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A New Climate Economy Special Initiative

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Background Paper

Global Review of Finance For Sustainable Urban Infrastructure

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CONTENTS

1. Introduction

1.1 OBJECTIVES

The overall aim of the work programme on Financing the Urban Transition is to empower national decision-makers with the knowledge and tools to better unlock, direct, and facilitate urban finance. Doing so will enable compact, connected urban infrastructure that supports sustainable development.

This paper is a background review representing part of the initial phase of the Financing the Urban Transition work programme. The review builds on a growing body of research that highlights both the importance of national sustainable infrastructure and the need to develop more effective and efficient financing mechanisms for delivering compact, connected cities that meet the UN's Sustainable Development Goals. While progress has been made in both these areas over the last five years, there remains a policy gap between the international/national level and the municipal level. In a survey of around 100 cities worldwide, LSE Cities found that 55% of municipalities identified lack of public funding as a major barrier to sustainable urban growth, while 50% cited insufficient national support. Furthermore, in previous New Climate Economy (NCE) research, few countries were found to have comprehensive strategies for urbanisation, while international funders have traditionally not invested in sustainable urban infrastructure projects.

Given this policy gap between levels of government, this review focuses mainly on the role of national governments and the international community in unlocking, directing, and facilitating finance flows that can deliver sustainable urban infrastructure.

Photo credit: *Visty Banaji*

About this working paper

This working paper was prepared for the Coalition for Urban Transitions, a special initiative of the New Climate Economy project. The Coalition is a major international initiative to support decision makers to meet the objective of unlocking the power of cities for enhanced national economic, social, and environmental performance, including reducing the risk of climate change. Research for this paper was conducted as part of the urban finance workstream which was co-led by the London School of Economics and PwC. The opinions expressed and arguments employed are those of the authors. This publication has been prepared for general guidance on matters of interest only, and does not constitute professional advice. You should not act upon the information contained in this publication without obtaining specific professional advice. No representation or warranty (express or implied) is given as to the accuracy or completeness of the information contained in this publication, and, to the extent permitted by law, the authors and distributors do not accept or assume any liability, responsibility or duty of care for any consequences of you or anyone else acting, or refraining to act, in reliance on the information contained in this publication or for any decision based on it. The paper draws on and extends the LSE Cities research and publications including previous New Climate Economy publications by the LSE's Economics of Green Cities programme, and the LSE's publications under RAMSES funded by the European Community's 7th Framework Programme under Grant Agreement No. 308497.

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This review is part of a wider report for the Coalition for Urban Transitions and the Infrastructure and Cities for Economic Development (ICED) project, funded by the UK's Department for International Development (DFID). It has the following specific objectives:

- review the public, private, and institutional sources of finance that are potentially available;
- identify the barriers to investing in sustainable urban infrastructure faced by different public and private funding sources;
- examine the most promising finance policy instruments, mechanisms, and institutional structures; and
- undertake in-depth country case studies on city-level finance barriers.

In terms of the scope of the review, the coverage was global and included countries at all levels of development from low to high income. Inclusion of high-income countries (e.g. in North America and Europe) was used to compare the financial level and potential of different developing countries and their cities. However, the main focus of the wider report is on low- to middle-income countries, where the potential for urban growth and capacity-building is particularly great. Nonetheless, many of the lessons drawn are also relevant to high-income countries and cities.

1.2 METHODOLOGY

A mixed-methods approach was used for the Interim Report and supporting analysis, drawing on evidence from four main sources: literature, expert interviews, databases, and a workshop in Mexico for the country case study.

We conducted a **quantitative literature review**. Internet data searches conducted in September and October 2016 identified 656 references related to sustainable urban infrastructure financing. The search included all 193 countries in the United Nations. Over 50 reports, papers, and articles were identified as potentially relevant to the review and were researched in more detail. Sources that were considered particularly relevant are included in the References section of the Interim Report.

While key word searches are useful for providing an objective, wide-ranging review of the literature, not all key articles and reports in the field are necessarily caught by the method. For this reason, we undertook a further **qualitative literature search** based on publications recommended by the Coalition for Urban Transitions and the Finance Working Group (see below), as well as references in bibliographies of other key works.

Interviews with experts have been an important source of evidence-gathering and objective critique. We conducted interviews with Finance Working Group members between October and December 2016, alongside additional interviews with a wider pool of experts in the public and private sectors. We conducted more than 20 semi-structured interviews with industry experts, academics, investors, and policy-makers. In a first step, we identified key experts on infrastructure finance from the the combined networks of the Coalition for Urban Transitions and the New Climate Economy. The objective was to get a comprehensive overview of barriers and enablers from different angles. In a second step, we employed a snowballing technique to identify additional interviewees (e.g. at the end of each interview the interviewees were asked for further recommendations).

In contrast to standardised interviews, semi-structured interviews are not arranged around a set of standardised questions and answers. Instead, they are organised around an interview guide that encompasses the key themes to be covered. In turn, this interview guide was structured around the analytical frame of the project. This approach provided a sequenced structure, while allowing sufficient openness for the possibility of discovery.

The synthesis of evidence in the global review also drew on London School of Economics (LSE) databases, including credit ratings at national and city levels, urban populations, and urban carbon emissions. Some datasets were developed under LSE's initial NCE urban analysis in 2014, while others have not been used for NCE analysis before.

The process of evidence gathering and synthesis allowed the opportunity to engage actively with stakeholders at two levels. First, a Finance Working Group of experts from the public and private sectors was created between September and December 2016. This included experts from a wide range of organisations from the public and private sectors: Deutsche Bank, Organisation for Economic Co-operation and Development (OECD), World Bank, the Urban Land Institute, the Climate Policy Initiative (CPI), C40 (Finance), LSE, PwC, and Siemens. Members of the working group provided inputs into the evidence-gathering exercise for the global review. Second, we conducted additional interviews with: the PRI (Principles for Responsible Investment), which represents over 1,600 signatories from the global financial services sector; the UNEP Finance Initiative, in collaboration with 200 financial institutions, including banks, insurers, and investors; Findeter, and the Nordic Development Fund.

2. Why finance matters for delivering sustainable urban growth

2.1 THE 3C MODEL OF URBANISATION

Urbanisation is one of the most important potential drivers of productivity and growth in the global economy. Between 2014 and 2050, the urban population is projected to increase by around 2.5 billion people, reaching 66% of the global population.[1] By 2030, China's cities alone will be home to nearly 1 billion people. India, Nigeria, and Indonesia will also experience rapid population growth. If managed well, the potential benefits of this urban growth are substantial. The economic potential is driven by the raised productivity that results from the concentration of people and economic activities in cities, which leads to a vibrant market and fertile environment for innovation in ideas, technologies, and processes. Similarly, well-managed cities in high-income countries could continue to concentrate national economic growth, through re-densification and the roll-out of innovative infrastructure and technologies.[2]

However, evidence suggests that governance and market failures limit the potential economic benefits, and impact negatively on the environment and on the quality of life of urban citizens. Where markets operate effectively, efficiently, and equitably, governments should not intervene. Nonetheless, urban growth and associated infrastructure deployment that is purely market based leads to a number of market failures, which in turn can hinder productivity and overall economic growth. Among these market failures are urban sprawl, congestion and longer travel times, negative externalities of pollution and carbon emissions, network externalities, reduced agglomeration effects on innovation and skills matching, and imperfect and asymmetric information.[3]

The urban infrastructure that countries and cities construct today will lock in economic and climate benefits – or costs – for decades to come. Urban infrastructure investments are typically in the range of 30 to 100 years, and the path dependencies created by urban form are sustained over centuries. Historical path dependencies can be seen in the widely varying rates of energy consumption and greenhouse gas emissions today among cities with similar per capita income and climate, due to past policy decisions that have shaped their urban form, transport systems, and building energy efficiencies. Over the next decades, this will be particularly important for cities in emerging economies. For example, 70–80% of the urban infrastructure that will exist in India in 2050 has yet to be built.[4]

If rapidly growing cities lock in a footprint of urban sprawl, the economic, climate, and social costs will also be locked in over the long term. A study of 50 cities worldwide estimated that almost 60% of growth in expected energy consumption is directly related to urban sprawl – more than the consumption related to increases in gross domestic product (GDP) and demographic changes.[5] Exposure to ambient and household air pollution, which results from a range of building, energy, transport, and land-use factors, cost the world's economy around US$5.1 trillion in welfare losses in 2013.[6] This is most acute in emerging economies: welfare losses in South Asia and East Asia and the Pacific were the equivalent of 7.4% and 7.5% of the regional GDP respectively.[7]

Consequently, if countries and cities are to capture the productivity benefits of urban growth while minimising the costs, cities will need to shift to a more economically and environmentally sustainable pattern of growth. In particular, urbanisation will need to be managed to avoid inefficient urban design, infrastructures, governance, financing mechanisms, and institutions.[8] If managed well, a range of higher-density infrastructure and services can be provided at lower per capita cost, supporting development goals and enhancing economic productivity. Failure to do so will produce a range of increasingly negative financial, social and environmental outcomes.

Addressing the market failures associated with poorly managed urban growth will require a new urban development model for many cities. In particular, three pillars are crucial: compact urban growth, connected infrastructure, and coordinated governance. These 3C pillars – compact, connected, and coordinated – can drive cost and resource efficiencies, through the benefits of economy of scale and agglomeration, and by fostering energy efficiency, renewable energy, resilience, productivity, environmental protection, and sustainable growth in the urban economy.[9] National and local fiscal policies affect all three aspects, and can be seen as a driver of sustainable structural change.

The three pillars of the 3C model of urban development are overlapping and mutually reinforcing, requiring integrated policy programmes to capture their benefits fully:

- **Compact urban growth:** through managed expansion and/or urban retrofitting that encourages higher densities, contiguous development, functionally and socially mixed neighbourhoods, walkable and human-scale local urban environments, the redevelopment of existing brownfield sites, and provision of green spaces.
- **Connected infrastructure:** through investment in innovative urban infrastructure and technology, such as bus rapid transit (BRT), cycle superhighways, electric vehicles, smart grids, energy efficient buildings, and essential water, sanitation, and waste services.
- **Coordinated governance:** through effective and accountable institutions to support the coordinated planning and implementation of programmes of activity and investment across public and private sectors and civil society.

A range of investments across multiple sectors will be required, many of which will need to be supported by new business models and financing models. This range of 3C investments includes but is not limited to:

- **Transport:** Investment is required in mass transit systems such as BRT and rail; cycling infrastructure and bike-share programming; infrastructure and spatial development for safe walking; electric cars, buses, lorries, and bicycles; car-sharing; “smart” mobility technologies to promote mobility choice; and emerging technology in autonomous vehicles.
- **Energy networks:** The shift to more localised and renewable/low-carbon energy solutions will involve a mix of district energy systems (thermal and electric); “smart” energy grids, including microgrids; distributed generation (solar electric and thermal principally, but also biomass/gas fuel cells and microturbines); local/regional scale centralised generation (solar, wind, and wave and tidal); demand response and “negawatt” energy dispatch; electric vehicle charging; and energy storage.
- **Buildings:** Buildings will be designed and retrofitted for energy and carbon/water/material efficiency and occupant health and productivity through locational choices and passive design strategies; efficient lighting, heating, cooling, ventilation, cooking, and building management technologies; energy generation and storage; thermally efficient building fabric systems/materials; locally or regionally sourced materials low in embodied energy and water; low-consuming water fixtures.
- **Water:** Water supply and waste- and storm-water management strategies and systems will be particularly influenced by the impacts of climate change. Solutions will include local water capture, treatment, and re-use (building to district scale); “green” and “blue” infrastructure (i.e., natural water attenuation, conveyance, and treatment systems); integrated urban/hinterland water resource management via land-use and landscape practices; and water-efficient urban and peri-urban agriculture.

- **Waste:** Initiatives will include reducing resource throughput via waste-to-energy systems; advanced manufacturing and production (e.g. 3-D printing); enhanced material sorting and recycling; and food and sewage nutrient recycling.

The list, while indicative, suggests that 3C infrastructure needs to be considered broadly as infrastructure in a more traditional sense (roads, water networks, railways, etc., from public or highly regulated investors and operators), and also a range of publicly and privately built assets and asset upgrades that contribute to low-carbon, economically diverse, socially inclusive, and climate-resilient cities.

2.2 INFRASTRUCTURE: A WIDENING DEFICIT IN GLOBAL INVESTMENT

Delivering the 3C model of urbanisation will require substantial investments in sustainable infrastructure.[10] The Paris Climate Change Accord, the UN Sustainable Development Goals, the Habitat III New Urban Agenda, and the Sendai Framework for Disaster Risk Reduction have all shown the need for a more strategic approach to investing in public infrastructure – one that leverages private and institutional capital more effectively. Developing and developed countries face substantial fiscal constraints,[11] and infrastructure development in the developing world, where it is needed most, has been limited, except in certain parts of East Asia.[12] A range of investments across multiple sectors will be required, many of which will need to be supported by new business models and finance structures. Examples include mass transit, energy networks and distributed renewable energy production, energy and resource efficient buildings, water supply, waste water management and waste reduction. Cross-border or national infrastructure is necessary, but needs to be supplemented by local investments and public service delivery for inclusive growth.

However, even financing business as usual infrastructure is currently a huge global challenge. In an early study, the OECD suggested that around US$50 trillion would be required for investment in global infrastructure over a 15-year period.[13] This included investments in road, rail, and basic energy and water infrastructure, much of this in cities. More recent estimates suggest that US$3.4–6 trillion will be required per year over the next 15 years.[14] In another study, the annual investment required has been estimated at US$4 trillion a year in 2015 rising to US$9 trillion a year by 2025, with total demand reaching US$78 trillion over the 10-year period.[15] Capital requirements for buildings alone are as high as US$7 trillion over the next 20.[16]

Under current projections, many cities will not be able to raise the finance required to meet this demand for infrastructure. According to a range of estimates, the deficit in investment for global infrastructure is growing by more than US$1 trillion annually. This investment gap is particularly acute in developing countries and emerging economies.[17] Recent estimates for a step change in infrastructure expansion to support growth acceleration and development put the gap in financing needs of developing countries between US$1.2 trillion and US$2.3 trillion per year, an increase of around 3–5% of developing country GDP.[18] If operation and maintenance costs are included, then these estimates could be doubled. In India alone, the gap in urban infrastructure investment is estimated at US$827 billion over the next 20 years.[19] Moreover, state-level debt in India has doubled in the past five years to $304 billion, putting pressure sub-national finances as well as constraining future access to financing.

If this infrastructure gap is not closed, and in the absence of adequate property rights, millions of urban dwellers will face living in informal settlements without basic sanitation, clean drinking water, energy provision, and waste collection. And without adequate shelter, public transport systems and general accessibility, people's mobility for employment, livelihood and quality of life will be inhibited.

Some research suggests that delivering sustainable infrastructure would require additional investment. The World Economic Forum estimated that an additional US$0.7 trillion per year would be needed to move from the "business-as-usual" economy to green growth.[20] The estimate assumes that, while savings from green growth would materialise (for example, 40% of rail and maritime tonnage in the United States is for transporting

fossil fuels, the level of which would drop in low-carbon energy systems), higher costs would arise, for example resulting from technology changes (WEF, 2013). Other authors have suggested that sustainable infrastructure can often carry higher capital costs and technical risks).[21]

However, moving to a 3C urban infrastructure model could result in higher savings and lower costs. For example, one analysis for the Global Commission has estimated that low-carbon cities could generate a stream of savings equivalent to US$16.6 trillion by 2050.[22] Compact urban development tends to require less construction materials and leads to more efficient operations than sprawling development. If pursued in the United States, compact development could yield more than US$100 billion in avoided public costs for infrastructure and service delivery.[23] Estimates show that China could save up to US$1.4 trillion in infrastructure spending – equivalent to 15% of China's GDP in 2013 – if it pursued a more compact, transit-oriented urban model.[24] Other hard-to-predict changes in technology and infrastructure service delivery models (e.g. shared mobility and autonomous vehicles; individual consumer distributed energy generation) may additionally result in lower centralised infrastructure investments that historically have been publicly funded.

