Financing the Transition:
Sustainable Infrastructure in Cities

March 2015

A Long Finance report prepared by Z/Yen Group and commissioned by WWF

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1. EXECUTIVE SUMMARY

Cities are faced with the huge challenge of providing infrastructure that meets the needs of a rising urban population with limited public resources. Cities already account for over 70% of global greenhouse gas emissions and energy consumption and face rising climate change-related risks. The way cities develop, particularly large and fast-growing cities in developing and emerging economies, is likely to have profound and long-term implications for both climate change and the global economy. Decisions and investments in urban infrastructure must be leveraged to achieve sustainable economic growth within the carrying capacity of the planet's systems and resources. More importantly, this is a unique opportunity to carefully consider investment for sustainable urban infrastructure that avoids the long-term lock-in effects of unsustainable fossil fuel-based technologies and development leading to run away climate change.

Sustainable infrastructure includes assets and projects that:

- reduce the environmental impact of urban infrastructure such as energy efficiency and renewable energy projects;
- improve the climate resilience of urban areas by improving the ability of infrastructure to cope with the consequences of climate change;
- help to protect biodiversity and ecosystem services;
- support the integration of nature-based assets into urban development.

This report provides an overview of financial instruments that are commonly used to finance infrastructure development. It analyses their potential to support the transition towards sustainable infrastructure, with a primary focus on energy efficiency and renewable energy at city level. It is based on detailed international research including 20 semi-structured interviews with senior city and finance professionals, over 180 responses to an online questionnaire, a global webinar and a comprehensive literature review.

The financing challenge

Financing the required infrastructure upgrading and development is a big challenge. Financing *sustainable* infrastructure is an equally big – and more urgent – challenge.

Central governments and cities are unlikely to fund the required infrastructure developments by themselves given their budgetary deficits and significant debt levels. Taxpayers are weary of having to provide any more funds following the financial crises, bank bailouts and subsequent stalled economic growth in many economies. Investors, whether banks, institutional investors, specialist funds and investment firms, need a return on investment and are unlikely to commit funds to infrastructure unless tangible opportunities with clear funding streams that meet their risk reward criteria can be identified.

Cities, but also governments at provincial or national levels, commonly finance, initiate or approve infrastructure development. Given competing public priorities, limited public financial resources and rising needs both for infrastructure upgrading and development, other sources of financing must be targeted. Cities have a critical role to play not only to leverage other sources of finance but also to ensure that future infrastructure upgrades and developments are sustainable through adequate policies and targeted financial support and incentives.

Sustainable urban infrastructure projects can be perceived as entailing relatively higher costs and risks compared to conventional infrastructure projects. Evidence however increasingly demonstrates how investment in sustainable infrastructure can boost infrastructure productivity and result in accumulated savings over time. Sustainable infrastructure projects should be structured, marketed and financed according to how anticipated savings and other quantifiable benefits can be monetised. For projects where technological risks or project uncertainty are more pronounced, public financial instruments or leverage tools can be used to improve their risk-return profile. Further, third party platforms and resources providing independent and expert guidance on sustainable infrastructure options and proven technologies can inform cities and investors' decision-making particularly in areas where they lack in-house capacity and expertise.

A range of financial instruments across public finance, debt and equity finance are commonly used to finance infrastructure. More often than not different financial instruments come into play to fund a single project. The financing approach, including the choice of instruments, is likely to depend on a range of factors including:

- the type of infrastructure;
- the stage, type and timeframe of the project;
- the contractual arrangement;
- the stakeholders involved and their risk/reward requirements; and,
- the regulatory environment.

Finding 1 – Some financial instruments have a higher potential to support investment in sustainable infrastructure (see Figure 1 below). Whether this potential can be achieved depends on:

- instrument design and scope;
- the integration of sustainability into investment or lending criteria;
- conducive and stable public policies.

Fig. 1 – Financial instruments with significant potential to support investment in sustainable infrastructure

Type	Instruments
Public	Public private partnerships (PPPs) Tax incentives Land value capture mechanisms Building rights and permits Grants and subsidies
Debt	Loans (incl. concessional loans or loans blended with grants) Special purpose bonds (e.g. green city bonds) Targeted guarantees and credit enhancement Debt refinancing mechanisms (e.g. asset-backed securities, forfeiting)
Equity	Listed infrastructure equity Infrastructure funds Thematic/targeted private equity structures and funds Equity-funded direct investments (SPVs and JVs)

Public finance

A range of public finance instruments and leverage tools can be used by cities (and other government entities) to support sustainable infrastructure investment and development. Public-private partnerships (PPPs) can support local investment in capital-intensive sustainable infrastructure and be designed to include sustainability targets and objectives. PPPs can be particularly suitable for types of sustainable infrastructure with stable and predictable returns and which rely on proven technologies. Taxes can incentivise investment in sustainable infrastructure for example by favouring density over urban sprawl or low-carbon energy over fossil-fuel sources. To be successful, tax design and implementation should be coordinated across policy areas. Public instruments such as land value capture mechanisms and user charges can encourage sustainable infrastructure development while leveraging funding for finance. Cities with limited public resources should prioritise grants and subsidies to support projects which have significant potential for leveraging additional sources of finance while delivering sustainable outcomes. Leverage tools such as building rights and permits can also be conditional on sustainable infrastructure targets and requirements being met. The exact range of instruments at cities' disposal and the extent to which these can be deployed to support sustainable infrastructure financing and development will tend to vary depending on local contexts including institutional and legal frameworks; government structure; and the degree of interactions among government entities at different levels (e.g. city, provincial, state and central government).

Debt finance

Depending on how sustainability is integrated in their design or scope, debt instruments like bonds and loans have the most potential to encourage investment in sustainable infrastructure. Securitisation and other refinancing instruments can support investment in sustainable infrastructure over time, by improving the liquidity and facilitating the repayment of senior debt, particularly for long-term capital-intensive projects such as renewable energy projects. Respondents suggested that more effort is required to develop further a secondary debt market for sustainable infrastructure. Loans and guarantees from government or development finance institutions can support debt finance provision in developing countries where domestic financial markets are underdeveloped or access to capital markets is restricted. There is potential to target credit-enhancement measures at sustainable infrastructure projects.

