013. *Planning, Connecting, and Financing Cities—Now: Priorities for City Leaders*.
- 84 A bond bank is a state-level entity that provides smaller public entities in the state with debt financing at a lower cost than the small entity could obtain on its own. Bond banks are able to provide lower-cost financing as long as they have higher credit ratings than the entities that seek to borrow.
- 85 World Bank, 2013. *Planning, Connecting, and Financing Cities—Now: Priorities for City Leaders*.
- 86 "A public-private partnership (PPP) is a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance." See <http://ppp.worldbank.org/public-private-partnership/overview/what-are-public-private-partnerships>.
- 87 Marin, P., 2009. *Public-Private Partnerships for Urban Water Utilities*. A Review of Experiences in Developing Countries. Public-Private Infrastructure Advisory Facility (PPIAF). Available at: <http://www.ppiaf.org/sites/ppiaf.org/files/FINAL-PPPsforUrbanWaterUtilities-PhMarin.pdf>.
- 88 Merk, O., Saussier, S., Staropoli, C., Slack, E., Kim, J.-H., 2012. *Financing Green Urban Infrastructure*. OECD Regional Development Working Papers 2012/10. OECD Publishing, Paris. Available at: <http://dx.doi.org/10.1787/5k92p0c6j6r0-en>.
- 89 WWF and Z/Yen Group, 2015. *Financing the Transition: Sustainable Infrastructure in Cities*.
- 90 World Bank, 2013. *Planning, Connecting, and Financing Cities—Now: Priorities for City Leaders*.

- ⁹¹ Floater, G., et al., 2014. *Steering Urban Growth: Governance, Policy and Finance*.
- ⁹² Mayor of London, n.d. The London Green Fund. Available at: <https://www.london.gov.uk/about-us/mayor-london/london-green-fund>. [Accessed 13 September 2016.]
- ⁹³ See: <http://westcoastx.com/> and <http://www.greeninvestmentbank.com/>.
- ⁹⁴ Soffiatti, R.V.F., 2012. A contribuição de melhoria como instrumento de recuperação da Mais-Valia Fundiária Urbana: Estudo de caso Eixo Urbano “Linha Verde”. Pontifícia Universidade Católica Do Paraná, Curitiba, Brazil.
- ⁹⁵ UN News Centre, 2012. *Rio+20: Development banks to invest \$175 billion in sustainable transport*. Available at: <http://www.un.org/apps/news/story.asp?NewsID=42287#.V4YetpMrLVo>.
- ⁹⁶ Barnard, S., 2015. *Climate Finance for Cities – How can international climate funds best support low-carbon and climate resilient urban development?* ODI working paper 491. Overseas Development Institute, London. Available at: <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9660.pdf>.
- ⁹⁷ Barnard, 2015. *Climate Finance for Cities – How can international climate funds best support low-carbon and climate resilient urban development?*
- ⁹⁸ Barnard, 2015. *Climate Finance for Cities – How can international climate funds best support low-carbon and climate resilient urban development?*
- ⁹⁹ Barnard, 2015. *Climate Finance for Cities – How can international climate funds best support low-carbon and climate resilient urban development?*
- ¹⁰⁰ World Bank, 2013. *Planning, Connecting, and Financing Cities—Now: Priorities for City Leaders*.
- ¹⁰¹ See: <https://www.usaid.gov/documents/1861/urban-climate-change-resilience-trust-fund>.
- ¹⁰² See: <http://www.adb.org/projects/48102-002/main>.
- ¹⁰³ See: <http://cdia.asia/who-we-are/what-is-cdia/>.
- ¹⁰⁴ Asian Development Bank, 2015. *Establishing the Future Cities Program in the Asia and Pacific Region*. ADB Technical Assistance Report. Available at: <http://www.adb.org/sites/default/files/project-document/178245/49053-001-tar.pdf>.
- ¹⁰⁵ German Federal Ministry for Economic Cooperation and Development, n.d. Germany’s commitment: Climate-smart urban development. Available at: http://www.bmz.de/en/what_we_do/issues/klimaschutz/cities-and-climate/germanys-commitment/index.html. [Accessed 13 September 2016.]
- ¹⁰⁶ World Bank, 2013. *Planning and Financing Low-Carbon Livable Cities*.
- ¹⁰⁷ Gakenheimer, R., 2011. Land Use and Transport in Rapidly Motorizing Cities: Contexts of Controversy. In *Urban Transport in the Developing World: a Handbook of Policy and Practice*. H.T. Dimitriou and R. Gakenheimer (eds.). Edward Elgar Publishing, Cheltenham.
- ¹⁰⁸ See: <http://www.etu.org.za/toolbox/docs/localgov/webidp.html>.
- ¹⁰⁹ Copenhagen Cleantech Cluster, n.d. *Urban Planning: Economic and social benefits*. Available at: https://files.lsecities.net/files/2014/05/Copenhagen-GEL_20May-Final_Full-report_1page-layout.pdf
- ¹¹⁰ Whitley and van der Burg, 2015. *Fossil Fuel Subsidy Reform in sub-Saharan Africa*.
- ¹¹¹ Contribution from Shelagh Whitley. The data is from: IISD-GSI, 2016. *Financing Development with Fossil Fuel Subsidies: The Reallocation of Indonesia’s Gasoline and Diesel Subsidies in 2015*. Available at: <http://www.iisd.org/sites/default/files/publications/financing-development-with-fossil-fuel-subsidies-indonesia.pdf>.
- ¹¹² LSE Cities, 2014. *Accessibility in Cities: Transport and Urban Form*.
- ¹¹³ See: <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone>.