2.3 FINANCIAL MATURITY: THE CHALLENGE FOR LOW- AND MIDDLE-INCOME COUNTRIES

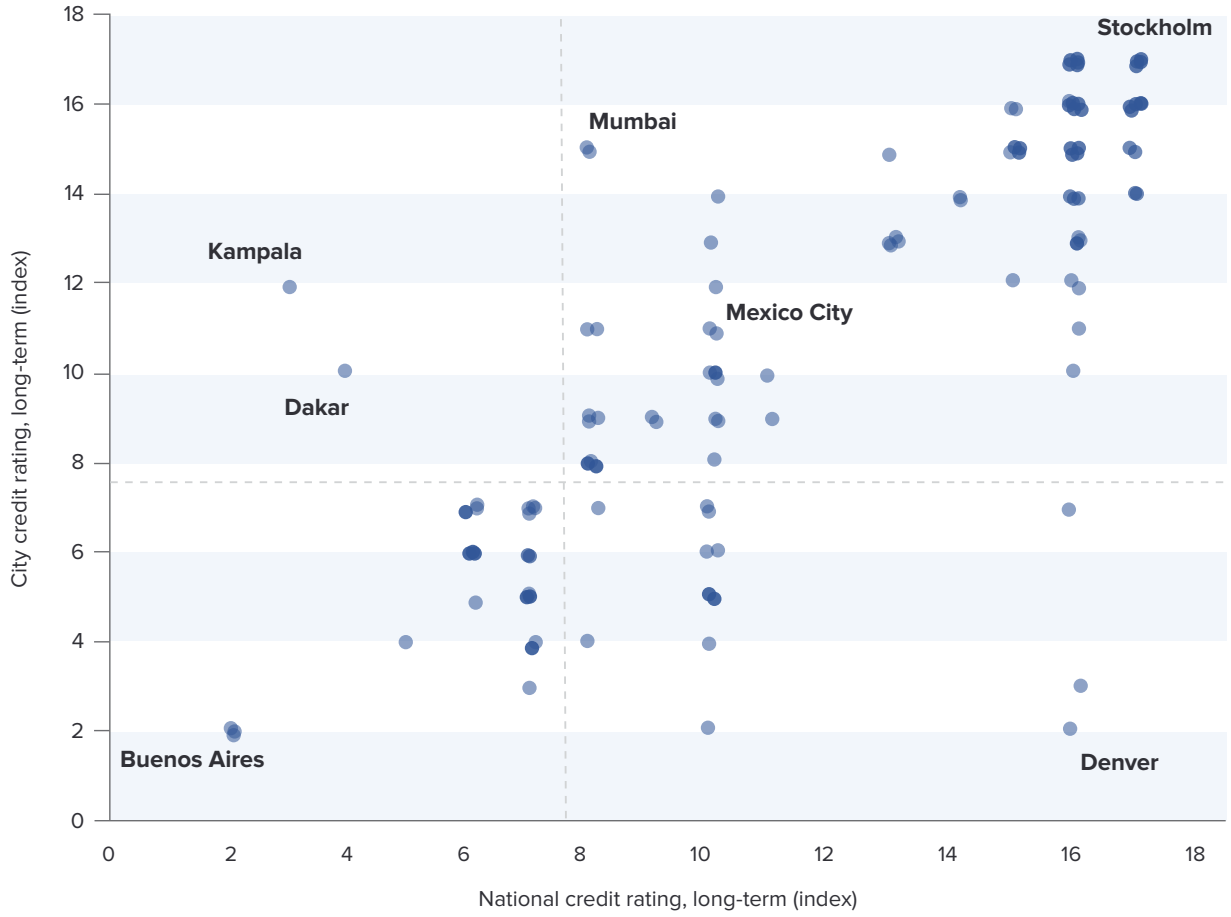
Countries at different levels of development and financial maturity face different financing challenges. In high-income countries, cities often have debt and equity financing options. Many of these cities have investment-grade credit ratings, enabling them to issue bonds and raise debt finance in the financial markets. At the same time, given high levels of income per capita, infrastructure such as renewable energy production and distribution, water networks and building developments can generate consumer revenue streams that incentivise private investors to purchase equity as a long-term investment.

In contrast, many low- and middle-income countries face severe constraints to accessing finance. In terms of debt financing, our analysis shows that 93% of low-income and lower middle-income countries have sovereign credit ratings that are below international investment grade. Interviews with finance experts suggest that the risk of infrastructure projects is often perceived to be too high for commercial and institutional investors in terms of equity financing, while the returns from user fees and revenue-generating assets are too low to provide a sufficient profit margin from an investment.

While national financial maturity and economic development are important determinants of a country's readiness to finance infrastructure at scale, national strategies will also need to take account of city-specific circumstances. Figure 1 shows that, while the local credit ratings of cities are significantly correlated with the international ratings of their respective countries, large variance exists between cities within a country. Similarly, Figures 2 and 3 show that, for low- and middle-income countries, city GDP per capita and projected carbon emissions growth are largely independent of the national level of financial maturity. This suggests that finance instruments and government enablers that are used to overcome infrastructure investment barriers will need to be tailored not only to different levels of national development and financial maturity but also to the specific circumstances of individual cities. Clearly asymmetric solutions are possible, but require local tax reforms to sustain access to credit.

Cities can receive investment-grade credit ratings in local debt markets even in countries that are speculative grade on the international markets. This opens a possible channel to debt financing for well-managed cities in lower-income countries. For example, capital cities Dakar (Senegal) and Kampala (Uganda) have achieved an investment-grade rating in their local markets despite international sovereign ratings of Senegal and Kampala being below investment grade (Figure 1). However, Dakar was unable to issue its bond due to national government restrictions, while Kampala has not yet issued its first bond. This demonstrates the impact of national government policy even when cities attain investment-grade ratings in local markets.

Figure 1
Relationship between city- and national-level credit ratings



Note: For national credit ratings, indices of 1 to 17 represent indexed ratings from the major international ratings agencies, with 1 being the lowest rating and 17 being the equivalent of AAA. A credit rating of 8 or above (dotted line) indicates an investment grade rating. For city credit ratings, indices of 1 to 17 represent local ratings, some of which correspond to international ratings.[25]

Source: London School of Economics analysis.

Despite examples such as Dakar, Kampala, and Mumbai, the average local rating of most cities is similar to or lower than that of the national government's international rating. As a result, commercial investors, such as infrastructure developers and funds, tend to concentrate their urban infrastructure financing in high-income countries, with cities in low- and middle-income countries generally relying on bank loans with higher interest rates. According to the Low Carbon City Lab, part of the EU-funded Climate-KIC, 13% of total capital from global green bond issuances flows to cities in mature markets, whereas less than 2% flows to cities in emerging markets.[26]

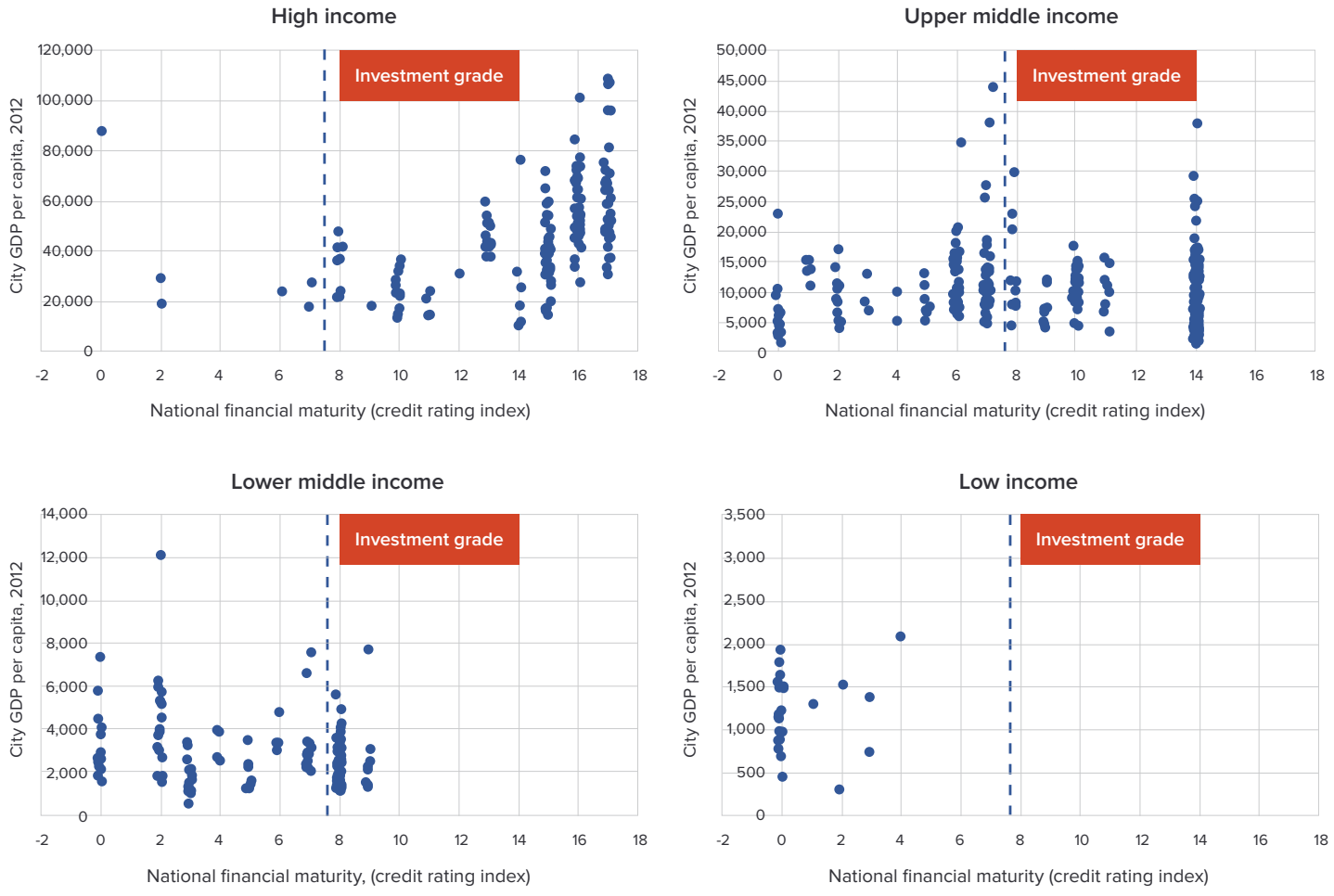
Cities will benefit from different strategies for increasing and leveraging their financial maturity, depending on their starting position. The credit ratings in Figure 1 can be used as proxies for financial maturity, as these ratings are based on various factors including debt levels and sound management of public finances by municipalities. Cities in the upper-right quadrant of Figure 1 (e.g. Stockholm, Mexico City, Mumbai) are relatively financially mature with sound municipal finances combined with highly rated sovereign debt of their respective countries. A strategy for these cities would be to use their high ratings wisely to leverage substantial debt finance where appropriate. Cities in the bottom-right quadrant (e.g. Denver) have the advantage of being in a highly rated country but are themselves underperforming in their reputation for municipal financial management. These cities have the greatest potential to shift their financial maturity upwards – even on international scales – through management capacity-building. Cities in the

top-left quadrant (e.g. Dakar, Kampala) have worked to increase their financial maturity despite being located in countries that are below investment grade internationally. The strategy for these cities will be to coordinate with their national governments to ensure that the municipality can obtain better spending responsibilities and access local debt markets where appropriate. Cities in the bottom-left quadrant (e.g. Buenos Aires) have low financial maturity and are located in countries that are below investment grade. These cities may look to international and national public funding for investments rather than seeking debt finance. At the same time, these cities can follow the lead of Dakar and Kampala by increasing their own creditworthiness over time. In all these four city types, national governments will play a critical role in supporting cities to deliver on their strategies through national-level regulatory frameworks, coordinated funding, and governance.

Even in high-income countries, municipal debt financing has not been a panacea to infrastructure investment needs. Many cities have accumulated substantial debts through bond issuances and private loans with the result that ongoing debt repayments prevent investments in future projects. Extreme cases are some cities in the United States, such as Detroit (Michigan), San Bernardino (California), Hillview (Kentucky), and Central Falls (Rhode Island) that have filed for bankruptcy.[27] Similarly, some experts interviewed have argued that many of China's cities may become over-leveraged, as state banks are obliged to purchase municipal bonds without sufficient own resources for payback. For these reasons, debt financing should only be considered as part of a sound financial management approach, including a local revenue collection and expenditure system that can anchor sustainable access to capital markets.

Figure 2

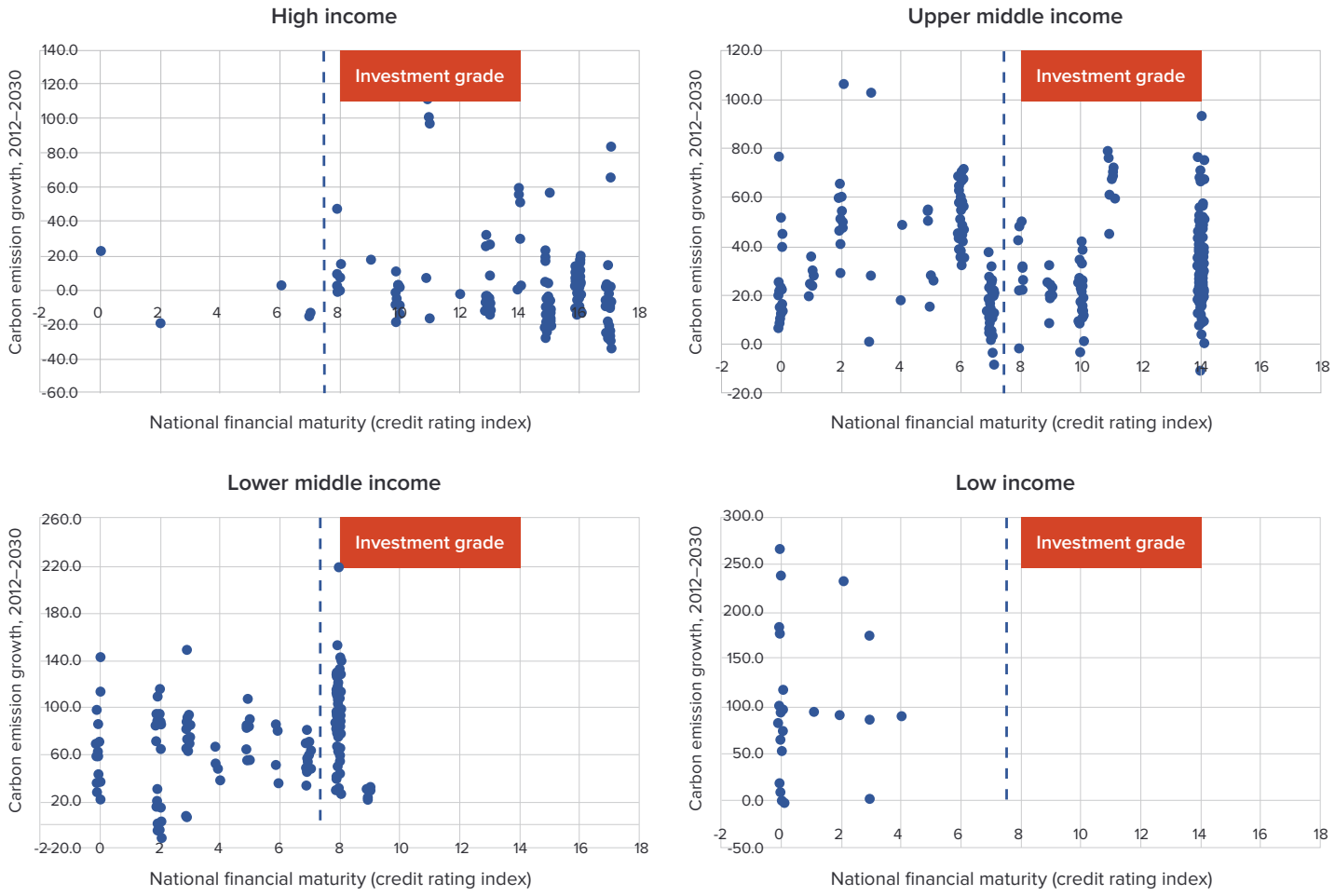
Relationship between city GDP per capita and national financial maturity (measured as sovereign credit rating) in countries with different income levels.



Source: LSE analysis with GDP data from World Bank and ECOFYS (2016).[28]

Figure 3

Relationship between city carbon emissions growth and national financial maturity (measured as sovereign credit rating) in countries with different income levels.



Source: LSE data and LSE/Oxford Economics analysis (see Floater et al., 2014a).[29]

3. Sources of finance and investment barriers

3.1 THE RANGE OF FINANCIAL SOURCES

A range of public and private finance sources will be required to deliver sustainable urban infrastructure. The scale of the global infrastructure investment gap over the next two decades raises the question of where governments can access the additional finances to deliver the required level of sustainable urban infrastructure. While some municipal governments can draw on funds to finance large infrastructure projects, even cities with relatively large own-sources of funding will generally require additional finance.

While many municipal governments are well placed to lead and manage urban infrastructure programmes, they often have limited powers and institutional capacity to raise finance. According to the IADB governance database,[30] less than half of countries (42%) are recorded as devolving fiscal or legislative powers to subnational governments, and of these the depth of revenue-raising powers is highly variable. In a global study, only

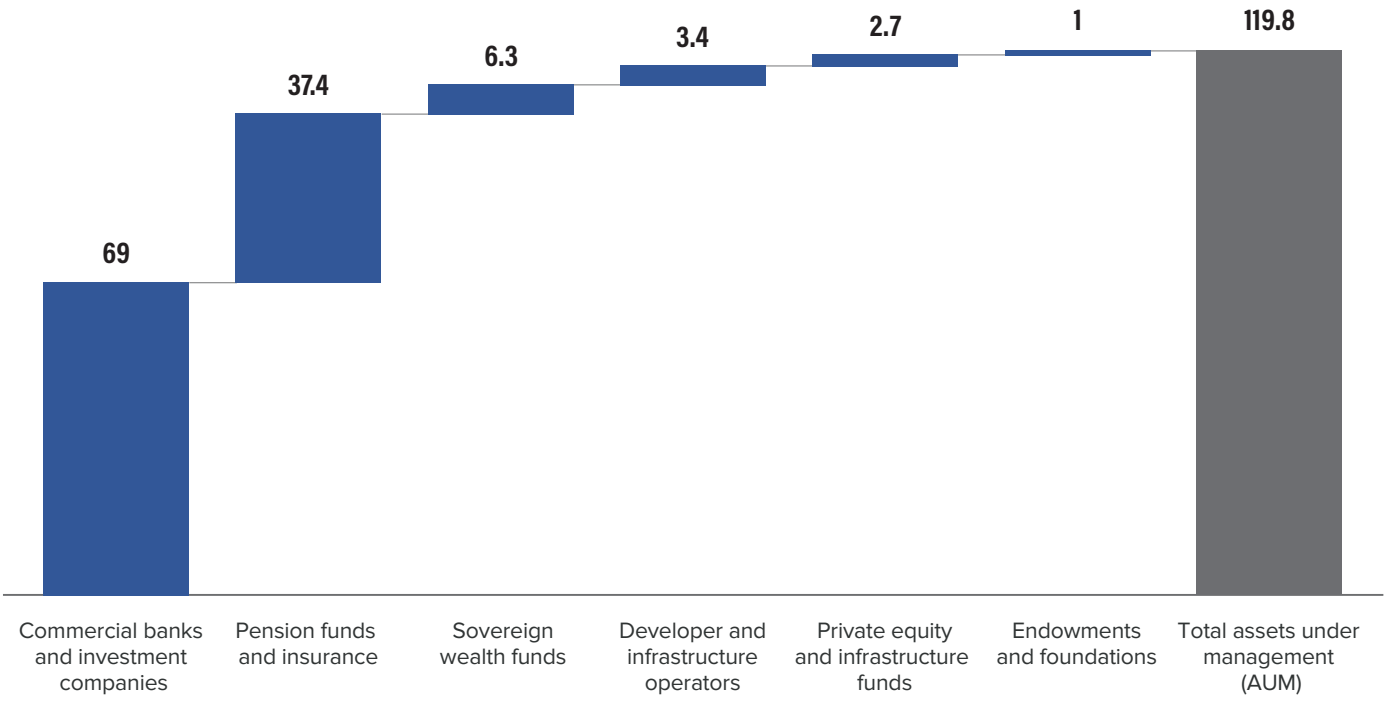
16% of countries sampled were found to grant significant taxation autonomy to their local governments. Similarly, 56% of countries forbid any kind of borrowing by local governments, while only 22 countries allow borrowing without any restrictions.[31] While, in specific cases, these restrictions may be an effective – even necessary – means of maintaining budget discipline, it highlights the challenge that municipal and regional governments face when financing urban infrastructure programmes.