Equity finance

Most equity instruments have potential to support investment in sustainable infrastructure. As owners of significant amounts of infrastructure assets, listed equities could have medium to high potential depending on their capital expenditure strategy towards low-carbon infrastructure; how they integrate sustainability into core business and policy requirements. Thematic funds (e.g. focusing on investment opportunities in clean tech, renewable energy or water) exist and could help direct investment towards sustainable infrastructure provided that disclosure of how sustainability is integrated into investment decision-making becomes more systematic. Equity-funded direct investments in infrastructure such as special purpose vehicles (SPVs) and joint ventures (JVs) are commonly used to structure the finance for capital-intensive infrastructure projects, including sustainable infrastructure such as renewable energy and public transport infrastructure. Whether there is additional potential to use such vehicles for investment in sustainable

infrastructure is unclear as it is likely to depend less on the instrument and more on a pipeline of projects which could benefit from being structured using this type of vehicles.

Finding 2 – The lack of investable projects seems to be the main issue preventing sustainable infrastructure investment at scale rather than the lack of finance. The risk-reward profile of infrastructure projects largely determines the 'investability' potential and thus their attractiveness to private finance investors such as banks, institutional investors and specialist funds. A pipeline of investable projects would allow large investors to commit a greater share of their resources to infrastructure.

The lack of robust funding streams (e.g. revenue from user charges) is a major obstacle to investability and thus to the private financing of infrastructure. Energy efficiency projects should seek to monetise anticipated savings. Renewable energy projects should seek to monetise avoided carbon emissions and other quantifiable benefits. Funding can be an issue for types of sustainable infrastructure where clear repayment sources are lacking or do not fully cover the costs. For example, the extra cost of adaptation to improve infrastructure climate resilience may not have a clear repayment source and will likely require some form of public finance support or policy incentive to be delivered. Respondents by and large confirmed that the lack of expertise and market capacity in relation to new technologies was more pronounced in developing and emerging countries. This could hinder private sector financing of sustainable infrastructure projects even when funding streams are available. Demonstration and capacity building through multi-stakeholders projects involving public, private and development finance actors might help in this case.

Small size or the lack of scale is another regularly mentioned issue preventing the financing of sustainable infrastructure at city level. Project aggregation at sector level or across cities or local authorities can facilitate access to finance, including from private sources such as infrastructure and private equity funds. This could be particularly relevant for energy efficiency or renewable energy generation projects distributed across buildings and sites.

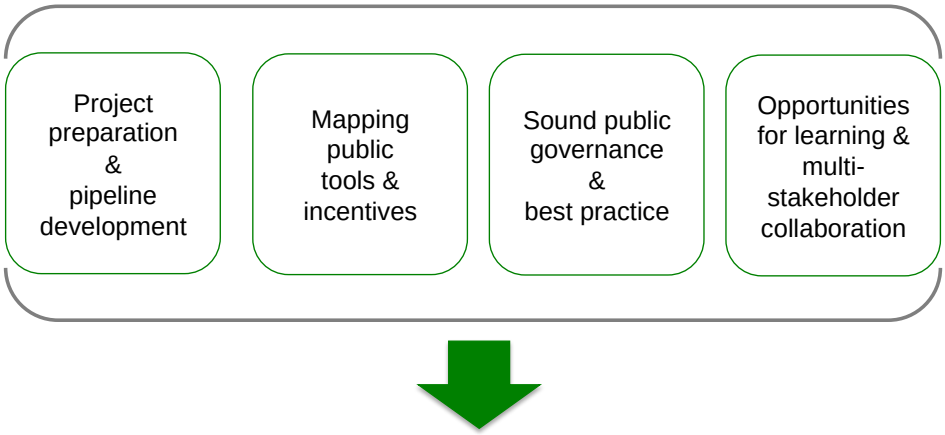
Investors are particularly wary of cities' being able to contract; cities managing their finances responsibly; and of cities' credit risk. Project prioritisation and preparation are critical to raising finance for infrastructure. Project prioritisation helps to narrow down a shortlist of projects that match local priorities and resources which can then be presented to developers and financiers. Project preparation helps to assess the viability of shortlisted projects through financial structure design; stakeholder consultation; cost revenue projections and social as well as environmental impact assessments. Capacity building and appropriate governance systems also critically influence the viability of sustainable infrastructure projects and their chances of raising finance.

Finding 3 – Cities can develop an attractive investment proposition for sustainable infrastructure financing and development, based on a 'product & marketing approach' to infrastructure financing.

Cities need to develop attractive investment propositions rather than demand investment if they want other sources of finance such as bank, institutional investors, specialist funds and even communities to support sustainable infrastructure development. Cities' efforts should primarily focus on project preparation and the

financing structure of sustainable infrastructure projects; public sector tools and incentives to leverage alternative sources of finance while meeting sustainability objectives and targets; and sound governance and best practice in order to boost investor and stakeholder confidence.

Fig. 2 – Towards a 'product & marketing approach' to infrastructure financing



Firstly, cities should seek finance through external sources for projects that have reasonable prospects of meeting investors' risk-return requirements. Public resources should be targeted primarily at priority projects which lack clear and predictable revenue streams. Second, cities should identify the range of public instruments, tools and incentives that both match their local contexts and which can effectively support sustainable infrastructure financing and development. Third, cities should aim to strengthen investor confidence by improving the transparency, accountability and sustainability of public finances as well as the efficiency of planning and procurement processes.