- ¹¹⁴ Arc Finance, 2014. *Pay-As-You-Go Technologies in Consumer Energy Finance*. REMMP Briefing Note. Renewable Energy Microfinance and Microenterprise Program. Available at: http://18microcreditsummit.org/wp-content/uploads/2015/12/REMMP_Briefing_Note_PayGo.pdf.
- ¹¹⁵ Gauntlett, D., 2014. *Distributed solar PV poised to reach its potential in Africa*. Navigant Research blog. Available at: <https://www.navigantresearch.com/blog/distributed-solar-pv-poised-to-reach-its-potential-in-africa>.
- ¹¹⁶ See: Energy and Environment Partnership Southern and East Africa, n.d. Success Stories: EnerGcare. Available at: <http://eepafrica.org/about-us/success-stories/energcare/>. [Accessed 13 September 2016.] See: UNFCCC Momentum for Change, n.d. EnerGcare – Bringing Renewable and Efficient Energy to South Africa’s Urban Poor. Available at: https://unfccc.int/secretariat/momentum_for_change/items/8325txt.php. [Accessed 13 September 2016.]
- ¹¹⁷ Feldman, D., Brockway, A.M., Ulrich, E., and Margolis, R., 2015. *Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation*. National Renewable Energy Laboratory and U.S. Department of Energy. Available at: <http://www.nrel.gov/docs/fy15osti/63892.pdf>.
- ¹¹⁸ For an example on cost savings, see: Greentech Media, 2016. Californians Just Saved \$192 Million Thanks to Efficiency and Rooftop Solar. 31 May. Available at: <http://www.greentechmedia.com/articles/read/Californians-Just-Saved-192-Million-Thanks-to-Efficiency-and-Rooftop-Solar>.
- ¹¹⁹ California’s distributed solar programme covers rooftop solar for electricity generation and thermal solar for water heating. For more information, see: <http://www.gosolarcalifornia.ca.gov/about/index.php> and <https://www.californiasolarstatistics.ca.gov/>.
- ¹²⁰ People’s Daily, 2016. China’s first gov’t-funded new energy micro-grid starts to operate in Beijing. 6 January. Available at: <http://en.people.cn/n3/2016/0106/c98649-9000037.html>.
- ¹²¹ Roerink, K., 2015. City of Las Vegas plans to go to 100 percent renewable energy. Las Vegas Sun, 24 November. Available at: <http://lasvegassun.com/news/2015/nov/24/city-of-las-vegas-plans-to-go-to-100-percent-renew/>.
- ¹²² Hove, A., 2016. What Zhangjiakou Tells Us About China’s Renewable Energy Roadblocks. Paulson Institute, 3 March. Available at: <http://www.paulsoninstitute.org/paulson-blog/2016/03/03/what-zhangjiakou-tells-us-about-chinas-renewable-energy-roadblocks/>.
- ¹²³ A newly merged initiative between the Compact of Mayors and the Covenant of Mayors will be formally launched in early 2017.

ABOUT THE NEW CLIMATE ECONOMY

The Global Commission on the Economy and Climate, and its flagship project The New Climate Economy, were set up to help governments, businesses and society make better-informed decisions on how to achieve economic prosperity and development while also addressing climate change.

In September 2014, the Commission published *Better Growth, Better Climate: The New Climate Economy Report*. Since then, the project has released a series of country reports on the United States, China, India and Ethiopia, and sector reports on cities, land use, energy and finance. In July 2015, the Commission published *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. In October 2016, the Commission published *The Sustainable Infrastructure Imperative: Financing for Better Growth and Development*. It has disseminated its messages by engaging with heads of governments, finance ministers, business leaders and other key economic decision-makers in over 40 countries around the world.

ABOUT THE COALITION FOR URBAN TRANSITIONS

The Coalition for Urban Transitions - launched in May at the Climate Leaders' Summit in New York - is a major new international initiative to support decision makers to unlock the power of cities for enhanced national economic, social, and environmental performance, including reducing the risk of climate change. The Coalition will provide an independent, evidence based approach for thinking about 'well managed' urban transitions to ensure that the growth of urban areas, and the accompanying process of economic, social, and environmental transformation, maximises benefits for people and the planet.

The initiative is jointly managed by the C40 Climate Leadership Group (C40) and World Resources Institute (WRI) Ross Center for Sustainable Cities, with a Steering Group comprising of 20 major institutions spanning five continents including leaders from think-tanks, research institutions, city networks, international organizations, infrastructure providers, and strategic advisory companies. The initiative will be overseen by a Global Urban Leadership Group to champion the work, drawing on members of the Global Commission on the Economy and Climate, as well as other prominent individuals as Ambassadors.

Acknowledgements

The authors would like to express thanks to a wide range of NCE partners including Kookie Habtegaber (WWF), Sam Barnard (ODI), Tim McMinn (PWC), Helen Mountford (NCE), James Rydge (NCE), Ferzina Banaji (NCE), Ipek Gencsu (NCE), Joel Jaeger (NCE), Jan Corfee-Morlot (OECD, NCE), Melissa Roberts (McKinsey), Dan Dowling (PWC), Maia Kutner (CDP), James Alexander (C40), and Andrea Fernández (C40), who all provided valuable comments and input to a previous draft. Any shortcomings or errors are those of the authors alone.