National finance ministries can play a role in providing more effective fiscal transfers to complement municipal sources of funds. However, in many cases, national and municipal funds will be insufficient to finance the programme of infrastructure delivery needed across cities in a country. This is particularly so in low- to middle-income countries. Consequently, the scale of the global investment gap will also require the involvement of private finance as well as international public funds, either through direct transfers from international bodies into cities/projects or indirectly through dedicated national-level investment vehicles.

Substantial sources of private and institutional finance exist that could help to reduce the infrastructure investment gap and be incentivised to finance sustainable infrastructure in cities. Nearly US$120 trillion of assets are currently under management by a range of commercial and institutional investors (Figure 4). Of these, commercial banks and investment companies represent US$69 trillion, while pension funds, insurance, and sovereign wealth funds (SWFs), which often tend to have a longer-term investment horizon, represent a further US$43.7 trillion. Developers, private equity, and infrastructure funds hold a combined US$6.1 trillion of assets.

Figure 4

Comparison of assets under management of private and institutional investors in 2015 (US$ trillions).



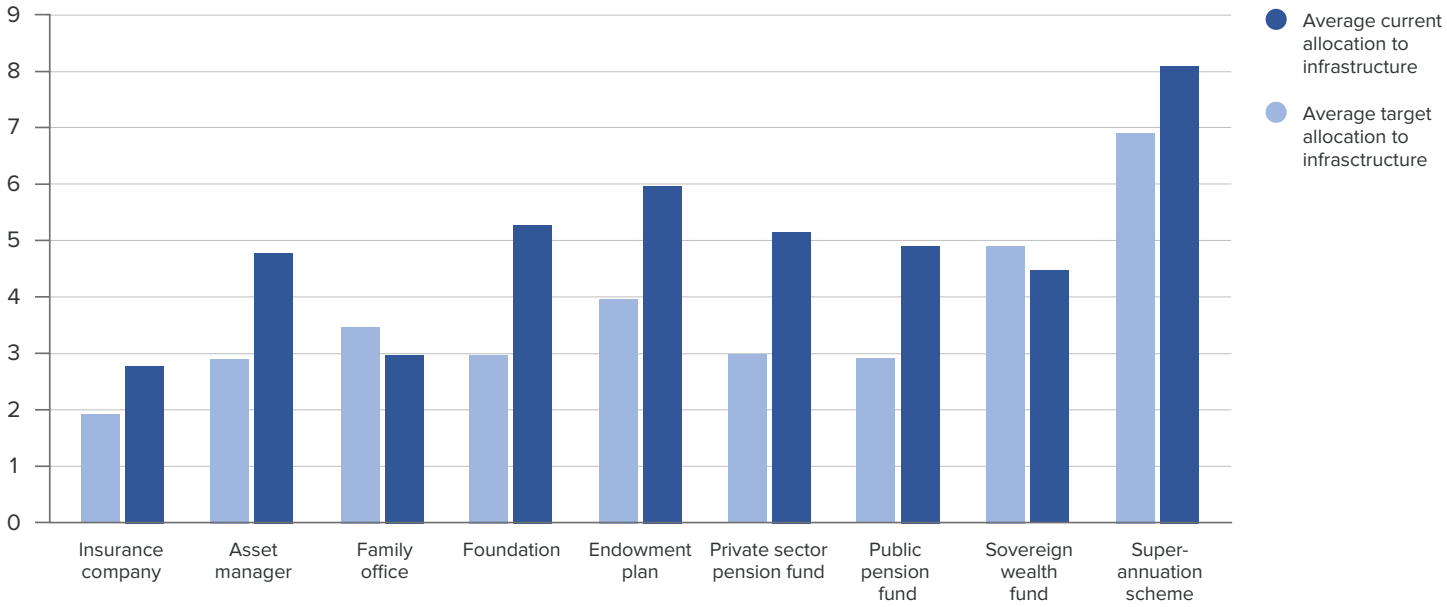
Source: McKinsey (2016) based on data from Preqin (2015).[32]

Bankability and creditworthiness are prerequisites to attract private finance. Private investors will be drawn to public infrastructure investments where a sufficient return on investment is forecast, based on income flows, to repay investors, or where governments can provide low-risk debt repayments based on wider municipal revenue sources. A range of finance instruments and mechanisms are available to suit either case, with different instruments being attractive to different types of investor. Unpacking the constituent elements within these pools of public, private and institutional capital is important, given the differing factors such as risk-return expectations and investment horizons of various investor groups.

Public capital sources and private investor profiles will suit different types and stages of public infrastructure. For example, private equity and infrastructure funds seek the greatest return and invest particularly in unlisted equity of projects with strong growth potential. These funds often invest in relatively new or unproven markets and technologies. In contrast, pension funds and insurance companies search for investments that provide steady long-term predictable income streams in order to meet ongoing obligations. Suitable investments are notably those that earn income or are of sufficient liquidity to pay pensions or insurance claims.[33]

The largest capital pool in terms of assets under management (AUM) may not necessarily be the most promising source of finance. A deeper understanding of how the available finance sources can suit various project stages, market and governance conditions, and investor appetites can create better targeting between investment need and capital resource. In general, all private investors will benefit from growth of secondary markets/improved liquidity in infrastructure finance. As Figure 5 shows, investor targeting of infrastructure financing is low and under-target across the institutional sector.

Figure 5
Breakdown of average current and target allocation to infrastructure by investor type



Source: Standard & Poor's (2014) (based on Preqin data).[34]

3.2 NATIONAL PUBLIC FINANCE

National government

According to Standard & Poor's, the average level of government infrastructure investment is about 3% of global GDP. Governments have traditionally financed a significant proportion of infrastructure investments through their revenue-raising and budgetary powers. Where revenue and budget powers remain largely centralised (i.e. at the national rather than local level), intergovernmental transfers may be the prime source of finance for local infrastructure.

Unlike in emerging markets, notably China (8.5%) and India (4.7%), government spending in OECD countries is declining.[35] Public budgetary constraints that result from a combination of factors, such as rising sovereign debt, slower economic growth, political uncertainty, and social conflict will negatively impact levels of national public investment in sustainable urban infrastructure in countries across all income levels. Local market investments can be further restrained by a lack of own-source revenues and/or poor management of fiscal transfers. In mature markets, evidence suggests that reduced infrastructure spending due to austerity measures has prolonged economic stagnation in many countries.[36] In a range of low- to middle-income countries, political unrest, conflicts, trade sanctions, and endemic corruption have all been factors in reducing investor confidence at national and local levels.

Government debt instruments, such as bonds[37] or direct project finance, will continue to be effective finance solutions where balance sheets are strong – a limitation in many jurisdictions. Off-balance sheet special purpose vehicles (SPVs), in collaboration with private entities, may be one solution for addressing balance sheet constraints. However, this will vary by government accounting practices. In many cases, assets developed by government or those acquired through private finance initiative contracts (including PPPs), should be kept on balance sheet and associated borrowing recorded as a liability.[38]

With insufficient public finance comes the need for government to set market conditions for attracting capital through effective regulation, budgeting, budget and investment forecasting, and project development and management. This can strongly influence the investment environment for public infrastructure and improve project bankability. As an example, having the flexibility to restructure budgets so that they accurately value and internalise positive and negative climate externalities, and attributes associated cash flows accordingly, may facilitate investment – for example, using a transportation budget to finance a local cycling scheme but accrue savings in the health budget as citizens exercise more and breath cleaner air.[39] Alternatively, perverse incentives resulting from government policy may hinder investment in low-carbon infrastructure – for example, subsidies that keep fossil fuels artificially attractive and reduce incentives to invest in clean energy and energy efficiency.[40] It is critical that governments focus on fundamentals, such as the transparent budget processes and the effects of tax reforms on production and consumption.

National development banks

National development banks (NDBs) are government-backed, government-sponsored, or government-supported financial institutions. They have specific public policy mandates, which they support through their capacity to, for example, extend credit on favourable terms or take long-term equity stakes. NDBs have existed since the 19th century, and by 2005 there were over 550 development banks worldwide.[41] Recent NDB growth is impressive: around 40% were created between 1990 and 2011.[42] This follows a period of financial distress for NDBs in the 1970s and 1980s, characterised by significant delinquency rates, particularly among agricultural banks.[43] With 152, Latin America hosts the largest number of NDBs, followed by Africa (147), Asia and Pacific (121), Europe (49), and West Asia (47) (Chandrasekhar, 2016). At the end of 2011, NDBs in Latin America had outstanding assets of nearly US$1 trillion and a capital base of US$100 billion.[44]

Most NDBs are completely state owned, although this can mean mixed ownership involving multiple levels of government (e.g. the German Bank of Development Kreditanstalt für Wiederaufbau, KfW); or mixed national, foreign, and multilateral ownership (e.g. the Development Bank of Kenya is owned by the Government of Kenya, Netherlands' Fin.-Maatschappij voor Ontwikkelingslanden N.V., the Commonwealth Development Corporation, Development Bank of Germany, and the International Finance Corporation). Most NDBs are structured to allow borrowing from other institutions or issued debt in domestic markets.[45] Some NDBs receive their funds solely from central banks, national treasuries, or ministries of finance and, in such cases, tend to be only development funds rather than banks.[46]

NDBs tend to be early-stage investors, can take on finance risk more readily than private financiers, and are particularly effective in providing long-term financing in local currencies in their local credit markets.[47] Another differentiating feature among NDBs refers to their project exposure. Tier 1 loan banks provide direct loans and take some or all of the project obligor's credit risk. In this case, the NDB acts like a commercial bank, extending credit directly to a project or a company. However, few national development banks are active infrastructure investors. According to a survey of 90 NDBs across 61 countries, only 4% have an infrastructure mandate.[48] Many NDBs also have capacity deficits in managing highly complex deals and mechanisms by themselves, such as interest rate hedging instruments or capital market guarantees.[49]

3.3 INTERNATIONAL PUBLIC FINANCE

Multilateral development banks and bilateral donors

Multinational development banks (MDBs) are important sources for mobilising capital for infrastructure investments (especially in low-income countries).[50] With their expertise, technical assistance, and structuring abilities, MDBs can play a role in the early stages of financing through to later operating stages. Their presence and convening power can create the perception of lower risk, lending credibility to a project to leverage additional finance from other financial institutions.[51] In addition to direct debt and equity finance, MDBs can: provide loan guarantees; offer in-house project preparation and technical project appraisal; undertake deal structuring; and generally support developers through high-risk phases.[52] The targeted application of MDB guarantees to address risks can be critical in the success of large infrastructure projects.[53]

Annual infrastructure financing from MDBs more than doubled from 2004 to 2013, from US$20 billion to about US$54 billion. The Asian Development Bank (ADB) has recently increased its lending capacity by 50%.[54] However, many see MDBs as operating below their potential. Leveraging some of their unique features though could allow them to play a much larger role moving forward. Doing so may require more flexibility (e.g. in gearing ratios or willingness to accept a lower credit rating than AAA), and an increase in technical capacity to grow project pipelines and deal-flow.[55]

Traditionally, MDB funding has focused on highway construction and other non-urban infrastructure. At the Rio+20 summit in 2012, the eight largest MDBs committed to a broad target of investing US$175 billion in sustainable transport over the next decade to 2022.[56] However, in 2013 many MDB-financed projects were still road constructions and around 80% of projects were not focused on urban areas. This suggests that, for the foreseeable future, a significant proportion of MDB financing will continue to provide incentives for business-as-usual urban growth rather than compact urban growth and connected infrastructure.

The MDB landscape is undergoing a degree of change with the capitalisation and launch of a handful of new institutions (though not necessarily urban focused). These are being driven by China and other key newly mature and emerging economies.

- **BRICS Bank** – a new development bank with an authorised capital of US$100 billion, which was launched in 2014. The major objective behind the creation was the mobilisation of resources for infrastructure and sustainable development projects in BRICS countries through loans, guarantees, equity participation and other financial instruments (New Development Bank, 2016).
- **The Asian Infrastructure Investment Bank (AIIB)** – the Chinese-initiated AAIB has a US$50 billion capitalisation, with plans to double its capital base. AIIB is fully dedicated to infrastructure investments, a point of difference from existing MDBs. As such, it may be positioned to coordinate investment for entire infrastructure networks, thus increasing the bankability of individual projects in the transport, water, and electricity sectors. The AIIB's leverage ratio is higher than its peer institutions (i.e. borrowing may be as high as 20 times capital), suggesting that it will be issuing AAA-rated bonds to long-term investors though to lower-rated bonds with a higher yield.[57] Opposition to the AIIB came mainly from the United States, fearing that China will use the AIIB to expand its influence in the region at the expense of Japan and the US, in terms of competing with the ADB and the World Bank respectively.[58] But it may be that its launch has brought attention to operational gaps in the main existing institutions: the World Bank's Global Infrastructure Facility (GIF), an infrastructure preparation initiative, became operational in April 2015 (see footnote 4 on ADB's balance sheet increase).

Bilateral and plurilateral donors are also important potential sources of finance for cities. Bilateral donors already support low- and middle-income countries to raise levels of social and economic development as well as to strengthen environmental and resource management. Rather than being considered investment capital, bilateral aid can be a source of capacity-building (programme support) and finance-blending (contributing grants for project development) in the infrastructure financing area. It is also often integrated within World Bank consortia for urban development activities in respective countries. Through deep knowledge of local markets and socioeconomic and politico-economic conditions, bilateral agencies can play an important convening and collaborative role between national and local governments, international financial institutions, and international private and commercial investors in individual countries.

Climate finance

The international carbon finance market is driven by the Clean Development Mechanism (CDM) and Joint Implementation (JI), which were created through the Kyoto Protocol for "converting" emission reductions projects into Certified Emissions Reduction (CER) units, which can then be traded. The market mechanism is designed to channel project-based finance and carbon emission reduction technology from wealthier countries to lower-income countries. CERs can be generated through individual projects (e.g. a wind farm) or through an aggregation of interventions (e.g. installation of solar hot water heaters across a housing estate).

For cities in developing countries, the Clean Development Mechanism has not been a major source of funding, partly due to very high transaction costs. Urban mitigation projects play a small role in the market (less than 10% of CERs), with urban-based projects largely focused on waste management, energy efficiency, and energy distribution.[59] The Programme of Activities (PoA) was developed partly in response to investments being concentrated in large projects in a few sectors and countries.[60] PoAs are designed so that, once a project is approved, additional programme actions can be added under the single umbrella over time. Take-up has stayed low, however. Lack of awareness of existing registered PoAs that may be available for other parties to participate in, combined with transaction costs and complexity, remain substantial barriers.[61]

A particular challenge for the CDM market is the market price of certified emission reductions, which has collapsed from a high of US$30 a few years ago to under US$1.[62] Various factors are responsible for this: market design that did not include a floor price; supply and demand imbalance because emission reduction targets have not risen significantly; and slower economic growth since the CDM market completed its first transactions in the mid-2000s.[63] There is uncertainty as to how the CDM will evolve in the post-Kyoto period (2020 onwards). At the 2015 Paris and 2016 Marrakech COPs, ways to reform the CDM and JI and/or shift towards a new market-based mechanism were widely discussed but inconclusive.[64]

Recent COP agreements have resulted in an increase in climate change finance pledged by developed countries. The target is to mobilise US$100 billion a year by 2020, which will serve as a funding floor through 2025.[65] Some of this finance will be direct investment from individual countries. The balance will be channelled through dedicated finance programmes, such as the Green Climate Fund, established in 2010 as an operating entity of the UN Framework Climate Change Convention's financial mechanism. The Green Climate Fund has achieved an initial resource mobilisation in excess of US$10 billion. Key fund features include:

- a goal to achieve a 50/50 balance between mitigation and adaptation investments;[66]
- the capacity to attract and channel direct private sector investments through a private sector facility;
- a risk-bearing capacity, allowing the Fund to support innovation and leverage and crowd in additional financing; and
- the variety of financial instruments available, such as grants, concessional loans, subordinated debt, equity, and guarantees.[67]

The Green Climate Fund works through a wide range of accredited entities to channel finance on a project and programme basis. These can be private, public (national and subnational), and non-governmental organisations (NGOs). Many are bilateral and multilateral development banks. Accredited entities carry out a range of activities, from the development of funding proposals to the management and monitoring of projects and programmes. Nearly half of the Green Climate Fund's mobilised funding to date has been grants; loans make up another 42%.[68]

The large grant allocation is consistent with the Green Climate Fund's mission to provide readiness support to facilitate additional finance flows. There has been some concern, however, that the process for designating accredited entities is cumbersome and that the range of entities eligible and accredited creates duplication with existing programmes and institutions.[69] There has also been concern that the nature of the funding approvals to date don't fulfil the organisation's objectives for transformational impact and deploying financial instruments for high private sector capital leveraging.[70]

3.4 PRIVATE FINANCE

Commercial banks and investment companies

The value of global commercial bank assets under management (AUM) is estimated at around US$40 trillion, with a further US$29 trillion managed by investment companies.[71] This makes commercial banks the largest potential source of capital for infrastructure projects. However, currently banks provide only around US$300 billion to infrastructure projects annually.[72]

Commercial banks can take debt or equity positions and adjust their risk-return appetites based on whether the asset is acquired for yield or for capital appreciation. They can be agents for infrastructure debt securitisation, stakeholders via their private equity platforms, or managers of infrastructure investment funds. Categorisation of infrastructure assets may be: social infrastructure education and healthcare facilities, courts and prisons, etc. (low risk and return); regulated assets such as utilities (medium risk and return); economic infrastructure such as cable systems, ports, and toll roads (higher risk and return); and hybrid regulated and economic assets (e.g. broadcast and wireless towers, waste) (BNP Paribas, 2008).