As shown in this report, some cities are already taking steps towards a 'product & marketing approach' to sustainable infrastructure financing through creative incentives, tools and financial instruments. Cities like Vancouver (Canada) and Pune (India) are tying low-carbon requirements to planning application processes and tax incentives, not only in relation to new infrastructure development but also to support the sustainable upgrading of existing infrastructure. Local and national governments in countries such as South Africa, Canada and India are actively pursuing economies of scale where applicable by establishing special purpose vehicles or companies to maintain, upgrade and develop infrastructure either across municipalities or within specific sectors (e.g. green technologies, renewable energy). Sao Paulo (Brazil) and London (UK) are leveraging land value capture mechanisms to raise finance on capital markets. Cities like Chicago (USA) are working to avoid additional debt on their balance sheets by structuring public private partnerships through separate entities involving private sector actors. Cities such as Gothenburg (Sweden) and Johannesburg (South Africa) are working to improve transparency and accountability on how the funds raised on capital markets through special purpose bonds (e.g. green city bonds) are being used.

Finding 4 – Collaboration across city departments, government entities at all levels and among stakeholders is key to unlock investment in sustainable infrastructure.

Local authorities should encourage collaboration internally, across departments, and externally, with government entities at other levels (e.g. provincial or national). Improving collaboration between departments in charge of sustainability, environmental services and energy and those in charge of planning, finances and procurement could help to identify areas where synergy is possible.

Others stakeholders have a role to play in supporting cities' efforts to finance and deliver sustainable urban infrastructure. The private sector, including financial institutions and investors, can share expertise in financing real assets such as infrastructure, particularly in relation to designing financing structures that allow aggregating and diversifying risk across a range of projects. Multilateral and national development banks can also share expertise in designing and structuring infrastructure projects across and within sectors. Financial institutions should strengthen their capacity to assess the sustainability impact of infrastructure projects and related investments. Networks and initiatives operating in finance, cities and sustainability, including civil society and academia, should continue their efforts to identify gaps; disseminate best practice and lessons learned; and favour multi-stakeholder dialogue. Central governments could support cities in their efforts through adequate regulatory frameworks and incentives and by encouraging best practice in public sector governance and finance management. Collaboration among cities and countries on sustainable infrastructure financing and development can support learning and best practice sharing as illustrated by relevant city networks (e.g. C40, ICLEI) and multi-stakeholder initiatives (e.g. G20's Global Infrastructure Initiative announced in 2014).

What next?

This report identifies four areas where multi-stakeholder collaboration is needed to support investment in sustainable urban infrastructure at scale and gradually shift towards a 'product & marketing' approach to sustainable urban infrastructure financing. These are:

- guidance for cities, infrastructure developers and financial institutions as to what sustainability for infrastructure means, and how the sustainability impact of a project can be quantified and monetised in the planning phase, and then monitored throughout the lifetime of the project;
- a framework to guide cities in the process of identifying, assessing and mapping relevant public sector tools, incentives and financing instruments which can be used to leverage investment in sustainable urban infrastructure development and upgrading;
- a comprehensive global database of urban infrastructure projects consolidating existing databases and documenting financing approaches as well as best practice in the use of public tools and instruments for sustainable infrastructure;
- more consideration given to finding ways of recognising good practice and innovation in this space such as for sound methodologies for evaluating investment in infrastructure from a sustainability perspective.

WWF and Long Finance welcome comments on this report and would like to invite stakeholders to express interest in potential future collaboration to explore some of the findings and recommendations.

2. INTRODUCTION

2.1. Background

People continue to move to cities. Today, over half the world's population resides in cities. Not surprising, cities are responsible for well over 70% of global CO2 emissions and global energy consumption. As urbanisation increases, it is projected that in the coming decades hundreds of trillions of dollars will be invested in urban infrastructure development, upgrade, use and maintenance. These investments need to be leveraged to ensure the creation of sustainable cities which reverse the trend of escalating emissions. "Reinventing the City", a report commissioned by WWF, reinforces this argument by highlighting how a strategic allocation of investments in cities can not only significantly contribute to curb climate change but also reduce urban infrastructure expenditure. (WWF, 2010)

This joint WWF and Long Finance research project, entitled "Finance Toolkit for Sustainable Cities", was carried out between November 2014 and March 2015. Building on WWF's Earth Hour City Challenge and Long Finance's Financing Tomorrow's Cities projects, this research sought to explore financial instruments that can be used by cities and investors to finance the development of sustainable urban infrastructure globally, with a focus on energy efficiency and renewable energy projects at city level.

2.2. Approach & methodology

Following desk research, Z/Yen sought to engage decision-makers, experts and professionals working with:

- cities;
- national or regional government bodies;
- development finance (DB) institutions, including multilateral and national DBs;
- financial services organisations (e.g. banking, asset management, fund management);
- institutional investors;
- professional services organisations;
- other private sector companies (e.g. ICT, construction, infrastructure technology companies);
- civil society organisations;
- academia;
- other relevant stakeholders and initiatives active in the space of urban development, finance and sustainability.

20 semi-structured interviews were carried out with city representatives and financial services professionals, as well as with private sector companies and relevant civil society organisations. The interviews focused on existing and prospective financial instruments for infrastructure as well as cities and financial institutions' experience of financing and delivering sustainable urban infrastructure projects (see *Appendix 2* for sample interview questions).

Fig. 3 – Interviews

Sector	Interviewees
Public – cities	Cape Town, Western Cape (South Africa) Chicago (USA) Gothenburg (Sweden) Pune (India) Sao Paulo (Brazil) Vancouver (Canada)
Finance – multilateral	Asian Development Bank (ADB) European Bank for Reconstruction and Development (EBRD) European Investment Bank (EIB)
Finance – private, investors, advisors	Allianz SE, Allianz CP Inderst Advisory Standard & Poor's GreenCape
Private other – infrastructure, technology	Siemens
CSOs, networks & initiatives	C40 Cities Development Initiative Asia (CDIA) Global Infrastructure Basel (GIB) ICLEI

A questionnaire was issued online to gain insight on people's experience and perception of sources of finance and financial instruments (see *Appendix 3*). 184 people from 27 countries kindly contributed to the online questionnaire, though a significant European bias should be taken into account when considering the data, given that nearly 80% of the respondents are based in Europe.

Fig. 4 – Respondents by location

Regions	Respondents
Africa	2
Asia	11
Australia	3
Europe	145
Latin America	4
North America	19
Total	**184**

Fig. 5 – Respondents by sector

Industry sector	Respondents
Finance	57
Professional Services	50
Private Sector Other	18
Public Sector	11
IFIs & MDBs	2
CSOs	15
Academia	21
Other	10
Total	**184**

A webinar, "Finance Toolkit for Sustainable Cities: Challenges & Opportunities for Innovation", was held in two sessions on 29 January 2015 in order to present, discuss and gather feedback on preliminary findings. About 60 people from 16 countries joined the webinar.

2.3. Research challenges, key definitions & limitations

There are some inherent challenges when conducting this type of research. Definitions can be problematic. How do we define cities? What is sustainable urban infrastructure? Terminology can be confusing too.

The literature and professionals use different key words almost interchangeably, for example 'financing approaches', 'funding models', 'financial instruments' and 'financing mechanisms'. Accurately understanding developments and trends in this area can also be challenging. What constitutes an innovative financial instrument? Is an instrument really new and innovative or is it rather another application of a known financial instrument? What are the unique challenges, opportunities and characteristics for financing sustainable cities compared to financing the average city? Trade-offs have to be acknowledged in particular in relation to sustainability e.g. how sustainable can urban development be? These have been given careful consideration and the following definitions should help to clarify the scope and purpose of this report.

Cities differ in terms of size, structure, spatial form, economy, wealth, local resources availability and ecological impact. Most countries use either a single characteristic or a combination of administrative, population (e.g. size or density), economic and urban characteristics (e.g. water supply systems, paved street, street lighting) to define a city. Population size is often used to differentiate between small, medium, large and mega urban centres, though the lower population limit above which a human settlement can be considered urban varies greatly across countries, between 200 and 50,000 people. We have adopted the UN definition of cities (see UN DESA, 2014: 54-55):

- small urban centres have a population of less or equal to 500,000 people;
- medium urban centres, a population between 1 million and 5 million people;
- large urban centres, a population of 5 million and more;
- mega urban centres, a population of 10 million and more.

In the absence of an agreed definition in the literature, this report considers **sustainable infrastructure** to include projects that

- reduce the environmental impact of urban infrastructure such as energy efficiency and renewable energy projects;
- improve the climate resilience of urban areas by improving the ability of infrastructure to cope with the consequences of climate change;
- help to protect biodiversity and ecosystem services;
- support the integration of nature-based assets into urban development.

When considering finance for infrastructure, it is important to differentiate between infrastructure funding and infrastructure financing:

- **infrastructure funding** refers to how infrastructure is paid for, that is the revenue sources, often collected over many years, which are used to pay for the costs of providing infrastructure services. Common sources of funding include tax revenues, user charges and other charges or fees dedicated to infrastructure. (Maier & Jordan-Tank, 2014)
- **infrastructure financing** refers to the way in which debt and/or equity is raised for the construction and operation of an infrastructure project based on projected funding (Maier & Jordan-Tank, 2014).

Sources of infrastructure financing therefore refer to possible providers of capital to build and upgrade infrastructure. These include:

- governments – local, provincial, national governments;

- financial services – commercial banks, specialist funds, private equity funds, infrastructure funds, other asset management and investment management firms and funds;
- public and development finance institutions – international financial institutions, multilateral and national development banks, export credit agencies;
- institutional investors – pension funds, mutual funds, insurance companies, sovereign wealth funds;
- capital markets – where people and companies trade debt and equities;
- private companies;
- communities.

Capital is allocated to projects through financing instruments. In essence, a **financing instrument** is a contract between the provider of capital and the project developer or institution responsible for the delivery of the infrastructure project. The International Financial Reporting Standards (IFRS) state: "a financial instrument is any contract that gives rise to a financial asset of one entity and a financial liability or equity instrument of another entity" (IFRS, 2012). A chosen financing instrument or contract will usually specify the financing mechanism; the role of each institution/ participant in the mechanism; the amount, the maturity and the currency; the financing cost (e.g. interest rate) and the payment method; the risk allocation between the participants; the payback if it is a debt instrument; and any other applicable special clause (Paun, n.d.).

Three main limitations apply to this report and should be taken into account by readers.

- First, it is not always straightforward to distinguish between sustainable and conventional infrastructure, both from an infrastructure and a financing perspective. Upgrades to conventional infrastructure such as housing stock or water network are likely to deliver resource efficiency benefits while enhancing reliability and sustainable quality service provision. From a financing perspective, it is not always easy to monitor whether investment goes to superior or average infrastructure options from a sustainability impact perspective even when the instrument (e.g. fund or bond) is branded as 'green'.
- Second, this report outlines and reviews financing approaches and instruments commonly used to finance infrastructure and assesses their potential to finance sustainable infrastructure development. The focus on energy efficiency and renewable energy helps to illustrate relevant applications in sustainable infrastructure but does not mean that the analysis focuses solely and comprehensively on financing approaches and instruments applicable to related types of infrastructure. References for additional information and more detailed analyses are provided where possible.
- Third, this report primarily addresses the role of cities and government authorities at all levels in supporting sustainable infrastructure financing and development through policies, financing instruments and leverage tools. Analysing the role (and responsibility) of the finance sector in channeling finance towards sustainable infrastructure is left outside the scope of this report.

2.4. Report outline & acknowledgements

This report comprises six chapters. Beside the executive summary (Chapter 1) and the introduction (Chapter 2),

- Chapter 3 outlines why sustainable infrastructure is key to the development of cities; provides an overview of infrastructure financing sources and trends; and outlines challenges and opportunities related to sustainable infrastructure development and financing.
- Chapter 4 reviews financing approaches and instruments relevant to infrastructure and analyses their potential to support investment in sustainable urban infrastructure with a focus on energy efficiency and renewable energy.
- Chapter 5 analyses the trends underlying the emergence of a 'product & marketing approach' to sustainable infrastructure financing and outlines examples of city innovation.
- Chapter 6 provides recommendations for future research and actions by way of conclusion.