Financial services regulations contribute to the gap between AUM and investments in infrastructure. For example, high reserve/liquidity requirements by many central banks make it more costly for banks to make long-term commitments for infrastructure projects. These limitations are generally informed by the international Basel III regulations, a global, voluntary framework aimed at strengthening commercial banks' capital and which most central banks draw upon for their national regulatory frameworks.[73] The major aim is to discourage any mismatches in the maturity of assets and liabilities. Basel III has the effect of encouraging shorter tenors, making it more difficult and expensive for commercial banks to finance long-term infrastructure projects.[74] Consequently, banks tend to invest in infrastructure assets when they are operating.[75] In addition, commercial banks, through their project finance expertise, are often more heavily vested than other institutional investors in the riskiest project stages – construction and early operations.[76] This may explain lending caps in countries such as India, which limit commercial bank exposure to any one sector at 15% of total net worth in spite of the massive infrastructure funding need in that country.[77]

Most international commercial banks limit their geographical exposure to OECD markets. Among the largest banks, Credit Suisse is one that allows infrastructure investments in selected emerging markets; Nomura is another, with expansion into the infrastructure segment in lower-middle-income countries in Asia (e.g. Indonesia, Philippines, Vietnam, Cambodia, and Myanmar). In less mature capital markets, local banks often lack the technical capacity or willingness to enter into complex and long-tenor infrastructure projects, irrespective of capital reserve requirements.[78] This is partly an issue with minimal access to long-term capital in these markets, which raises the cost of finance. Should banks seek to raise long-term debt from international sources, or partner with international banks for project finance, currency risks become an issue. Perceived or actual high risks of sustainable, low-carbon projects also play into this low investment focus in less mature markets, but it is also a barrier (though less pronounced) in mature markets.[79]

Developers and infrastructure operators

Infrastructure developers are privately held, listed, or state-owned companies that actively invest their balance sheet capital in infrastructure projects. There is great variation in their structure and geographical reach, ranging from domestic construction groups (e.g. Taylor Wimpey, China Communications Construction Company Ltd), domestic conglomerates (e.g. Kier Group), international construction groups (e.g. Vinci Construction), and international conglomerates (e.g. Ferrovial).[80] There are also infrastructure subsidiaries of international conglomerates (e.g. Cheung Kong Holdings Infrastructure) and infrastructure arms of SWFs (e.g. Abu Dhabi Future Energy Company, aka Masdar). It is common to see developers from small countries with well-regarded infrastructure assets to seek international opportunities, for example: Strabag (Austria), NCC (Sweden), Salini Impregilo (Italy), BAM (Netherlands), Cheung Kong Infrastructure

Holdings Ltd (Hong Kong), and Keppel Infrastructure (Singapore). While OECD country investments are most common, softening market conditions since 2008 in several mature markets have compelled the search for emerging market opportunities. European infrastructure developers have recently participated in projects such as the Panama Canal, the Riyadh Metro line 3, the Doha Metro system, and the Grand Ethiopian Renaissance Dam.

Infrastructure developers are generating increasing revenue shares from non-greenfield construction business as a result of efforts at diversification by developers into non-construction services along the infrastructure value chain. On average, European developers' operating income from other activities (non-construction) grew two to three times the rate of income from core construction activities for the period 2013–2015.[81] Note, as well, that many large infrastructure companies operate on an integrated approach to develop and hold assets. This both reduces liquidity in the overall infrastructure market, as projects are not released into the secondary market, and minimises the capital return and recycling potential for these companies.[82]

Private equity and infrastructure funds

The value of global private equity and infrastructure fund assets under management is estimated at around US$2.7 trillion.[83] Private equity (PE) firms invest listed or unlisted equity through a number of means and strategies, notably venture capital, mezzanine financing, and leveraged buyouts. Many PE firms target opportunities with enhanced risk adjusted returns through a combination of capital appreciation and cash yield, targeting between 15% and 25% returns.[84] Most typically have short- to medium-term exit strategies. When investing in infrastructure, they tend to focus on unlisted assets that cannot be easily traded and therefore involve greater risk and return. On the whole, PE target rates are higher than those that most infrastructure projects can typically deliver. Strategies such as taking technology risk (innovative deployment of emerging technologies) do offer one area where these return expectations may be met.

PE firms often act as conduits to channel investment from institutional investors to infrastructure. Because of their appetite for higher risk, PE firms can play an important role in financing infrastructure in developing countries where there is a lack of investment-grade bonds. PE investments thus offer one alternative to raising finance. Reflecting this, a number of developing countries, such as Senegal,[85] have recently set up their own sovereign PE firms. Some large institutional investors have also started to build their own PE arms rather than outsourcing investments.[86] However, the principal infrastructure focus of PE firms remains on assets in OECD countries, which is where they mostly fundraise and operate from.

3.5 INSTITUTIONAL INVESTORS

Pension funds and insurance

Pension funds (including public pension funds and superannuation funds) and insurance companies hold around US$37 trillion in assets globally.[87] They are the two largest institutional investors in infrastructure as well: 42% of infrastructure assets under management are held by insurers; 24% by public and private pension funds.[88] Insurance companies and pension funds share important similarities with regard to their liability structure and risk-return profile (i.e. they earn income and/or convert liquid assets to pay beneficiaries, and are generally risk averse).

Pension funds can be particularly large in developing countries relative to national GDP, though with great variation between them.[89] With their long-term liabilities and responsibility to act solely in the best interests of their beneficiaries, pension funds tend to have lower risk appetites than commercial investors. Generally, they target investments yielding stable returns at around 6–8% across the overall portfolio. As a result, pension funds seek long-run return on debt that is relatively well protected from losses; and cash-yielding investments that generate a stream of income year on year to support their liquidity requirements to pay pensions.[90]

There is a trend among pension funds towards increasing their exposure to infrastructure investments. More than 185 pension funds had investments in infrastructure last year, up from 136 the year before, according to research from Aurium Capital Markets.[91] Insurers' interest in the asset class is also rising, in particular through public–private partnership (PPP) and private finance initiative (PFI) models, and in both primary and secondary project phases. The attraction to PPPs/PFIs issued by sub-sovereign entities is that they provide implicit government support – though the safety of such investments under a stressed scenario is difficult to determine as it is partly reliant on the actions and priorities of the relevant government.[92]

While the growth fund numbers moving into infrastructure assets is promising, the allocation toward infrastructure within funds is low. Surveys of large pension funds, conducted by the OECD, suggest that less than 1% of their asset allocation in 2015 went to direct equity investment in unlisted infrastructure.[93] Many pension funds lack the investment mandate for infrastructure.[94] Furthermore, EU Solvency II regulations on investment limits, capital adequacy, reserve requirements, the valuation of assets and liabilities, and limits on foreign investment can all discourage pension and insurance investors from making longer-term and cross-border investments.[95]

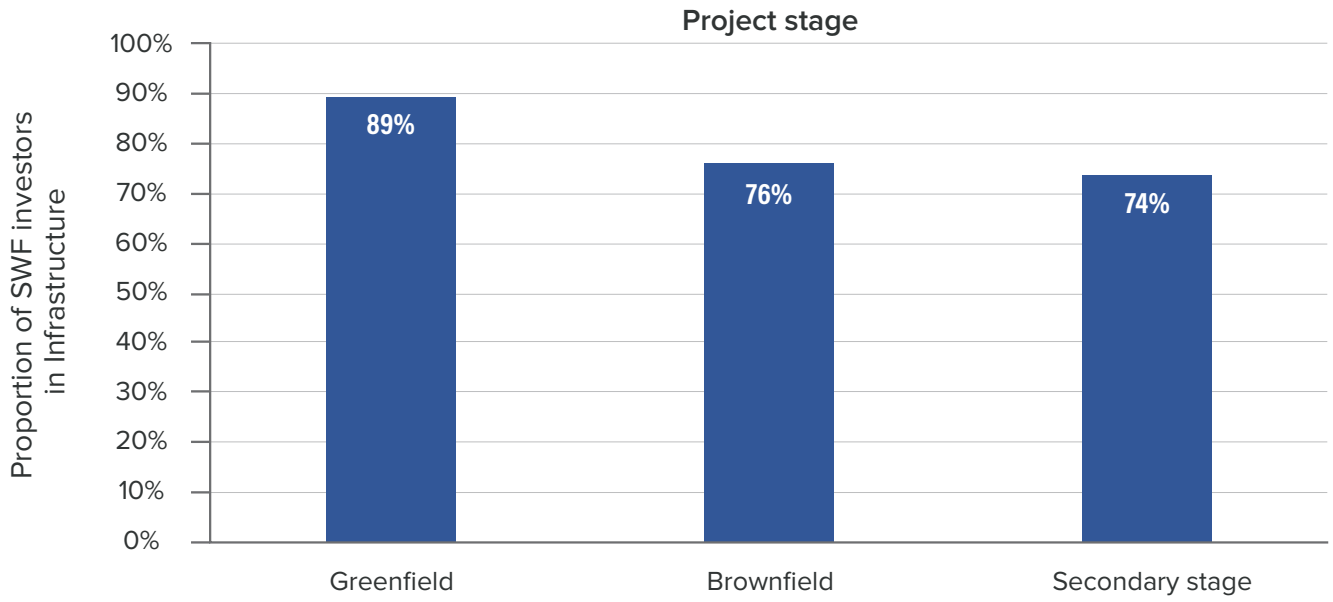
As infrastructure has historically been a minor element of these investors' portfolios, most institutions have limited expertise and built-up knowledge base in the asset class. The capital costs of seemingly similar infrastructure projects can vary dramatically due to local conditions as well as differences in design, engineering, management, procurement, and sourcing. Sorting through these differences and tailoring financing structures to each project increases transaction time and costs.[96]

Sovereign wealth funds

The average size of a sovereign wealth fund (SWF) is similar to that of the world's largest pension funds.[97] With an estimated volume of US$6–7 trillion at the beginning of 2016, SWFs surpass the combined value of hedge funds and PE funds.[98] Historically, countries have developed SWFs as a tool to manage and recycle large current account surpluses. However, there has been a growth in SWF divorced from this macroeconomic rationale. For example, Italy created the Fondo Strategico Italiano in 2011 and Ireland created its Strategic Investment Fund in 2014 with explicit developmental and infrastructure mandates.[99] Many new SWFs in Africa are similar. In this way, many SWFs show characteristics for NDBs.

SWFs have become important actors in international infrastructure projects. Between 2014 and 2016, the proportion of SWFs that invest in infrastructure assets increased from 57% to 62% respectively.[100] Unlike pension funds, SWFs have no specified liabilities. As such, SWFs are not constrained by increasingly tight solvency regulations (e.g. Solvency II) and thus can match very well to long-term infrastructure projects. The fact that SWFs favour greenfield investments demonstrates their appetite for large-scale, long-term projects (see Figure 6). On the other hand, their interest in large-scale investments can limit their incentives to invest in urban projects in fragmented markets such as distributed utilities and energy efficiency.

Figure 6
Sovereign wealth funds investing in infrastructure by project stage



Source: Preqin (2016).[101]

Some institutions use external managers to invest their capital (e.g. Australian Future Fund), whereas others have built their internal capacity to manage capital deployment directly into infrastructure projects (e.g. Abu Dhabi Investment Authority and Singapore's Temasek). The China Investment Corporation has direct as well as indirect (externally managed) exposure to infrastructure assets. However, many of the smaller and medium-sized SWFs do not have the necessary in-house investment capacity for structuring infrastructure deals in environments with different regulation and domestic specificities. Building in-house investment capacity in infrastructure takes time. Where SWFs can co-invest with local PE companies or industrial/technology companies (e.g. clean energy technology partners), these capacity constraints can be addressed. Finding credible partners in emerging markets, however, can be challenging (author's interviews). Some sector initiatives are trying to ameliorate this: the Korean Investment Corporation initiated the Co-investment Roundtable of SWFs in 2014 with the purpose of fostering cooperation and co-investments among large institutional investors and SWFs;[102] and in Africa, the Ai African Sovereign Wealth and Pension Fund Forum has created a platform for enabling SWF and pension fund cooperation in long-term investment projects.[103]

3.6 MAJOR BARRIERS TO URBAN INFRASTRUCTURE INVESTMENT

The mismatch between supply and demand of investment in sustainable urban infrastructure is the result of a range of direct market failures, institutional failures, and price distortions in the wider economy. Addressing wider price distortions is not within the scope of our report, but it represents a necessary policy intervention for shifting investment into more sustainable infrastructure. Carbon pricing and implementing regulatory programmes that incentivise a transition to a low-carbon economy provide the wider context within which market and institutional failures directly relating to urban infrastructure need to be coordinated.

A large proportion of public infrastructure provision will require public funds, as the returns on equity are insufficient to offset the upfront capital costs. This is particularly the case for low- and middle-income countries, where income levels of consumers are often too low even to meet the costs of operating utilities let alone any initial capital investment. At the same time, institutional and governance failures prevent municipal governments from raising sufficient revenues or from facilitating or executing transactions for locally controlled investments.

In addition to market failures in the wider economy, six broad barriers are contributing directly to the investment gap in sustainable urban infrastructure. Some of these barriers are commonly faced by all investors and funders, while other barriers are more specific to 3C infrastructure. The barriers include both those that are specific to investment activities financed by either the public or private sector, and those that are applicable to both sectors. Based on evidence from the literature and consultations with finance experts, the barriers identified included (see also Tables 1 and 2):

1. **Lack of upfront public capital.** Government lacks the upfront capital to fund its investment priorities.
2. **Institutional inertia.** The difficulty of changing investment patterns due to institutional, governance, and contractual/financial features present in the market.
3. **Institutional capacity.** National, regional, and municipal governments cannot initiate projects or act as bankable counterparties due to structural, technical, and skills limitations.
4. **Risk.** Investors perceive a significant risk of losing their investment due to a variety of risk factors.
5. **Low returns.** Investors forecast that an investment will generate insufficient returns, e.g. through debt repayments, asset appreciation or income streams as a return on equity, relative to other sectors and asset classes.
6. **Imperfect information.** Investors possess insufficient information on opportunities that exist, and how worthwhile an opportunity may be.

The global economy, political uncertainty, and social conflict continue to have major impacts on national government revenues and infrastructure spending. Although not necessarily directly related to infrastructure, these global and regional trends have a huge potential impact on sustainable infrastructure spending. For example, in many high-income countries, low economic growth, austerity policies and ageing populations have contributed to national government spending constraints across all sectors. Indeed, evidence suggests that reduced infrastructure spending due to austerity measures has prolonged economic stagnation in many countries.[104] In a range of low- to middle-income countries, political unrest, party differences between levels of government, conflicts, trade sanctions and endemic corruption have all been factors in ineffective inter-governmental transfers and reducing investor confidence at national and local levels. While these impacts are not within the scope of this report, infrastructure investment needs to be understood within the context.

Multilateral development banks (MDBs) and bilateral donor funds are important sources of infrastructure capital but are traditionally not urban-focused).[105] They can provide a range of project preparation technical assistance, structuring abilities, direct investments, wholesale capital, and guarantees – a range that is unique in the institutional sector. However, most MDB-financed projects are not focused on urban areas, and finance commitments for sustainable urban infrastructure can be hindered by risk aversion, low leverage ratios, eligible counterparties to finance agreement, and internal capacity.

Climate finance such as the Green Climate Fund and CDM do not strongly target 3C urban infrastructure, and transaction costs can be high. Challenges such as the effective structuring of carbon markets and difficulties translating donor pledges to well-capitalised funds have resulted in limited impacts from these sources. The PoA structure for CDM projects, designed to reduce transaction costs for small projects, has had limited success due to information barriers.[106] And although the Green Climate Fund is still in its early stages, some studies suggest that funding approvals to date have not fulfilled the fund's objectives for transformational impact and deploying financial instruments for private sector capital leveraging at scale.[107]

Commercial banks operating in tightening regulatory environments (e.g. Basel III) are disincentivised from long-term financing due to increasing capital reserve requirements. Commercial bank business models, particularly following the global financial crisis in 2008, require sufficient liquidity in order to meet ongoing customer obligations, whereas infrastructure projects often require long-tenor loans. In countries where sources of long-term capital are scarce (e.g. shallow capital raising and/or secondary markets), infrastructure finance into long-term illiquid assets creates a pronounced mismatch with the mostly short-term liabilities through which banks are capitalised. In addition, commercial banks, through their project finance expertise, are often more heavily vested than other institutional investors in the higher risk project stages – construction and early operations.[108] This may explain lending caps in countries such as India which limit commercial bank exposure to any one sector at 15% of total net worth in spite of the huge infrastructure financing gap in the country.[109]

Table 1

Six barriers to investing in sustainable urban infrastructure identified from consultation with public and private investors and experts.