Two addenda are provided with the report:

- ***Addendum A*** provides a detailed overview of relevant sources of finance for infrastructure and trends in infrastructure financing.
- ***Addendum B*** provides an overview of initiatives and organisations relevant to sustainable infrastructure and infrastructure financing globally and categorises these according to their primary purpose.

This report includes four appendices:

- *Appendix 1* lists the affiliations of people who have kindly contributed to this project.
- *Appendix 2* contains the interview template.
- *Appendix 3* reproduces the online questionnaire.
- *Appendix 4* provides the bibliography, with much of the reference material available online.

This report was prepared by Chiara von Gunten and Michael Mainelli of Z/Yen Group. We are very grateful to WWF for their support throughout this project, in particular to Magnus Emfel, Jeet Mistry and Kookie Habtegaber for providing inputs, contacts and resources. We would like to thank all the participants who contributed to discussions during events, completed the online questionnaire or agreed to semi-structured interviews. We received enthusiastic participation from everyone on this project, and it was a pleasure to meet so many people thinking innovatively about finance for sustainable urban infrastructure. We owe special thanks to Magnus Borelius and Sara Pettersson (City of Gothenburg) as well as Brian Field (European Investment Bank) who kindly shared their experience and insights on financing sustainable urban infrastructure during the webinar's panel discussions. While there were many direct and indirect contributors, the conclusions in this report are the sole responsibility of Z/Yen Group.

3. CITIES, SUSTAINABLE INFRASTRUCTURE & FINANCE

3.1. Why cities need sustainable infrastructure

Cities drive economic growth, job creation and innovation. Cities generate around 80% of global economic output (New Climate Economy, 2014). The world's major 600 cities generate together over 50% of global GDP with less than a quarter of the world population (Barysch, *et al.*, 2014). Adequate infrastructure is critical to support cities' economic growth, competitiveness and attractiveness. Standard & Poor's finds that a 1% GDP increase in infrastructure spending can have a multiplier effect of between 1.0 and 2.5 for G20 countries over a three year period, with greater effect in developing economies, particularly emerging economies such as China, Brazil and India (Standard & Poor's, 2015).

About 50% of the 7.2 billion global population already live in cities and this figure is projected to increase to 75% of an estimated 9.6 billion global population by 2050 (Barysch, *et al.*, 2014). Developing and emerging countries, which already account for three quarters of the world's urban population and most of the world's largest cities, will experience most of the increase in urban population (Revi *et al*., 2014). Rising urban population leads to expanding urban areas and increasing infrastructure needs. These include transport, buildings, energy, water and sanitation, waste management, telecommunications and social infrastructure such as education, health care and public facilities (Standard & Poor's, 2015).

Infrastructure needs vary across countries and cities, depending in part on the stage of economic development; the availability and state of existing infrastructure; and future demand. Developed economies must replace and upgrade increasingly out-dated and obsolete infrastructure. Developing and emerging economies, where 90% of anticipated urban growth is expected to take place, must plan urban development and build from scratch new infrastructure in order to accommodate the needs of a rapidly rising urban population and expanding economic activity while avoiding the proliferation of informal settlements. (World Bank, 2010; Standard & Poor's, 2015)

Cities already account for 70% of global greenhouse gas emissions and of energy consumption (IEA, 2008). Much of the urban growth, particularly in developing economies, is unplanned and unstructured which creates additional economic, environmental and social costs (New Climate Economy, 2014). Urban climate change-related risks are increasing, including both catastrophic risks - arising from the poor design and location of the built environment and infrastructure; and systemic risks - which arise from the poor design and performance of typical urban planning and construction and of urban services and management systems under changing climate conditions (Revi *et al*., 2014; ICLEI, 2011). Climate change risks can not only adversely impact existing infrastructure and ecosystem services but also have widespread detrimental effects on people's health and livelihoods as well as on local and national economies (Revi *et al*., 2014).

The environment is a critical foundation supporting the sustainability of other dimensions such as economic and social development (Raworth, 2012). Sustainable infrastructure is thus a key element defining cities' ability to meet inhabitants and business demands. Infrastructure development however needs to ensure minimum impact on the environment by preserving the natural resource base and by helping to

reverse greenhouse gas emissions increases. Decisions on, and investments in, urban infrastructure must be leveraged to achieve sustainable economic growth within the carrying capacity of the planet's systems and resources. How cities develop over the next decades, particularly major and fast-growing urban areas in developing and emerging economies, will impact on the sustainability of future cities. In turn, this is likely to have profound and lasting implications for cities' safety, resilience and socioeconomic development over time. Investment in infrastructure and resource efficiency are two of three critical drivers of change to overcome market, policy and institutional barriers to low-carbon economic growth identified by the New Climate Economy (2014). Achieving low-carbon and climate-resilient urban development is a policy objective for many governments. Channelling investment in sustainable urban infrastructure is a critical part of the challenge (Corfee-Morlot *et al*., 2012).

3.2. Infrastructure financing landscape: sources and trends

While estimates and methodologies vary, the scale of the financing needed to deliver the required infrastructure globally is huge. According to Standard & Poor's, about USD 57 trillion is needed to finance infrastructure globally between 2014 and 2030 (Standard & Poor's, 2014). The OECD states USD 82 trillion must be invested in infrastructure between 2009 and 2030 (OECD, 2012). Booz & Company estimated 30-year cumulative urban expenditures (covering infrastructure development, maintenance and usage) to amount to USD 350 trillion (WWF, 2010). The table below provides an overview of the regional infrastructure needs. These figures should be considered with caution given different sources and approaches.

Fig. 6 – Regional infrastructure financing needs

Region	Annual infrastructure investment needed (USD)	% of regional GDP
Africa	93 billion	15%
Asia	750 billion (between 2010-2020)	-
Australia	23 billion[1]	-
Europe	Over 560 billion[2] (up to 2030)	2.6%
Latin America	320 billion	6.2%
North America	510 billion	-

[Sources: Adapted from figures quoted by World Bank, 2009; ADBI, 2009; Inderst & Della Croce, 2013; Inderst, 2013; ECLAC, 2014; Standard & Poor's, 2015]

Financing the required infrastructure upgrading and development is a big challenge. While governments have financed most of the infrastructure development, national and city governments are unlikely to be able to fund the required infrastructure developments given budgetary deficits and significant debt levels. Governments in developing countries often lack the institutional capacity to plan, and the financial resources to fund, the unprecedented level of new infrastructure required to accommodate their rapidly growing urban population. Infrastructure often competes

[1] Inderst & Della Croce (2013) quote AUD 30 billion a year, about USD 23 billion
[2] Inderst (2013) quotes 500 billion Euros a year, about USD 566 billion

for limited public resources with other socio-economic policy priorities (e.g. education, health, ageing populations etc.). (Maier and Jordan-Tank, 2014)

Taxpayers are weary of having to provide any more funds following the financial crises, bank bailouts and subsequent stalled economic growth in many economies. Following the crises and new regulations, commercial banks face more stringent capital, funding and liquidity requirements, which constrains their ability to provide long-term infrastructure financing to the level they used to.

As governments and banks' ability to provide long-term financing shrinks, many worry that the global infrastructure investment gap is widening to unprecedented levels. Estimates range between USD 500 billion and USD 1 trillion a year depending on the source and the methodology (Standard & Poor's, 2014; WEF, 2013). Experts suggest that additional incremental investment between USD 0.7 trillion and USD 1 trillion per year is required specifically in low-carbon climate resilient infrastructure in order to limit the increase in global temperature to two degrees Celsius (WEF, 2013; IEA, 2012.) The volume of investment in sustainable infrastructure, though growing, seems to fall short of meeting the desired targets. Investment in clean energy for example is estimated to be short of the required levels by at least USD 150 billion a year by 2020, a large proportion of which will need to be provided in the East Asia and Pacific region (Baietti *et al*., 2012).

Current trends in infrastructure financing have two important implications. First, relying on general tax revenue to leverage finance for infrastructure development is no longer an option in many places (Jordan-Tank & Maier, 2014). Second, a broader group of investors and financiers should be targeted. ***Addendum A*** (p.54) provides an overview of relevant sources of finance for infrastructure, including development finance institutions (international, multilateral and national development banks); export credit agencies; institutional investors; specialist funds, private equity and other investment funds; capital markets; private sector companies and communities.

Financing for infrastructure is likely to come increasingly from a combination of sources and to require multi-stakeholder collaboration between public and private sector actors. Investors, whether banks, institutional investors, specialist funds and investment firms, need a return on investment and are unlikely to commit funds to infrastructure unless tangible opportunities with clear funding streams that meet their risk reward criteria can be identified. As this report explores in greater detail in Chapter 5, a gradual shift away from a purely 'needs- & tax- based' approach to infrastructure financing and towards a more pragmatic 'product & marketing approach' to sustainable infrastructure financing is needed in order to deliver the required infrastructure assets and services.

Financing for sustainable infrastructure specifically does not only depends on the availability of finance but also on the extent to which sustainability is integrated into lending and investment strategies underpinning infrastructure financing. Multilateral development banks are increasingly adopting environmental and social guidelines and principles to guide their activities as illustrated by IFC's Performance Standards on Environmental and Social Sustainability (IFC, 2011). Some MDBs are going a step further by integrating sustainability into their lending criteria. In 2013, the European Investment Bank (EIB) decided to align its energy lending criteria with EU policies and targets by adopting guidelines to support investment in energy

efficiency, renewable energy and energy grids (EIB (a), 2013). The guidelines notably introduce an Emission Performance Standard to ensure that all fossil fuel power generation projects financed by the EIB are in line with member states commitments to EU climate policy (EIB (b), 2013).

While interest for infrastructure as an investment opportunity is rising, institutional investors currently allocate only a small portion of assets to infrastructure, on average 1% for pension funds. Bloomberg New Energy Finance (BNEF) estimate that of this 1%, only 3% are invested specifically in green infrastructure (Liebreich & McCrone, 2013). More generally, evidence suggests that sustainability could be more systematically integrated into the decision-making and risk assessment processes underpinning investment in infrastructure. Respondents working in finance suggested that more transparency is needed to reasonably assess the extent to which sustainability criteria are taken into account particularly by thematic and specialist funds investing in infrastructure.

Regions, countries and cities around the world are devising ways to tap alternative sources of finance for infrastructure. In Europe, the European Commission and EIB launched the European Fund for Strategic Investments (ESFI) with an initial funding of Euros 21 billion[3] to mobilise private investment through leverage and co-financing for anticipated investments amounting to at least EUR 315 billion over 2015-2017 (EIB, n.d.; Standard & Poor's, 2015). Multi-investor approaches should be encouraged further as illustrated by the Pan-African Development Infrastructure Development Fund (PADIF) which pools capital from African institutional investors, national and multilateral development banks as well as private financial institutions for investment in infrastructure across the African continent (see AfDB, 2007; Bloomberg, n.d.; Harith website). Sustainable infrastructure objectives and targets should be systematically integrated to the overall objective and resource allocation strategy of multi-investor funds.