Barrier	Definition	Specific examples
Lack of upfront public capital	Government lacks the upfront capital to fund its investment priorities.	• Governments' lack of borrowing capacity due to low creditworthiness as a result of factors such as high debt ratios, low capital reserves, limited revenue sources and/or restricted revenue-raising powers, insufficient or inaccessible collateral, etc. The limitations on raising or controlling revenue may be statutory, macroeconomic, or political.
Institutional inertia	The difficulty of changing investment patterns due to institutional, governance, and contractual/financial features present in the market.	• Incumbency advantages (established market participants, low-cost operations from amortised assets). • Built-up experience and networks within finance institutions that favour deal-making and deal-flow with known participants and well-understood technologies and systems. • Institutional arrangements and governance within and between public entities that favour maintenance of existing technologies over introduction of new ones. • Exiting from stranded assets can lead to high losses. This increases risks of rent-seeking behaviour. • Portfolio or resource allocation mandates within funds or investment organisations that prohibit infrastructure finance.
Institutional capacity	National, regional, and municipal governments cannot initiate projects or act as bankable counterparties due to structural, technical, and skills limitations.	• Institutional lack of knowledge and skills, inclusive of innovative financing mechanisms, emerging low-carbon technologies, co-benefit investments (e.g. ones that address mitigation and adaptation simultaneously), etc. • Government institutions have inadequate budgeting and accounting skills and resources. • There is a lack of long-range targets or infrastructure planning, resulting in a lack of signals to market participants about investment needs and intent. • Poor collaboration between levels of government. • Absence of devolved borrowing or taxation authority.
Risk	Investors perceive a significant risk of losing their investment due to a variety of risk factors.	• Many factors to which deployed capital is put at high risk are unique to 3C infrastructure as a new asset class. Examples include: • Asset performance uncertainties (often exacerbated by a dearth of long-term supporting data). • Counterparty/off-taker assurances (do developers and operators have sufficient track records, balance sheets, and management and operations systems to meet investor needs?). • Regulatory or legal uncertainty or immaturity, particularly in markets undergoing significant technology and/or structural changes (e.g. energy, mobility), and/or where incentives and subsidies are features of early-stage markets. Other factors are: • Lack of secondary, conversion, or refinance markets for large, long-term investments. • Political risk/conflict. • Exchange risk. • Limited additional capital sources for pooling, sharing risks.

Barrier	Definition	Specific examples
Low returns	Investors forecast that an investment will generate insufficient returns, e.g. through debt repayments, asset appreciation or income streams as a return on equity, relative to other sectors and asset classes.	• As with the risk barrier, there are several factors more pronounced with 3C assets: • Higher market values assigned to "brown" assets (or alternatively, a lack of a "green" premium). • High transaction costs, particularly for small projects, or those with short pipelines. The lack of standardisation in project development, assessment, and underwriting is also a contributing factor. • Investments with high carrying costs due to the time needed to underwrite and construct or generate cash flow. • The costs to manage or maintain the assets are high compared with older, more established technologies and Operations and Maintenanceecosystems. Other factors are: • A limit or lack of income from certain infrastructure assets. • Challenges in creating asset-backed investments in networked infrastructure (i.e. network externalities). • High capital reserve requirements placed on investors. • Shallow capital markets (particularly in emerging markets) lead to high cost of capital environments.
Imperfect information	Investors possess insufficient information on opportunities that exist, and how worthwhile an opportunity may be.	• Potential project sponsors and investors in 3C assets can suffer from one or several of the following: • Lack of market data on investment opportunities, technologies, and/or partners. • Inaccurate forecasting of usage or revenues. • Lack of "green" valuation criteria and measurements. • Finance sector capability with new technology or systems. • Poor in-operation project tracking and asset surveillance. • Imperfect information on the accumulation of liabilities at different levels of government.

Developers and infrastructure operators are increasingly taking revenue growth opportunities in services rather than investing in new infrastructure projects. Companies expand into services that span the whole infrastructure cycle to take advantages of synergies between different activities. The slowdown in OECD economies generally and public infrastructure spending specifically has necessitated a shift to seeking projects in emerging markets. With limited projects that meet investor risk-return criteria, infrastructure developers are generating increasing revenue shares from existing construction and operations business.[110]

While private equity firms are more risk tolerant than many institutional investors, the returns on typical public infrastructure projects are often too low. Private equity includes venture capital, senior and mezzanine financing, and leveraged buyouts. On the whole, PE investment return target rates are relatively high to offset the higher risk that investors are willing to take. Lack of local familiarity is also a major barrier for PE investors who tend to prefer projects that they can thoroughly assess for risk.

While pension funds favour lower-risk investments, liquidity requirements (e.g. under Solvency II in Europe) can reduce the incentive to invest in longer-term infrastructure projects. The transaction costs of investing in fragmented projects is also a major barrier. Asset allocation to infrastructure generally is very low within these institutions' overall portfolios.[111] Some, particularly pension funds, lack the mandate to invest in the class altogether, or are only permitted to invest in listed infrastructure funds (e.g. Norway's Pension Fund Global). Most have limited expertise and capacity for infrastructure project acquisition, deal structuring, and investment management.

Table 2

Potential sources of sustainable urban finance, and barriers faced by public, private, and institutional investors

Finance source		KEY BARRIERS					
		Lack of upfront public capital	Institutional inertia	Institutional capacity	Risk	Low returns	Imperfect information
National public finance	**National government**	For example, low growth, reduced tax receipts	For example, regulations block new service delivery models	For example, lack of financial management expertise			
	National development banks	For example, limited capital-raising ability	For example, existing NDBs favour investments in Business-as-usual sectors	For example, specialised institutions (e.g. Green Banks) require new skills			
International public finance	**Multilateral development banks**		For example, internal rules on low leverage ratios, low risk tolerances	For example, limited host government capacity to structure investment			
	Climate finance (e.g. Green Climate Fund)	For example, mismatch between donor pledges and funding committed		For example, lack of technical expertise in low-carbon technologies			For example, difficult to measure additionality, performance requirements
Private finance	**Commercial banks and investment companies**		For example, national lending caps on banks for infrastructure financing (e.g. in India)	For example, lack of experience with project finance and municipal bond issues	For example, political risks and regulatory changes that impact income flows leading to non-performing loans	For example, high capital requirements constrain long-term investments (e.g. Basel III)	For example, lack of commercial knowledge in emerging markets for loan syndication
	Developers and infrastructure operators		For example, better profit-making opportunities in servicing existing assets than new asset development		For example, local currency variability in project income against foreign currency denominated debt	For example, high local market interest rates make projects unattractive	For example, lack of familiarity with operating partners in emerging markets
	Private equity and infrastructure funds		For example, investors lack trusted relationships with partners and counterparties in 3C infrastructure		For example, risk that government guarantees could be reversed	For example, private equity hurdle rates unsuited to infrastructure investments	For example, lack of information on value potential of new technologies

Finance source		KEY BARRIERS					
		Lack of upfront public capital	Institutional inertia	Institutional capacity	Risk	Low returns	Imperfect information
Institutional finance	Pension funds and insurance		For example, appetite for very large investments may miss smaller urban-scale opportunities			For example, liquidity requirements limit long-term investments (e.g. Solvency II)	For example, lack of knowledge in infrastructure
	Sovereign wealth funds		For example, fund prohibitions from investing in infrastructure		For example, uncertainty with asset performance in new technology	For example, numerous small projects mismatched with large capex strategy	For example, no clear partner strategy in unfamiliar emerging markets

Sovereign wealth funds (SWFs) are not constrained by liquidity requirements and are well capitalised, but some SWFs are prohibited from investing in infrastructure. They share the long-term investment horizon common to some pension and insurance funds. But compared with these, SWFs have no specified liabilities and are not constrained by solvency regulations (e.g. Solvency II). Many SWFs can apply an investment focus in support of policy objectives, similar to national development banks. Their focus on large-scale investments can limit their interest in certain fragmented markets such as distributed utilities and energy efficiency. Additionally, some SWFs lack explicit infrastructure investment mandates.

4. National and international action to unlock urban investment

4.1 : RAISING, STEERING, AND BLENDING FINANCE

The key mechanisms can be grouped into three broad areas of action by national governments: raising, steering, and blending finance (see Figure 7). National governments can support municipal governments in raising finance for investing in urban infrastructure through increased local revenue-raising powers, such as property taxation, and by leveraging private capital through municipal debt financing linked to own-source taxes that can anchor access to credit. In the absence of these powers, funds can be provided by national finance ministries in the form of fiscal transfers or from international finance institutions such as multilateral development banks (although the disincentive effects of relying on transfers with poor monitoring need to be kept in mind). National governments can also create the market and enabling conditions to steer private investment into more sustainable urban infrastructure. Finally, national governments can blend finance but using public finances, guarantees, and other instruments to attract private capital into revenue-generating infrastructure assets or debt financing while remaining cognizant of overall as well as local liabilities. To capture these roles of national governments, the conceptual framework in Figure 7 shows the sequencing from barriers to areas of actions to the finance mechanisms that can be deployed for government and private/institutional investment in sustainable urban infrastructure.

All of the actions can be facilitated and strengthened by capacity-building at the national to local level so that there is effective governance between and within levels of government. This includes both tax and public financial management policies and capabilities. This is necessary if markets are to merge that are stable and attractive to investors of 3C infrastructure. Regulatory weaknesses that prevent proponents of investment activities from structuring or executing transactions or that diminish investor appetite must be addressed alongside the identification of appropriate finance mechanisms.

Raising finance

To raise finance for urban infrastructure, national governments can support national and local tax reforms, increase the size and effectiveness of fiscal transfers to cities or legislate and provide support for fiscal decentralisation and/or local debt borrowing and bond issuance. Both require effective coordination between layers of government. Yet there are particularly strong reasons to promote decentralisation based on allocative efficiency, since the costs and benefits of public services are fully internalised, as well as on preference matching, as information on local needs and preferences is better collected at the local level. Fiscal decentralisation can be a particularly effective tool to deal with climate change challenges: because impacts are felt locally, support for mitigation or adaption actions can be easier to mobilise. With decentralisation, however, comes the need for an adequate institutional environment, namely, strong accountability at various levels of institutions, transparent and inclusive governance, information-sharing, sufficient local own-source revenues, and strong budgeting and accounting capacity at the local level.[112] Building this capacity where it is lacking will take time and resources.

Bond issuance can be an effective instrument for raising finance for sustainable urban infrastructure. The cost of servicing debt can be substantially lower than commercial bank loans and consequently can represent better value for money for the issuer. Bond financing is well aligned with the role of government as principal investor in infrastructure. Bond repayments can be supported by general government revenue or project-specific revenue. In either case, the financial basis for government is premised on the role of infrastructure in delivering future growth and thus additional government revenues. Long-term repayments also play a role in equitable policy-making, as long-term assets have benefits for future citizens who can play a role in its financing.[113]

Some cities and countries will have little own-source finance, and debt markets will remain out of reach due to lack of capacity. In these cases, international public finance will remain important. Direct project loans or lines of credit to national financial institutions that otherwise lack access to long-term debt can be a much-needed source of lower-cost capital for targeted 3C investments. For this reason, multilateral development banks and bilateral and plurilateral aid donors will continue to play a crucial role, as well as NDBs and investment vehicles where they exist. Further discussion on these sources of finance can be found in the Blending finance section below.

Steering finance

As well as supporting cities to raise finance, national governments can provide policy frameworks that create and shape the market conditions to steer private investment into more sustainable urban infrastructure. Policy instruments may include regulation, taxation and other forms of pricing, and information, among others. Spatial planning is a particularly powerful instrument for steering finance. However, this is covered in other research programmes led by the Coalition for Urban Transitions and consequently we do not address it in this paper. Of the steering instruments raised by finance experts interviewed, land value capture (which is strongly linked with spatial planning) and pricing, regulation, and standards were highlighted as instruments with particular potential.

Blending finance

Blending finance has huge potential for overcoming infrastructure investment barriers. Public finances alone are insufficient to address the infrastructure investment needs of most countries. As a result, a national government's ability to use targeted public funds to leverage and crowd in private finance to specific investment projects or finance facilities will be critical. Blended finance is more than just a mechanism for complementing government funds with those from commercial/institutional sources. It can also activate and draw from technical and implementation skills of civil society actors, philanthropic institutions, development banks, and private for-profit institutions.[114]

Blended finance encompasses a large portfolio of potential instruments and finance sources. The source of public funds can be debt or equity contributions from government entities through their ability to raise finance, including resources from development finance institutions channelled through national entities. Risk mitigants such as loan loss reserves, loan guarantees, liquidity facilities, currency hedges, and other credit enhancements are additional elements that can be brought in whole or in part from public agents.[115] PPPs and PE tranches invested in commercially managed funds are other forms of blended finance.[116] Lastly, blending can draw together resources for project preparation (treating due diligence and transactional support including raising finance as equity) with debt or additional equity (for project

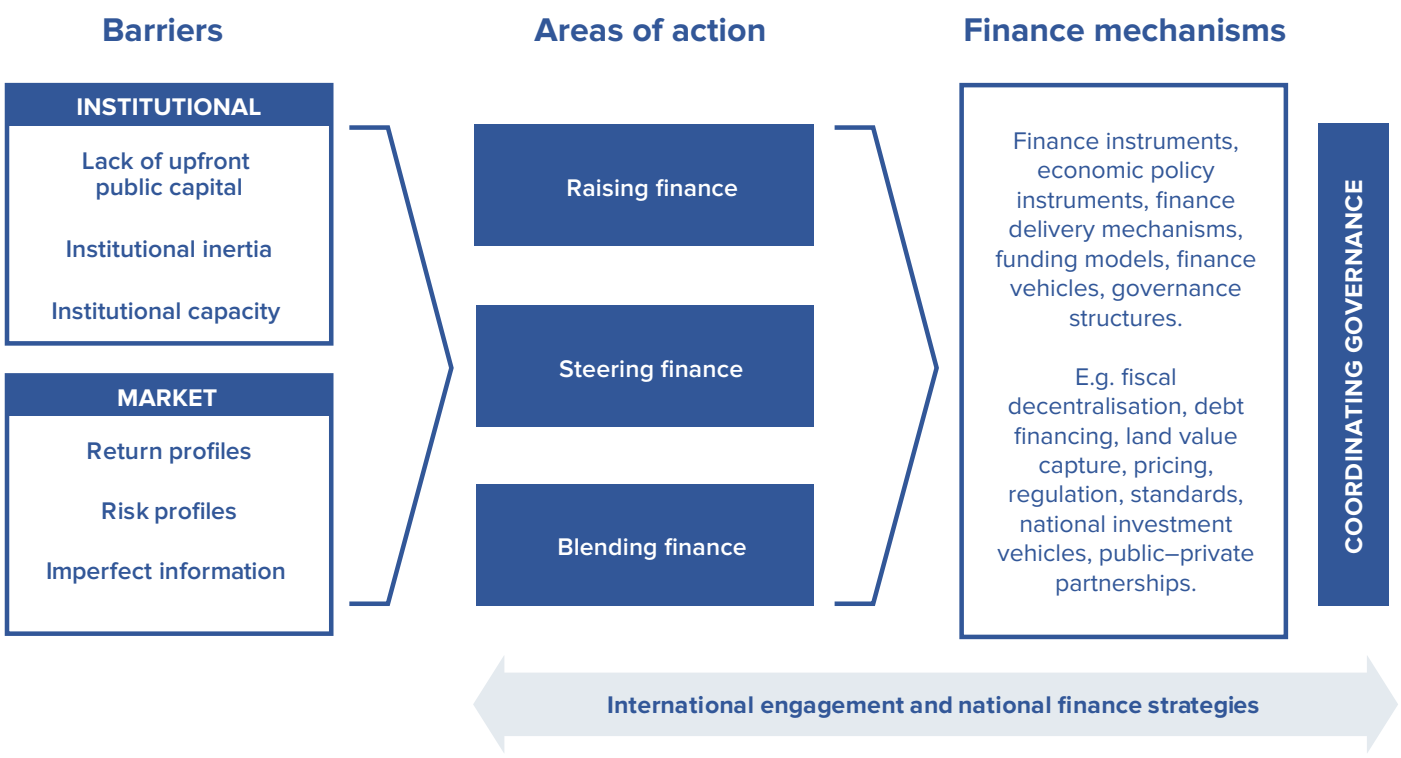
execution and operations) from different entities to facilitate investments. For projects where experience is limited – such as deploying a new technology or lending in a low-capacity country – preparation can be as high as 10% of the overall investment cost.[117]

Blending allows for multiple financiers to pool capital for projects that are too large or too risky for a single entity to underwrite on its own. It is a way to layer multiple capital types and sources with differing risk appetites, rate of return expectations, and investment horizons. Blended finance is optimally applied to projects and finance structures marginally below real or perceived commercial viability, and that cannot be unlocked by an enabling policy and institutional environment alone.[118]

Through leveraging private capital and expertise, blended finance can scale and accelerate the deployment of capital in ways that the public sector cannot achieve acting alone. Research from the World Economic Forum (2013) suggests ratios of 1:5 and above are not uncommon (that is, US$1 of public funding mobilises a further US$5 of private investment), and that higher ratios (e.g. 1:8) can be achieved, particularly where the government contribution is grant based. Other research suggests that even greater leveraging is possible through blended finance, where US$1 of paid-in public capital can crowd in anywhere from US$10 to over US$70 of private capital.[119] Yet empirical evidence suggests that leverage ratios for climate finance are often well below their potential. For example, over the period 2013–2014 climate finance comprised US$40.7 billion of public finance and an estimated US$14.7 billion of mobilised private finance per year.[120]

Delivering on these three areas of action will require national financial and industrial strategies that support urban infrastructure investment, as well as a range of national finance instruments and mechanisms to deliver 3C infrastructure both directly and through support to municipalities (see Figure 7). The following sections explore these strategies and mechanisms in more detail.

Figure 7
Areas of national and international action: raising, steering, and blending finance



4.2 NATIONAL STRATEGIES: FRAMEWORKS FOR SUPPORTING THE URBAN TRANSITION

Investment flows can be greatly enhanced where national authorities clearly articulate their development strategies for sustainable urban infrastructure. Yet very few governments – developed and developing – have well-articulated strategies and investment plans for sustainable infrastructure in urban development, transport, and energy. Such strategies include better energy pricing, the phasing out of fossil fuel subsidies, and greater regulatory stability (e.g. through independent regulators).[121] The mechanism for producing nationally determined contributions (NDCs) agreed at COP21 in Paris should give more emphasis and weight to national and regional low-carbon infrastructure policy and planning, and may prove central to understanding investment needs and structuring the opportunity for investors.

Sustainable finance also needs to be placed at the centre of long-term national plans for "green" economic development and industrial strategy. This has already started tentatively in some countries. In China, green finance is now regarded as a national strategy, while the Bank of England has argued that a new financial system is required that delivers mainstream finance for achieving the Sustainable Development Goals.[122] Denmark's 2012 Energy Act sets 2050 as the target for the country to be fossil-fuel free. However, national plans and industrial strategies are needed urgently in countries at all levels of development that provide the market incentives for a transformation in urban infrastructure financing.