Cities' ability to raise finance for urban infrastructure tends to be a function of:

- budgets and credit worthiness;
- access to other sources of government funding (e.g. regional or national funding streams) or to capital markets;
- their ability to tap into alternative sources of financing such as private finance through incentives and tools; and
- their ability to leverage existing assets in order to develop new ones, linking both to land use planning. (World Bank, 2013)

Public sector support in the form of financial instruments, tax incentives and concessional funding is unlikely to vanish entirely. Rather it remains important to leverage alternative (including private) sources of finance for infrastructure. Public sector leadership is critical to encourage investment in sustainable infrastructure, through specific public policies and instruments providing incentives for sustainable infrastructure development over the long term. The effectiveness of such public interventions is contingent on a broader institutional environment, including the presence of trusted and coherent legal frameworks and institutions; the level of sophistication of local private financial markets; and the overall attractiveness of a country's investment climate. Basically, investors have to trust governments'

[3] Euros 16 billion from the EU in the form of guarantees and Euros 5 billion from the EIB

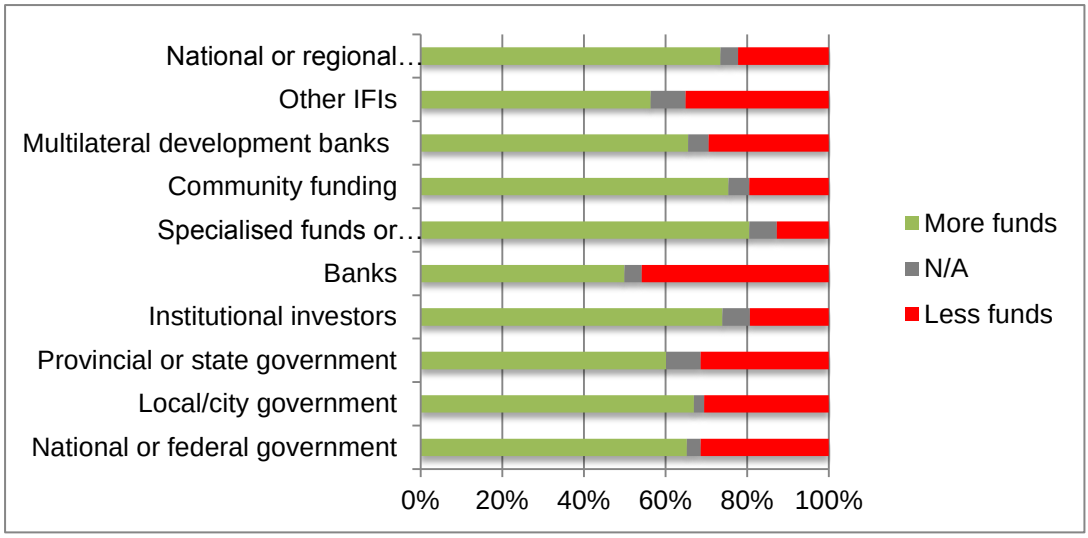
promises. Such a coherent and well-functioning institutional environment can represent a challenge in some places, particularly in developing countries (World Bank, 2013).

Box 1 – Respondents' views on sources of finance for sustainable infrastructure

Respondents to the survey agreed that financing for sustainable infrastructure would usually come from a combination of sources and was likely to be contingent on a stable and predictable regulatory environment.

The graph below illustrates how respondents perceived that known sources of finance for infrastructure would allocate funds to infrastructure over the next five to ten years.

Fig. 7 – Perceived fund allocation to infrastructure over next 5 to 10 years



Respondents suggested that most known sources of infrastructure would commit relatively more funds to infrastructure over the next five to ten years, particularly specialist infrastructure funds and investment firms, national and regional development banks, institutional investors and local communities. The picture was less clear for banks, which seems to be consistent with the increasing regulatory capital constraints most banks face which is reducing their incentive to hold long-term liabilities on their balance sheets.

3.3. Sustainable infrastructure: challenges and opportunities

Distinguishing between sustainable and conventional infrastructure is not always straightforward. From an infrastructure perspective, sustainable outcomes can arise directly or indirectly depending on the type of infrastructure, the local context and the enabling environment. For energy infrastructure for example, sustainability arises from the choice of energy from a renewable source but also from the reliability of energy supply networks and grids. For other types of infrastructure such as water networks or public transportations, sustainable outcomes can arise indirectly from improved resource efficiency resulting from a range of upgrades and measures

including better technology, more reliable networks, sustainable materials and renewable energy sources.

Infrastructure project developers are increasingly required to look beyond labour and material costs to take into account the full lifecycle costs of operations, maintenance, energy, water, and waste management as well as the consequences of pollution, climate change and the depletion of natural resources (Manning, 2012). Getting the calculations right and weighing accurately different options can prove complex. Standards and certifications schemes have emerged particularly for energy efficiency in buildings (e.g. BREEAM created in 1990 in the UK, followed by LEED and PEER created in the US – (see Vierra, 2014)). More recently, tools and frameworks are emerging to support the evaluation and rating of social, environmental and economic benefits for different types and sizes of infrastructure projects. For example, Harvard University and the Institute for Sustainable Infrastructure (ISI) in the USA have developed the Envision Sustainability Infrastructure Rating System, a holistic framework which helps to consider the costs and benefits of infrastructure projects across five key dimensions: quality of life; leadership; resource allocation; natural world; climate and risk (Manning, 2012).

Sustainable infrastructure is often perceived to entail relatively higher costs and risks compared to conventional infrastructure. Part of the upfront investment may only show benefits in the long run (e.g. for climate change adaptation or deep building renovation projects). Environmental externalities related to conventional infrastructure may not be adequately internalised. This can create market distortions discouraging further investment in sustainable infrastructure. Sustainable infrastructure projects, involving relatively new technologies or relying significantly on government support (e.g. renewable energy generation), can be perceived as riskier given technological, economic or regulatory uncertainties.

Evidence increasingly demonstrates how investment in sustainable infrastructure can boost infrastructure productivity and result in accumulated savings over time, such as lower maintenance or better service provision. BEEM-UP is a European public private partnership (PPP) collaborative project which aims to demonstrate the economic, social and technical feasibility associated with deep renovation projects using three retrofitting sites in Sweden, France and the Netherlands (BEEM-UP, 2014). Preliminary monitoring results from BEEM-UP show how deep renovation projects lead to important savings which could outweigh over time the costs of the upfront investment (BEEM-UP, 2014). This suggests that sustainable urban infrastructure projects should be structured accordingly, that is by finding ways of monetising anticipated savings.