Central banks and financial regulators are potential agents for making information more accessible and relevant for investors. For example, France's Energy Transition Law requires France-domiciled asset owners and managers to report climate factors and carbon emissions footprints by December 2016.[123] Banks and other lenders/investors could also be advised or compelled to match environmental standards or certifications to loans originated and/or held in portfolio and make the results available – for example, for buildings which have been or could be assessed under one of the several voluntary or mandatory energy or environmental performance-rating tools. Proponents suggest that this would: create better market transparency on the flows of finance to energy efficient assets and products; provide valuable information on the portfolios of energy efficient loans that could be packaged as asset-backed securities into green bonds; and provide the basis for evaluating the financial performance of energy efficient loans relative to their inefficient alternatives.[124] Several national or subnational governments have mandated building-level energy performance reporting.[125]

A range of low- and middle-income countries are already starting to use national banking regulations and guidelines to drive sustainable finance at national and local levels. For example, a regulatory requirement obliges Bangladesh commercial banks to invest a proportion of their lending to "greener projects", which is supported by financial incentives such as low-cost wholesale loans to help move banks towards new markets.[126] The China Banking Regulatory Commission and the Ministry of Environmental Protection are implementing a Green Credit Policy and Guidelines to incentivise banks to provide finance for green-related projects, as well as creating disincentives for investment in environmentally polluting projects.[127] In another example, the Kenya Bankers Association has established a sustainable finance working group for developing sustainable finance principles for the sector and to provide capacity-building for credit risk management that integrates environmental and social responsibilities.

National governments also play a strong enabling role in setting market conditions that draw in private sector capital to sustainable infrastructure programmes. Direct government investment can provide a foundation that demonstrates long-term commitment, builds skills, and provides the performance evidence needed to steer towards green growth. But facilitating entry of the far greater private capital sources requires a mix of non-financial actions beyond direct investment, such as enacting supportive policies, standards, and regulations, as well as pricing signals and improved information flows. Examples include limitations on floor space and building heights, green procurement policies and contracts, congestion charging, energy efficiency standards and incentives for low-carbon vehicles. With an effective mix of financial and non-financial policy instruments, investment in 3C infrastructure becomes more credible in the long term as a transition to resource efficiency becomes widely recognised as inevitable.[128]

4.3 DELIVERY: PRIORITISING FINANCE MECHANISMS WITH HIGH POTENTIAL

Alongside national strategies for an economy-wide transition to a green economy, our analysis of the literature highlighted 72 major finance instruments and funding models that have been used or could potentially be used for investing in urban infrastructure projects and programmes (see Annex: Inventory of Finance Instruments).

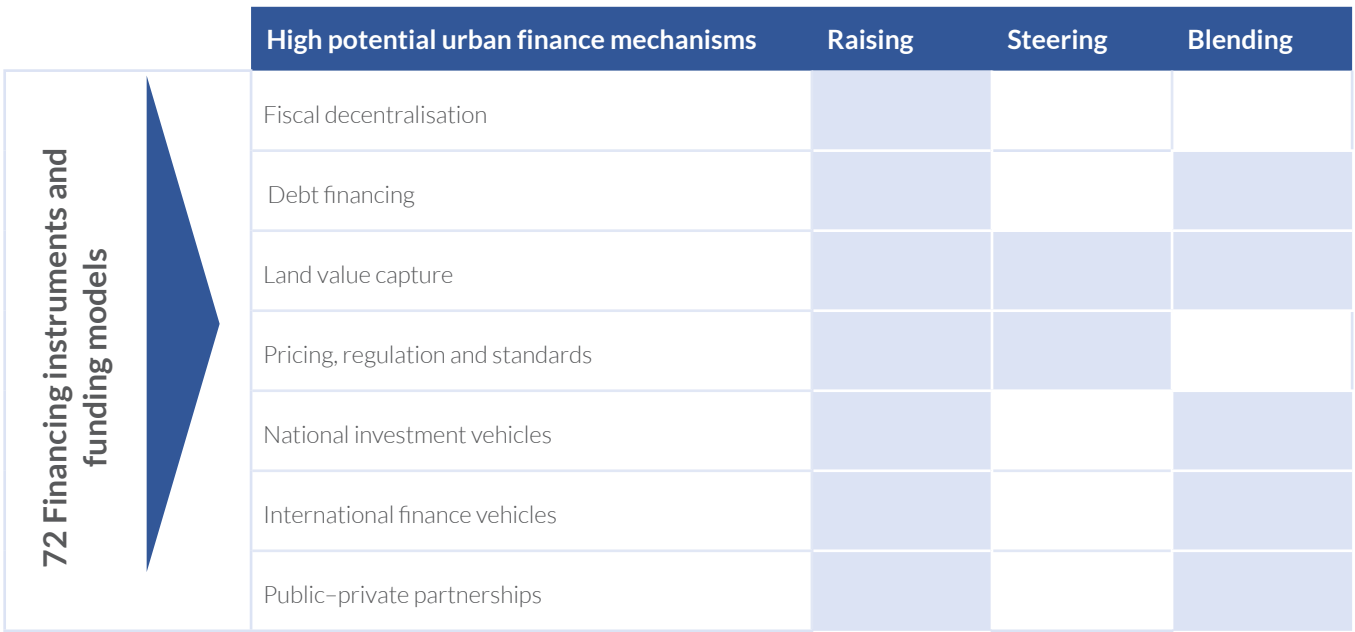
Of these instruments and models, 51 (71%) were found to be public finance or policy instruments, while 21 (29%) were private finance instruments. This reflects the continued importance of public finances and government policy frameworks for delivering sustainable urban infrastructure.

Seven key finance mechanisms could have significant potential for overcoming barriers to investing in sustainable urban infrastructure. Following consultations with the Finance Working Group members, additional interviews with finance and policy experts, and taking account of additional evidence from the literature, we identified the following seven finance mechanisms as promising tools for future examination by national governments:

1. Fiscal decentralisation
2. Bonds and debt financing
3. Land value capture
4. Pricing, regulation and standards
5. National investment vehicles
6. International finance
7. Public–private partnerships

These finance mechanisms support investment in 3C urban infrastructure, have potential for financing at scale, lie under national government control or influence, and have supporting evidence of previous effectiveness. All seven mechanisms have the potential for raising finance, while two could support steering finance, and five could be used for blending finance (see Figure 8). While these seven finance mechanisms have been prioritised in this phase of analysis, many of the other 72 finance instruments and models are also likely to be effective in overcoming finance barriers to a 3C urban transition. The relative effectiveness of different mechanisms will depend on country-specific circumstances, and as such any country-level pilots should be open to exploring the full range of potential finance mechanisms. At the same time, the seven mechanisms identified here may provide a useful starting point for examination. The potential of the seven promising finance mechanisms is explored in the following sections.

Figure 8
Seven high potential urban finance mechanisms: filtered from 72 financing instruments and funding models



Fiscal decentralisation

Local control over tax rates at the margin (for example, surcharges) or simple property taxation measures are required to reduce moral hazard by creating greater direct responsibility for spending and budgets by cities and regions. They do not need complicated administrative arrangements, but decentralisation does require clarity of spending responsibilities at the local level and political will at the national level.[129] While cities are likely to continue to rely on fiscal transfers over the short to medium term, there must be clarity as to sources and uses of funds as well as responsibilities for liabilities.

Regardless of the levels of decentralisation in a country, measures are required to ensure appropriate accountability and to balance own-source revenue-raising, intergovernmental transfers and spending obligations among levels of government. Negative macroeconomic results could result if national governments cede more expenditure responsibilities than revenue-raising options (with a potential reduction in service quality or overall service provision); or conversely more revenue-generating capacity and transfers than expenditure, thereby reducing national resources that could be used for other priority spending.[130]

Governments can generate income with a range of taxes, charges, and transfers to fund government operations and investments. In most countries, the majority of revenues flow to national or state governments, which then reallocate the funds to lower levels of government. As a result, most city governments are highly dependent on their national governments for operating and investment resources. Examples of city tax revenues include property tax, income tax (individual and corporate), surcharges, and sales or value added tax. According to the OECD Revenue Statistics,[131] non-tax revenues comprise grants, property income, sales of goods and services, fines, penalties, forfeits, other social contributions, miscellaneous, and unidentified revenue. Any number of taxes, fees, and transfers can be structured to promote certain behaviours or outcomes in support of 3C infrastructure – for example, taxing vehicles based on their emissions.

Property taxation is a revenue-raising instrument that many cities could develop as a significant source of finance. Property taxation can be progressive, physically tied to the locality and (subject to design and administration) relatively easy to collect compared with other forms of taxation. Property values also tend to appreciate through the provision of additional public goods and services: proximity to transit systems and parks, connections to centralised utilities, presence of quality schools, and the like. The appreciation of property values in turn can lead to increased property tax revenues, although changes in value are hard to capture in developing countries. At the same time, property tax can provide a reinforcing link with land value capture mechanisms (discussed in later sections). Furthermore, taxing immobile assets is less likely to exacerbate regional inequalities, e.g. wealthier individuals moving to lower-income tax regions. In developing countries, the creation of property taxes can also be a complementary means for establishing individual ownership and residency rights with their attendant benefits of expanding access to personal credit.[132]

However, while property taxes tend to be less distortional and progressive, they may also be costly to administer, particularly in developing countries. Successful implementation and management is affected by the capacity to carry out market-based property valuations and enforce property rights. One finance expert interviewed for the report suggested that greater support for revenue collection at the city level could be provided by the national revenue agency.

A diversified portfolio of revenue sources could be beneficial for local governments, as it improves risk sharing and reduces exposure to economic fluctuations.[133] At the same time, the empirical evidence regarding property tax effectiveness in raising local revenue is mixed, with mostly successful cases in the Baltic states, but less robust evidence in other regions.[134] Even in mature economies where property tax setting and collection is seemingly within the skill-base of local governments, their share of revenue remains modest. In the United States, while local government revenues from property taxes represent a higher proportion of revenues than in Europe, fiscal transfers nonetheless remain higher: transfers represent 37% of revenues while property taxes represent 30%.

Even when cities and regions have built the capacity necessary to generate local revenues, transfers may continue to play an important role in order to supplement local taxation which may not be sufficient to meet spending requirements. When fiscal transfers are used, the effectiveness, efficiency, and equity of transfers will depend greatly on design, and be greater when coordination between national, regional, and local governments is strong.

Bonds and debt financing[135]

Governments – both national and subnational – can raise private debt capital to finance infrastructure projects. Debt capital can be raised in the form of a bank loan or syndicated loan (multiple lenders) for a project. Loans can be differentiated between construction or project finance (short-term debt used to pay the costs associated with project development and construction) and permanent finance (longer-term debt used to finance an asset during its operational life). Risks are generally more predictable for permanent loans, which therefore tend to have lower interest rates than construction debt.

The global market for green bonds is growing rapidly, with around US$160 billion in labelled green bonds and an estimated US$576 billion in unlabelled green bonds outstanding.[136] Labelling and standards are particularly important for institutional investors and other finance sources who have environmental, social, and governance mandates. Labelling and post-investment impact measurement does add to transaction costs. However, investor demand for green bonds currently outstrips the supply and yields are generally on par with, or lower than, comparable standard bonds, making them cost-effective for the issuer.[137]

Subnational bond issuance is a significant market in high-income countries, but the market for municipal green bonds remains relatively small. In the United States, bond issuances by state and local governments ranged from US$380 billion to US$500 billion each year for the period 2005–2011.[138] However, relatively few municipalities in low- and middle-income countries have investment-grade credit ratings or own-source tax handles, which severely limits access to bond finance. And even in the United States, the green municipal bond market is estimated at only around US$30 billion, about a third of which is labelled.[139]

As a prerequisite, cities need a sufficient supply of own source revenues before municipal bond issuance can be viable, otherwise the default risk will be too high. In the absence of decentralisation, national governments can provide guaranteed multi-annual fiscal transfers to reduce investor risk. Asset-backed securities can also help to reduce risk for private and institutional investors, but could shift liabilities to the center.

National finance ministries and the international community can provide support for debt financing by developing municipal creditworthiness programmes and issuing sovereign bonds or providing national guarantees for investors. First, they can support cities to build capacity for achieving municipal creditworthiness and the issuance of muni-bonds. Second, national governments with investment-grade credit ratings can issue national bonds for the purpose of funding urban 3C infrastructure, or place guarantees on municipal borrowing to reduce risk for private and institutional investors.

The lack of municipal creditworthiness is one of the main reasons preventing cities from issuing municipal bonds. According to the World Bank,[140] only around 4% of the 500 largest cities in developing countries are classified as creditworthy in international financial markets, and only 20% are creditworthy even in local markets. The success of issuing debt depends on the quality of financial management systems, the quality of urban governance, and the type of expenditure to be financed.[141] It is also important for issuers to engage investors early enough in the process to ensure sufficient market appetite for the bond.

Programmes such as the World Bank's City Creditworthiness Initiative and Climate-KIC's Green Bonds for Cities project are helping to educate participating cities on the importance of credit ratings and creditworthiness. Capacity-building measures include municipal budgeting, local own-source revenue collection, financial management, and auditing, infrastructure investment planning, and private capital attraction for raising green bond finance. Even when a city has achieved an investment-grade credit rating, sound financial management is essential to minimise the risk of future default and to provide headroom for future investments while debt repayments of older projects are still ongoing.

Box 1

Bonds in low-, lower-middle- and upper-middle-income countries

LOW-INCOME COUNTRIES

Dakar has secured an independent credit rating in hopes of issuing a US$40 million bond to finance development of a central market for the city's street vendors. With support from donor grants, it undertook a process of improving its budgeting, financial management, and accounting practices, which resulted in securing an A3 short-term rating and a BBB+ long-term rating. In spite of this success at receiving an investment-grade rating in the local markets, the city of Dakar was not able to issue its bond due to national government restrictions.[142]

Kampala has made institutional changes to how the city is managed, principally through the creation of a new executive body, the Kampala Capital City Authority (KCCA). A key priority has been increasing tax collection, with KCCA actions resulting in a near doubling of tax revenue collected. This improvement has factored into the city receiving an "A" long-term credit rating from a South African rating agency. The city hopes to issue its first bond in the near future.[143]

LOWER-MIDDLE-INCOME COUNTRIES

West Java, Indonesia, the country's largest province, which includes the outskirts of Jakarta, has received central government approval to issue its first municipal bond. The planned issuance, a 10-year nearly US$300 million note, will be used for the development of a new international airport. It would be the first subnational issuance, a model the national government wishes to see replicated.[144]

Lagos State Government sold just over US$500 million of seven-year notes in 2013, its third such issuance. The proceeds support infrastructure investment in the transport sector. 13 of 36 Nigerian state governments have also issued their own subnational debt.[145]

Although this market is developing, risks remain given the poor development of state and local own-tax handles.

UPPER-MIDDLE-INCOME COUNTRIES

Belize City established a domestic municipal bond programme and issued three separate bonds in 2012. These were short-term (two-year, 3.5% coupon), medium-term (five-year, 5.5% coupon), and long-term (10-year, 8% coupon) notes. The government used the proceeds to build over 100 streets in a country where only about 20% of streets are paved. Other Latin American countries, such as Colombia, Brazil, and Mexico, also have experience in national and subnational bond markets.[146]

Johannesburg and Cape Town have both been active in the municipal bond market for several years. Recent announcements from central government that fiscal transfers will decrease due to national budgetary constraints are making local borrowing more urgent. Johannesburg is also the first sub-Saharan African city to issue a green bond, which it did in 2014. The 10-year, 10.18% note raised more than US$125 million for investments in: renewable energy (photovoltaics, solar hot water); landfill methane capture; and hybrid-fuel buses.[147] Cape Town has issued its first green bond in summer 2017.

Leading middle-income countries have already launched regional and municipal bond programmes. For example, in middle-income countries, the West Java region and the cities of Lagos, Belize, Johannesburg, and Cape Town are all active in the bonds market (see Box 1). At the same time, Dakar is now seeking to issue its first municipal bond worth US$40 million following an initial shadow credit rating assessment by Moody's in 2012. The process included assessments of the quality of the city's decision-making. The rating provided a benchmark against which improvements could be made before obtaining an official, public rating from a local ratings agency.[148] However, inadequate local tax systems, weak expenditure management, a culture of rent-seeking and high public debt led the central government to prevent the municipal debt issue.

In most countries, the process of improving financial maturity shows a pattern where bank lending tends to predominate early with bond transactions emerging later. The generally lower transaction cost and complexity associated with debt finance compared with bonds helps to explain this. It is generally the case that both types of lending co-exist, often catering to different elements of the market.

Land value capture[149]

Land value capture (LVC) relies on a set of instruments for financing public infrastructure, particularly large transport projects. Improvements in transport infrastructure lead to increased land and property values nearby. This uplift in value can be used as a source of revenue. At the same time, LVC can be used to drive more compact urban development.[150] Examples include Hong Kong, Bogota, Portland (Oregon), and Tokyo.[151] Strategies for governments to extract the uplift in value include land value taxation, negotiated extractions, tax increment financing, special assessments, joint development, betterment levies, transportation utility fees, impact fees, and air rights. LVC can be used to part-finance infrastructure in combination with public, debt, or equity investments.[152]

While revenue for LVC is locally derived, national legislation and frameworks are critical enablers for creating the revenue stream. Constitutional, statutory, and policy frameworks created by national governments can incentivise LVC financing of sustainable infrastructure by regional and municipal governments. Where urban infrastructure is part-financed by the national finance ministry, the release of national public funds can be linked to effective LVC plans. Even when local governments are empowered to collect property taxes, higher levels of government often retain the power to set assessment parameters or tax rates.[153] Furthermore, in a number of countries where urban finance and decision-making is largely centralised, national bodies use LVC mechanisms to finance local urban investments. Examples with admittedly mixed results include urban housing developments in Morocco and Egypt through national land and property development companies.[154]

The effectiveness of LVC can be increased where governments integrate spatial planning policies and investment strategies with transportation infrastructure. How governments use their capacity and authority to develop area/sector plans and master plans can set a development vision toward growth nodes and corridors that enhance land values within close proximity to these. Cities will need the legal and institutional frameworks, and technical expertise and capacity for planning strategy and regulations, to create these links.[155]

LVC is most effective when combined with an effective tax system and transparent property market. Where land is owned by national authorities, they can directly influence or capture the gain related to land sales or ground leases. In addition, regulatory certainty, effective monetary policy and a range of national fiscal policies that shape the wider macroeconomic environment will contribute either directly or indirectly to real estate and land asset value and thus the revenue potential from LVC.[156]

Box 2

Land value capture in low-, lower-middle- and upper-middle-income countries.

LOW-INCOME COUNTRIES

Experience with land value capture (LVC) in low-income countries is limited and success has been mixed. In **Ethiopia,** where land is owned by the state, new development is directed by local authorities (in urban areas) through a lease proclamation process. Most LVC in **Addis Ababa** is via direct allocation where a "base price" for the land servicing is set and paid by the developer. The proceeds from land leasing are dedicated to infrastructure provision and represent roughly 10% of municipal capex funds.[157] However, payments for the duration of the lease are not equal to what the market considered to be the value of the lease, and government capacity to deliver serviced land has been diminished as a result.[158]

Other examples of LVC agreements in sub-Saharan Africa include **Angola, Democratic Republic of Congo, Ghana, Rwanda, and Senegal.** Many of these are negotiated in-kind contributions from private developers to public utility services for land under development. These tend to be more ad-hoc than strictly programmed.[159]

LOWER-MIDDLE-INCOME COUNTRIES

In **Egypt,** most urban fringe land where extensive new development is planned is under national control through the New Urban Communities Authority (NUCA). NUCA had traditionally financed infrastructure provision, and then sold the serviced land to developers to recapture its investment. Experience, however, showed expenditures by the public in excess of receipts. The process has been reformed where land is given to private developers with the mandate to install planned infrastructure. A portion of the land is returned for public purposes, with the remainder retained by the private company for further development.[160]

UPPER-MIDDLE-INCOME COUNTRIES

Shenzhen is the first city in mainland China to make extensive use of "rail plus property" development, where the same public entity that is developing the rail infrastructure also takes ownership and responsibility for the station land/adjacent land development. The city government has granted land to the municipal metro company as an equity asset. The metro company then enters into partnership agreements with development companies to share the costs and gains of property projects.[161] This has had some notable successes, but in general, land-based financing in China is now reaching its limits due to the accumulation of liabilities and a problem with rent-seeking.

Quito, Ecuador, has made use of sale of development rights, a concession to a landowner or developer to exceed building height/density on a plot beyond what is established in the zoning plan. This provides an upfront payment to government, as well as an ongoing increase in property tax receipts above what would have been received under the zoning conditions. By targeting zoned that is already serviced and that can support the increase in development area, government is generating revenue from a planning decision that does not require extra investment while achieving other gains from urban densification.[162]

Public authorities in **Brazil** own very little land. Selling development parcels or development rights in order to fund infrastructure investments is thus limited. An alternative that has been applied in **São Paulo** is the selling of air rights which allow developers to increase the floor area allowable or change the use on a particular parcel of land. CEPACs — tradable air rights — are created by municipal governments and auctioned on the Brazilian stock exchange. Municipal governments set the minimum price of the CEPAC, and the amount of the CEPAC issued corresponds to the additional square metres that the present and future urban infrastructure can support in a designated Operacion Urbanisica (UO), a special development zone. Revenues from CEPAC auctions are deposited in a special escrow account earmarked for area improvement plans. The sale of air rights has been a viable revenue-raising tool for São Paulo. However, so as to create higher demand for air rights, the allowable (free) floor areas in large parts of the city were reduced. This has arguably led to less intensive development in certain areas than otherwise is considered optimal.[163]

Pricing, regulation and standards

National policies, combined with international frameworks, for carbon pricing can drive investments into sustainable urban infrastructure. Economic efficiency points to the advantages of a common global carbon price, with emissions reductions taking place wherever they are lowest cost.[164] With cap and trade, the limit of pollution levels (the cap) is set, with the price (and therefore lowest cost) for meeting the cap being determined by the market. In contrast, while taxation provides certainty over the price of the pollutant, being fixed by the government, the precise reduction in pollutants cannot be certain. However, carbon taxes at the national level and local surcharges have a role to play in influencing decisions by producers and consumers, as well as local governments and cities.

Carbon pricing at national and subnational levels requires effective coordination. Emissions trading and taxation are most often used as national-level instruments. However, the use of carbon pricing is increasing at city and regional state levels. By 2015, a total of 39 countries and 23 cities and regions had employed carbon-pricing instruments.[165] As urbanisation continues to grow globally, national governments increasingly need to consider the outcomes of their pricing policies in cities and ensure that pricing is coordinated effectively with other policy instruments at city, national, and international levels.

Tax credits and preferential pricing can be a powerful spur for investment in targeted infrastructure. In 2011, the Brazilian government gave tax breaks for those investing in "infrastructure notes" issued to finance infrastructure projects in the transportation, logistics, sewage and water treatment, energy, irrigation, and telecommunication sectors.[166] Tax advantages for investors of municipal bonds are available in the United States. Tax advantages for electric cars have played a major role in growing that market, though incentive changes have led to large swings in purchase volumes over short time periods in Denmark.[167] Research has shown that vehicle purchase decisions in Switzerland have been influenced as a result of subsidies or surcharges placed on cars depending on their pollution levels.[168]

Along with pricing, national regulation and standards can be highly effective instruments for driving sustainable urban infrastructure. Regulatory measures are particularly powerful for creating a shift from infrastructure investment that locks in high-carbon pathways to new green technologies in the urban economy.[169] For example, land development regulations that promote medium- to high-density developments around mass transit systems can incentivise low-carbon mobility, reduce social exclusion, promote agglomeration and economic productivity, and minimise climate-related risks. Banking regulations can also influence investment decisions that direct finance towards green investments.

Performance standards and reporting requirements for buildings can improve energy and resource efficiency, increase productivity, and provide financial gains for residents. Building codes and standards can steer private finance to reduce the consumption of energy, water, and other resources, as well as promoting the generation of local, distributed renewable energy. A global investment opportunity estimated at US$300 billion per year through 2020 for both retrofitting and constructing new buildings to high energy-efficiency standards exists for cost-effectively moving carbon levels towards a 2°C limit.[170] An evaluation from New York City shows that for a group of 3,000 buildings that consistently reported data for the period 2010–2013 as mandated by local law, emissions dropped by 8% while energy use decreased by 6%. Data reporting and public disclosure is assumed to be a factor.[171] Banking regulators in the European Union are considering changes in risk coverage ratios as a result of the evidence that green properties improve asset quality.[172]

Energy and utility regulations can be significant market influencers and help to drive investment at a time when wholesale price signals in power generation investment are in fact declining. Investors placing greater relevance in long-term fixed-price contracts or regulated pricing is making renewable energy the largest and fastest-growing component of power generation investment worldwide.[173] Energy investor risk-weighting is particularly skewed towards policy and regulatory environments, such as the duration of the pricing or off-taker regime, its legal basis, its ability to be amended, a country's track record of adjusting or replacing legislation and whether this is planned and transparent, and the impact of a change of political party in government.[174] Feed-in tariffs, which provide a predictable income stream for renewable energy investments, had been a favoured tool for early-stage renewable energy market growth. Feed-in tariffs are unlikely to be as significant moving forward, due to technology price declines and concerns over costs borne by governments or consumers. Auctions tied to guaranteed power purchase agreements[175] are instead

emerging as the renewable energy policy of choice for larger-scale systems.[176] Regulatory clarity on distributed generation assets (e.g. interconnection standards, ability to send excess power to grid, wheeling across property lines, etc.) is particularly useful for smaller, local/urban-scale deployments.

Regulations can also shift utility practices and address network design. For example, many jurisdictions mandate that utility programmes help customers to reduce consumption (often supported by rate restructuring or incentives).[177] In the US, the State of New York is reforming its power market to reward utilities for introducing energy efficiency measures and other innovative demand response mechanisms to deliver a secure power supply.[178] Other US state regulators are investigating ways in which regulated utilities can promote private investment and/or secure investment returns from local-area microgrids.[179] Regulatory reviews for utilities to introduce or maintain net-metering of distributed generation, or grid storage requirements, have repeatedly been shown to offer a net financial benefit to ratepayers and improve overall system costs.[180]

National investment vehicles

Green investment banks (GIBs) are dedicated finance institutions seeded by public capital. These institutions then blend private finance on a wholesale level (drawing in investors to increase capitalisation to be used for project or vendor finance); or project finance level (leading or participating in loan syndication). GIBs can be considered an emerging subset of national or regional development banks – government-backed lending institutions for which there is a long track-record. In emerging markets, they can be particularly useful for drawing in bilateral or multilateral development finance or climate finance to meet local, transactional needs where domestic public or private funds are likely to be more limited than in mature economies.[181]

Currently, over 10 GIBs are capitalised and operational in the world, all in middle- and high-income countries. These include national-level GIBs (Australia, Japan, Malaysia, Switzerland, United Kingdom); US state-level GIBs (five in total), and one city-level GIB in Abu Dhabi.[182] The UK GIB is capitalised at around US$7 billion and has mobilised an estimated US$3 for US$1 invested. The US State of Connecticut Green Bank has attracted US$10 in private investment per US$1 of public capital.[183]

GIBs tend to have a mandate to generate commercial returns, with governance structures to operate as independent institutions separate from direct government control. While green investments can be mainstreamed within existing government-supported development banks, the experience to date suggests the value of centralising expertise in an institution dedicated to leveraging and mobilising green investment – to unlock larger private capital flows.[184] GIBs have also shown significant flexibility and range of investment services, such as direct project debt and equity investments, deploying risk mitigation instruments (subordination, reserves, and guarantees), aggregating/warehousing smaller loans for future securitisation, and issuing green bonds.

Rather than establishing stand-alone institutions such as a GIB, Green Funds can provide a pool of capital for targeting specific investments or classes of investment. The intent is to provide early-stage market support to technologies or systems to advance government policy. Green Funds are managed by existing agencies or ministries within government. Green Funds may be more limited in their scale or impact compared to a GIB, which has the ability to borrow and thus leverage its government seed capital. However, it will have a smaller impact on a government's balance sheet compared with a bank whose entire capitalisation will be counted as government debt.[185]

Aggregation platforms can support the bundling and potential securitisation of multiple small investments. They address the key issue of scale that blocks private finance interest in certain new markets and/or markets defined by the perceived or actual small size of the project or asset. Distributed renewable energy and energy efficiency investments are prototypical markets that would benefit from aggregation. For example, WHEEL (the Warehouse for Energy Efficiency Loans) is an aggregation platform for residential energy efficiency loan programmes sponsored by US states, local governments, and utilities.[186] Though there is ample evidence related to asset performance (distributed energy) and costs-benefits (energy efficiency retrofits) to show both are sound investments, factors such as customer acquisition costs, lack of standardisation between projects, project set-up and monitoring/verification, lack of obvious collateralised assets to lend against, and relatively low amounts of capital invested has prevented these markets from meeting their potential. Aggregation platforms can provide a needed secondary market to recapitalise

primary investors, and help to promote project development and project contracting standardisation. Even with larger infrastructure investments, the fragmented nature of the market (lots of small and medium-sized cities) means that many bankable projects escape the attention of large investors. In these circumstances, smaller cities can benefit from national platforms, which provide both independent technical advice and aggregate smaller infrastructure projects that may be of a similar nature.[187]

Box 3

National investment vehicles in low-, lower-middle- and upper-middle-income countries

LOW-INCOME COUNTRIES

National Public Service Sector Pension Fund of Tanzania is a state-owned investor in fixed capital stock, capitalised through public sector work pension fund contributions. It has been a significant actor in the commercial and residential real estate market having led several large development projects, a portion of which have been retained in portfolio for ongoing income generation. It is also a strategic investor in a newly established real estate investment trust (REIT) created to develop low-income housing schemes. Present activities have shifted away from direct property development to industrial development activities, as mandated by the national government.

The Infrastructure Development Bank of Zimbabwe was established in 2005 with a mandate for long-term infrastructure finance and development. Shareholders of the Bank include the national government, local institutional investors, and international financial institutions (IFIs). Finance mechanisms utilised include project-specific debt and equity financing and PPPs. It operates on a commercial basis and secures investment capital, in part through listed and private placement bond offerings.[188]

LOWER-MIDDLE-INCOME COUNTRIES

Ho Chi Minh City Financial Investment Company is a state-owned wholesale investor for channelling investment capital to state-owned head corporations, limited companies, and joint-stock companies involved in infrastructure development and operations. It is one of 28 local development investment funds (LDIFs) operating in Vietnam, which were given statutory authority by the national government in 2001. LDIFs allow provincial governments to mobilise capital and enter into contracts with the private sector for the development of municipal infrastructure.[189]

The **Zambia National Pension Scheme Authority** channels national social security contributions into nationally relevant investments. It seeks a 2% return on investments over the rate of inflation. As of year-end 2013, it held shares in 14 listed companies on the Lusaka stock exchange (more than half of all exchange listed companies), with its investments representing about 2.4% of total market cap.[190]

UPPER-MIDDLE-INCOME COUNTRIES

The **State Oil Fund of the Republic of Azerbaijan** is an SWF established in 1999. It provides finance to strategically important infrastructure projects in the Republic as well as generating investment income through international investments. It has a portfolio target of 70% debt, 15% equity, 10% real estate, and 5% gold. It mixes in-house with external investment capability, with a maximum allocation to external managers of 60% of the total value of the portfolio.[191]

Thailand's Energy Conservation Promotion Fund (ENCON Fund) supports the national government's energy conservation-related programmes, targeting energy efficiency, renewable and alternative energy development, R&D projects, human resources development, and public education and campaigns. The fund is financed through a tax on petroleum products, with annual revenues of around US$200 million. Its activities include tax incentives and project investments through an Energy Efficiency Revolving Fund.[192]

International finance vehicles

At the Rio+20 summit in 2012, the eight largest MDBs committed to a broad target of investing US$175 billion in sustainable transport over the next decade to 2022.[193] Within this broad pledge, the institutions committed to integrating sustainable transport into their existing policy frameworks. In making their commitment, the MDBs signed up to a definition of sustainable transport as "transport that is accessible, affordable, efficient, financially sustainable, environment-friendly and safe."[194] This commitment is significant because the funding has potential to leverage substantial private sector investment for sustainable transport projects.

However, investments in 3C urban infrastructure have been lagging behind. In a review of the 186 transport projects funded by the major MDBs in 2012, only 41 (22%) were unambiguously urban projects, while 16 of these were focused on roads or urban highways.[195] This suggests that, for the foreseeable future, MDB financing will continue to provide incentives for business-as-usual urban growth rather than compact urban growth and connected infrastructure.

Climate change specific programmes and finance mechanisms have increased over the last decade, but the scale of finance for 3C infrastructure remains relatively small. These could help to increase finance flows for 3C infrastructure in middle- and low-income country cities. Research by the Overseas Development Institute shows that there is room to grow this urban-specific investment. It reviewed finance flows from several multilateral climate funds for the period 2010–2014 to quantify low-emission and climate-resilient development in developing-country cities. It identified US$842 million in approved climate finance for explicitly urban projects, which equates to just over 1 in every US$10 spent on climate finance over the period. The majority of this finance has supported low-carbon urban transport systems in fast-growing middle-income countries.[196]

MDBs are experienced in the use of blended finance, and scaling this finance mechanism is an opportunity for the sector. Recent examples include the Tamil Nadu Urban Development Fund (India), supported by the World Bank, the ADB, the Japanese International Cooperation Agency, and KfW, which issues bonds for smaller urban areas; and the US$150 million for the Urban Climate Change Resilience Trust Fund (supported by ADB, US Agency for International Development (USAID), the UK Department for International Development (DFID), and the Rockefeller Foundation) for resilience planning and implementation support in Asian cities.[197]

Bilateral donors play a key role in international funding. Statistics published by the OECD show that bilateral overseas development assistance (ODA) has been increasing in absolute dollar terms (nearly US$150 billion in 2015) and relatively stable as a percentage of gross national income (0.30% in 2015, down from the recent peak of 0.32% in 2005). Estimating financial flows specifically to urban development and urban infrastructure is challenging. The largest shares of aid go to the education, health, and population sector (19.4%) and economic infrastructure (19%). Multisector assistance, which includes both urban and rural development, is approximately 10% of total ODA funding.[198]

However, bilateral aid is often regarded as a source of general and sector budget support rather than a source of investment capital. Recipient partners often place an emphasis on enabling resources or functions in support of government-led sector investment programmes; providing more and better technical and policy advisory support; and doing more to leverage private finance flows. This presents an opportunity for bilateral agencies, although national budget constraints in donor countries since the global economic downturn remain a challenge.[199]

Existing international finance structures could be reformed to allocate a greater proportion of funds to 3C infrastructure. Alternatively, a new international facility could be created specialising in sustainable urban infrastructure. Finance and policy experts interviewed for the global review were split on whether institutions should be reformed or new institutions created. On the one hand, it was argued that a new institution would be unnecessary, costly, and risk duplication with existing mechanisms. However, others argued that a dedicated facility would provide a greater focus to deliver 3C infrastructure and be a more effective vehicle for leveraging private investment, through more targeted infrastructure programmes.

A range of dedicated multilateral facilities or institutions for blending private and public infrastructure finance is emerging internationally. The World Bank's Global Infrastructure Facility (GIF) is principally designed to build project pipelines and bring projects to investment-ready status in emerging markets. It coordinates input and

advice from multiple participants in the infrastructure development, finance, and operation chain. It is in its pilot phase, seeded with US$100 million for project preparation, financial structuring, and bid documentation. It may be supported by a dedicated finance window in the future.[200]

Africa50, established in 2015, is an infrastructure fund owned by 22 African governments, the African Development Bank, and institutional investors. It has been initially capitalised at US$740 million, with approximately 85% of the capital value dedicated to equity finance and the balance to project preparation activities. Africa50's primary target sectors are energy (renewable and conventional; generation and transmission and distribution); and transport (roads, airports, ports, and logistics).[201]

The International Finance Facility (IFF) was proposed by the UK government in the mid-2000s to securitise donor commitments for long-term programmatic funding. By issuing bonds, IFFs would create a larger upfront capital pool for high-cost/high-impact initiatives than would otherwise be available. Private capital could be mobilised both through the bond issuance, and also through the advance market commitment that leverages interest from private philanthropic and commercial partners in delivering the programme. The IFF model was successfully applied to the GAVI Alliance, a public–private partnership which works to increase access to vaccination in developing countries.[202]

Public–private partnerships[203]

PPPs offer a finance solution to public entities where private capital is less costly than public capital, and/or where the public sector lacks the technical development and operational/managerial resources to efficiently develop and operate a particular infrastructure asset or class of assets.[204] So as to meet the higher return expectations from private investors than is needed for public finance, the universe of suitable projects for PPPs is limited principally to those that can generate sufficient income-backed returns.[205] Energy and road infrastructure projects have attracted the vast majority of global PPP finance,[206] given energy market rules (allowance for private/merchant generators) and income streams (tolling) of these assets.

The effectiveness of PPPs has been mixed, and depends heavily on appropriate project identification, structuring, contractual arrangements, and government capacity (particularly to monitor liabilities). Successful implementation requires regulatory clarity and transparency on which public entities can enter into PPPs and under what terms. National governments (solely, or in conjunction with bilateral donor institutions and multilateral development banks) could support municipalities through the development of a centralised PPP unit to provide technical and contractual services to governments that lack resources for this, ensuring that PPPs are fit for purpose.[207]

PPPs can offer an alternative for financing important projects in underdeveloped finance systems. However, PPPs used to finance municipal investment have mostly been unsuccessful, due to a number of existing challenges.[208] First, PPPs should be used on a small subset of public projects and should be viewed as a form of borrowing, instead of a substitute for municipal public revenue-raising. Second, in many countries, poor policy and business environments make it difficult to extract the resulting profit of a given investment thereby deterring private investment. Third, there is the possibility of "game play" between levels of government, and between the public and private partners, given asymmentric information. This also leads to rent-seeking behaviour. Fourth, in situations of high sub-national debt, the risk of hidden liabilities needs to be addressed with tight monitoring and strengthened public expenditure management, as well as greater accountability at the sub-national level, including through own-source revenues and hard budget constraints.

Box 4

Examples of public–private partnerships (PPPs) in low-, lower-middle- and upper-middle-income countries

LOW-INCOME COUNTRIES

The **Sierra Leone** government, Office of the President, established the Public–Private Partnership (PPP) Unit in 2014 to collaborate and provide technical support to national ministries/agencies and to local councils for engaging the private sector in public sector services delivery. It focuses on energy, transport, agriculture, fisheries, health, local government, waste, and education. The PPP Unit was devised as a means to close the finance gap of the country's Agenda for Prosperity, a US$5.2 billion expenditure strategy, of which government commitments total US$2.2 billion.[209]

The **Gambia PPP programme** was initiated in 2016 through the Ministry of Finance and Economic Affairs. Only two PPP projects have been completed in the Gambia, and none since 2006. A 2015–2020 National PPP Policy has now targeted priority investments that can attract private participation. The PPP programme will support the development of an enabling PPP law and a procedural framework.[210]

LOWER-MIDDLE-INCOME COUNTRIES

The **Philippines PPP Center** provides technical assistance to national government agencies, government-owned and -controlled corporations, government financial institutions, state universities and colleges, and local government units, as well as to the private sector, to help develop and implement infrastructure projects. The Center was established in collaboration with a number of funders and technical partners including the ADB, Association of Southeast Asian Nations (ASEAN), Australian Department of Foreign Affairs and Trade (DFAT), Global Affairs Canada, Japan International Cooperation Agency (JICA), Foundation for Economic Freedom (FEF) and Cities Development Initiative for Asia (CDIA).[211]

The **Council for the Development of Cambodia** is the government agency responsible for promoting, facilitating, and registering PPP projects. A PPP enabling law (Law on Concessions) has been in place since 2007. The Council provides project identification, structuring, and transaction technical support to government agencies seeking PPP projects; and markets PPP opportunities to external investors/partners. The Ministry of Economy and Finance undertakes costs and benefits assessments and legal review of proposed PPP transactions, and is responsible for assessing and approving the liabilities of the government under proposed PPPs.[212]

UPPER-MIDDLE-INCOME COUNTRIES

The **Colombia Agencia Nacional de Infraestructura (ANI)**[213] is a decentralised state agency for national infrastructure. It is financially and technically autonomous, housed within the Ministry of Transportation. ANI is responsible for planning, coordinating, structuring, executing, administrating, and evaluating concession projects and any other PPPs that include design, build, finance, operations, and maintenance aspects of transportation projects in the country.[214]

4.4 COORDINATING GOVERNANCE

Increasing finance flows to cities for 3C infrastructure will require effective, coordinated governance, both at the national level and at regional and city levels. At the local level, several elements of urban governance are essential, including multi-level governance with effective legal and regulatory coordination of national, regional, and city policies; city leadership and financial authority; transparency and accountability; and horizontal policy integration at the local level.[215] At the same time, generating cooperation among local governments may be encouraged by the national government through intergovernmental systems, legal frameworks or specific financial incentives.[216]

In many countries, capacity-building will be critical to operationalising the raising, steering, and blending of finance through effective institutional governance. This applies both to national and municipal entities who, working collaboratively or independently, will need to be agents for setting market conditions, determining infrastructure development needs and structuring projects, and acting as bankable counterparties to other public and private investors. Capacity-building is required not only to address the institutional failures that often act as barriers to investment: lack of upfront public capital, institutional inertia that continues to incentivise business-as-usual development, and gaps in skills, expertise, and structures. It is also essential to operationalise instruments such as finance blending mechanisms that can help to overcome market barriers such as risk-return profiles and imperfect information.

Building effective urban governance will need to be done in phases, depending on the starting position of the countries and cities, particularly in terms of financial maturity and income levels. For some low-income countries, the development of basic budgetary, accounting, and financial management systems at the municipal level will be required alongside measures for accountability and transparency. For countries with cities that already have basic management systems in place, building more effective fiscal coordination between national finance ministries and municipalities may be more of a priority.[217] With more sustainable municipal revenues, countries can consider the development of more sophisticated financial management for building creditworthiness in readiness for access to the debt markets.

Internationally recognised systems of municipal accounts (such as the IMF's GFSM standards or IPSAS) could help to establish a municipal credit rating system. Having a standard baseline against which to measure the financial management of municipalities enables potential investors to differentiate between more and less creditworthy local actors. It would also provide administrations with a tool to improve their credit rating, by understanding how their accounts affect their rating. Cities could then build on this by introducing into their accounting practices some of the core principles of the "integrated reporting model", such as the recognition of environmental or social capital.

Institutional readiness needs to be factored into programmes for scaling up sustainable urban infrastructure. Given the range of investments required and the cross-cutting nature of 3C infrastructure, coordination between government departments and agencies at the same level and between levels is necessary. There are sound reasons why finance should be directed by local rather than national actors, and optimally more cities will be in a position to do so. But in practical terms, the capacity deficit at the local level is significant and addressing it comprehensively will take time. Therefore, stronger coordination between national and local entities is of great importance in the short to medium term.

The Coalition for Urban Transitions is examining national frameworks for integrated governance. The aim is to promote governance integration through joined-up institutional structures and practices. Early insights suggest that where power has been devolved, 3C policy integration may be enhanced. Evidence also shows that broader metropolitan governance structures can deliver services with greater efficiency by sharing costs, exploiting economies of scale, and reducing negative externalities that can spill over municipal boundaries.[218]

5. Conclusions

One of the objectives of this work programme going forward is to explore potential actions that national governments can take to overcome the barriers to municipal, private, and institutional investment in sustainable urban infrastructure. For municipal governments, fiscal decentralisation can scale up the local finances needed for large infrastructure programmes. For private and institutional investors, national regulatory frameworks and policy programmes can incentivise incremental investments into more sustainable infrastructure, while blending structures can help to reduce the barriers of risk, return, and imperfect information.

However, evidence for the effectiveness of the seven key finance mechanisms identified by experts in the review is mixed and incomplete. For this reason, we recommend that the Coalition for Urban Transitions examines the potential of these seven instruments in more detail, particularly at the level of national case studies. These case studies could build on and extend the work undertaken in parallel with this review in Uganda, India, and Mexico. The following sections provide a summary and recommendation for each of the seven finance mechanisms identified.

Fiscal decentralisation

Own-source revenues at the margin, including local surcharges and simple forms of property taxation, can increase the efficiency of public finances and provide municipalities and regions with greater sources of revenue over which they retain control. The design and management of intergovernmental transfers, spending responsibilities and governance mechanisms at different levels of decentralization or devolution have a major role to play.

Bonds and debt financing

Municipal bonds are an important tool for raising upfront capital to finance sustainable urban infrastructure. However, as a prerequisite, cities need sufficient own-source revenues for making debt repayments, along with capacity for budgetary, accounting, and financial management. Creditworthy national governments can collaborate with cities to identify investment priorities and the preconditions to issue national green bonds to support them. Where national debt markets are constrained by a lack of liquidity, national governments should work with capital market authorities and IFIs on creating secondary markets and instruments to reduce the cost of longer-term local currency finance.

Land value capture

Land value capture can help to finance large urban transport and development projects. National governments can provide strong regulatory frameworks and guarantees that enable municipalities to use land value capture for shaping compact urban development. National governments can also incentivise municipalities to assess and implement LVC under best practice guidance as a condition of allocating national funds to part-finance infrastructure projects. Furthermore, they can be active participants in urban infrastructure and property development in cases where land is controlled by national entities.

Pricing, regulation, and standards

Pricing carbon and urban pollution is critical for steering investments into sustainable urban infrastructure. At the same time, leakage and unintended behaviours from poorly planned price signals need to be minimised. The delivery of sustainable urban infrastructure at scale also requires regulations and standards that steer private finance into new markets and infrastructure programmes. National regulation is particularly important for incentivising investments in resource-efficient buildings, solar, and other forms of distributed utilities.

National investment vehicles

National development banks, green investment banks, and other national-level investment vehicles with a specific mandate for financing sustainable urban infrastructure have substantial potential for blending public and private finance. National vehicles can reduce policy risk for investors, leverage private finance, and provide longer-term investment horizons. National investment vehicles can provide leadership for developing and deepening national equity and debt markets, while setting strong, long-term market signals for attracting and allocating capital for sustainable infrastructure.

International finance facilities

The potential of international finance institutions and bilateral donors to drive sustainable urban infrastructure is substantial. Established MDBs and bilateral overseas development assistance already play a critical investment role in low- and middle-income countries, while the Asia Infrastructure Investment Bank (AIIB) and the BRICS New Development Bank are increasingly a source of infrastructure finance in emerging economies. The annual infrastructure lending of MDBs may need to increase five-fold over the next decade, from around US$30–40 billion to over US$200 billion. As trusted conveners, MDBs can bring together governments, the private sector, investors, and civil society to help to establish replicable and scalable models of blended finance. There are opportunities for MDBs follow the “clean and green” lead of the AIIB, reallocating more of their capital to infrastructure that is both urban and sustainable. MDBs could also grow their balance sheets for greater use of guarantees and other lower risk leveraging tools consistent with their high credit ratings.

International finance facilities can provide an important role for blending public and private finance, particularly when national investment vehicles do not exist or have limited capacity. An international finance facility devoted to sustainable urban infrastructure investment could be explored by the international community. This could provide new leadership to set long-term international market signals for attracting and allocating capital for sustainable infrastructure. Alternatively, MDBs could take on this role.

Public–private partnerships

Public–private partnerships (PPPs) can play a role in delivering urban infrastructure projects where governments face technical and financial constraints, particularly in middle- and high-income countries with mature financial systems. PPPs allocate risks between public and private entities and aim to provide more sustainable financing options and better value for money. There are many forms of PPP, but their potential is limited to suitable project types. Private sector participation is likely to increase where projects involve commercial returns on revenue-generating assets.

ANNEX: INVENTORY OF FINANCE INSTRUMENTS AND FUNDING MODELS

Finance instruments and funding models[219]	Type of instrument[220]	National public finance	International public finance	Private finance	Institutional finance
National investment vehicles	Blending structure	X			
International finance facilities	Blending structure	X	X	X	X
Investment platforms	Blending structure	X	X	X	X
Public–private partnerships (PPP)[221]	Blending structure	X	X	X	X
Public–public partnerships	Blending structure	X	X		
Joint ventures	Blending structure	X	X	X	X
Green investment banks	Blending structure	X	X	X	X
Public sector equity*	Government finance instrument	X	X	X	X
Trade credit	Government finance instrument	X			
Special drawing rights	Government finance instrument		X		
IFI finance	Government finance instrument		X		
Bilateral aid	Government finance instrument	X			
Multilateral aid (e.g. funds)	Government finance instrument		X		
On-lending facilities	Government finance instrument	X	X		
Revolving funds	Government finance instrument	X			
Regional development funds	Government finance instrument	X			
Escrow accounts	Government finance instrument	X			
Green investment funds	Government finance instrument	X	X		
Procurement	Government finance instrument	X	X		
Power purchase agreements	Government finance instrument	X		X	X
Carbon procurement vehicles	Government finance instrument	X	X		
Land auctions	Government finance instrument			X	
Guarantees	Government finance instrument	X	X		
Currency exchange funds	Government finance instrument	X	X		

Finance instruments and funding models[219]	Type of instrument[220]	National public finance	International public finance	Private finance	Institutional finance
Tax-based land value capture (LVC)	Policy and revenue instrument			x	x
Development-based LVC[222]	Policy and revenue instrument			x	x
Carbon credits	Policy instrument		x		
Emissions trading systems	Policy instrument			x	x
Decentralised fiscal powers	Policy instrument	x			
Building standards (e.g. energy efficiency)	Policy instrument	x		x	x
Energy regulation (e.g. FITs)	Policy instrument			x	x
High-density building rights	Policy instrument			x	x
Business improvement districts	Policy instrument			x	x
Tax on low density developments	Policy instrument			x	x
Congestion charges	Policy instrument			x	x
Contracts for difference	Policy instrument	x			
Special purpose vehicles	Policy instrument	x	x		
Municipal corporation	Policy instrument	x			
Fiscal incentives/disincentives	Policy instrument			x	x
Removing lending caps for banks	Policy instrument			x	
Feed-in tariffs	Policy instrument	x			
Public equity*	Private finance instrument	x	x	x	x
Private equity*	Private finance instrument	x	x	x	x
Longevity swaps	Private finance instrument			x	x
Stock options	Private finance instrument			x	x
Preferred stock	Private finance instrument			x	x
Depository receipts	Private finance instrument			x	x
Transferable subscription rights	Private finance instrument			x	x
Equity futures	Private finance instrument			x	x
Convertible debenture	Private finance instrument			x	x

Finance instruments and funding models[219]	Type of instrument[220]	National public finance	International public finance	Private finance	Institutional finance
Warrants	Private finance instrument			x	x
Options	Private finance instrument			x	x
Credit derivatives	Private finance instrument			x	x
Repurchase agreements	Private finance instrument			x	
Commercial bank loans	Private finance instrument			x	x
Asset-backed securities	Private finance instrument			x	x
Infrastructure debt funds	Private finance instrument			x	x
Energy services companies	Private finance instrument			x	x
Yieldcos	Private finance instrument			x	x
Master limited partnerships	Private finance instrument			x	x
Green bonds	Public debt instrument	x		x	x
Project bonds	Public debt instrument	x[223]		x	x
Municipal bonds	Public debt instrument	x		x	x
Convertible bonds	Public debt instrument	x		x	x
Catastrophe bonds	Public debt instrument	x		x	x
Concessional debt	Public debt instrument	x			
Road tolls	Revenue instrument			x	x
Parking fees	Revenue instrument			x	x
Tax increment financing	Revenue instrument			x	x
Betterment levies	Revenue instrument			x	x
Property tax	Revenue instrument			x	x

Source:s Rabinowitz (2016), BNEF et al. (2016), Zuckerman et al. (2016), Godfrey and Zhao (2016), McKinsey (2016), C40 Cities et al. (2016), NCE (2016), Climate Policy Initiative (2015), UN-Habitat (2012), Group of MDBs (2013), Bhattacharya et al. (2015), Bhattacharya et al. (2012), DFID (2015), Cities Climate Finance Leadership Alliance (2015), Z/Yen Group et al., (2015), Floater et al. (2014a, 2014b), UNCTAD (2013), OECD (2013), Merk et al. (2012), IMF (2004), Dhameja and Sastry (2002), Baietti et al. (2012).[224]

** Public equity refers to publicly listed equity on the stock exchange, whereas private equity refers to unlisted equity. Public sector equity refers to equity stakes in companies that provide government services.*

ENDNOTES

1 UN DESA, 2014. *World Urbanization Prospects: The 2014 Revision, Highlights*. United Nations Department of Economic and Social Affairs.

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ABOUT THE COALITION FOR URBAN TRANSITIONS

The Coalition for Urban Transitions - launched in 2016 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 Cities 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 thinktanks, 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.

ABOUT PwC

At PwC UK, our purpose is to build trust in society and solve important problems. We're a network of firms in 157 countries with more than 223,000 people who are committed to delivering quality in assurance, advisory and tax services. Find out more and tell us what matters to you by visiting us at www.pwc.com/uk.

ABOUT LSE

The London School of Economics and Political Science (LSE) is one of the foremost social science universities in the world. LSE Cities is an international centre at the LSE that carries out research, graduate and executive education and outreach activities in London and abroad. Its mission is to study how people and cities interact in a rapidly urbanising world, focusing on how the physical form and design of cities impacts on society, culture and the environment. This research was commissioned via LSE Enterprise.

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