Cities as well as investors do not always have sufficient in-house capacity and expertise to assess different sustainable infrastructure strategies and projects. Tools providing independent and expert guidance to cities and investors on sustainable infrastructure options and related technologies, associated costs and benefits, requirements and implementation are therefore important. ICLEI is developing Solutions Gateway, an online resource aiming to support cities in the development of low-emission strategies, plans and projects. For each solution, information on long-term impacts; benefits and co-benefits; requirements for implementation; and enabling and multiplying actions to enhance effectiveness and efficiency is provided based on proven technologies and best practice. Tested by 37 cities participating in

the Urban LEDS project[4], the resource will be officially launched at ICLEI's World Congress in April 2015 and made available to ICLEI members free of charge thereafter.

Standards supported by third party certification can also add transparency and visibility for sustainable infrastructure projects. Global Infrastructure Basel (GIB) is working on transforming GIB Sustainable Infrastructure Grading, a self-assessment tool used since 2012 on over 150 infrastructure projects, into an international and third party verified voluntary sustainability standard – GIB standard for Sustainable and Resilient Infrastructure – to be used in the project preparation phase as an instrument for risk mitigation and cost reduction. The standard is deemed to have de-risking potential, which could increase the attractiveness of sustainable infrastructure projects to investors. (GIB, 2015)

Public sector leadership at all levels is critical to encourage investment in sustainable infrastructure. As outlined at the end of section 3.2, public sector support is important to encourage multi-stakeholder infrastructure finance. In addition to that, specific public policies and instruments should be implemented to overcome outstanding barriers and to encourage investment from stakeholders other than government in sustainable infrastructure specifically. For renewable energy for example, governments have a key role to play in increasing the coherence and consistency of signals across different policy areas including those who do not take climate-related objectives into account (see OECD, 2015 for more information). Incentive measures are not enough. Disincentives (e.g. fossil fuel subsidies) as well as market and regulatory rigidities favouring conventional over sustainable infrastructure should also be addressed to support investment in sustainable infrastructure.

[4] The Urban-LEDS project, funded by the European Commission, and implemented by UN-Habitat and ICLEI, has the objective of enhancing the transition to low emission urban development in four emerging economy countries.

4. FINANCING SUSTAINABLE INFRASTRUCTURE

Real assets such as infrastructure present distinct challenges when compared to more conventional assets such as listed equities and government bonds. Infrastructure assets usually involve more significant upfront capital requirements, relatively higher transaction costs over long time frames, and liquidity risk (see for example Ehlers, 2014 or Cremers, 2013).

How an infrastructure project is financed does not seem to be contingent on whether the infrastructure in question is sustainable or not. The stage of development of a technology or of the project and how sustainable infrastructure impacts on costs and benefits might however influence the financing approach (Merk *et al.,* 2012). Overall, the financing approach, the sources of finance and the combination of financial instruments are likely to depend on a range of factors, project-specific and exogenous ones.

Project-specific factors include:

- the timing, type and sequencing of the infrastructure project in question;
- the availability of clear funding streams, i.e. stable and predictable cash flow to recover upfront investment and generate return;
- the capacity and appetite of the relevant entities (project sponsors) to take on the appropriate level of risk and to find acceptable forms of security. (Berwin Leighton Paisner, 2012)

Exogenous factors relate to the enabling environment, including institutional capacity and rule of law as well as how relevant public policies impact on the risk-return profile of an infrastructure project.

This chapter is structured as follows:

- Section 4.1 provides an overview of financing approaches commonly used to finance infrastructure.
- Section 4.2 briefly describes relevant financial instruments across public, debt and equity finance and assesses their potential to support investment in sustainable infrastructure.
- Section 4.3 illustrates how different financial instruments come into play by analysing how energy efficiency projects can be financed.
- Section 4.4 provides a high-level overview of how renewable energy projects at city level, particularly in relation to public policy and finance support.

4.1. Common financing approaches for infrastructure

The level of financing required to finance sustainable infrastructure globally is such that most governments are unlikely to be able to finance it on their own. Public sector involvement remains critical, but given limited availability of public resources, fiscal and budgetary constraints as well as rising debt levels, many governments seek to encourage private sector investment in infrastructure, particularly through project finance involving private sector participation.

Project finance is a common financing approach for infrastructure. Project finance aims to raise long-term finance based on the projected cash flows of the project

rather than on the balance sheets of the project sponsors. Project finance usually combines public finance, equity and debt instruments and multiple stakeholders including public and private sector entities, known as sponsors, as well as banks and other financial institutions providing loans for the operation. Project finance is particularly attractive to finance the development of large capital-intensive infrastructure projects. Two types of contractual arrangements exist: the creation of legally and economically self-contained entities i.e. special purpose vehicles (form of equity finance); and a set of contracts dictating the distribution of risks and returns, the governance, as well as the responsibility for financing and for providing infrastructure services between public and private sector entities. (Gardner & Wright, 2010; Ehlers, 2014)

While it is difficult to find figures on the use of project finance for sustainable infrastructure, Bloomberg New Energy Finance estimates that renewable energy accounted for 18% of a total volume of USD 288 billion in 2013 (BNEF, 2014: 13).

Municipalities as well as government entities at regional or national level regularly use project finance to deliver sustainable infrastructure projects including under public-private partnerships (PPPs). Private financing for both capital intensive and less-capital intensive infrastructure projects requires a well-defined and functioning market for sustainable infrastructure projects; good return prospects on investment and limited risk (Merk *et al*., 2012). Private-sector participation (PSP) in project finance allows governments to tap into private sector design and engineering expertise; better manage construction timelines; reduce costs; and improve the delivery of services (Standard & Poor's, 2015).

PSP approaches can be particularly relevant in developing countries where cities and other government entities may have more difficulties in accessing capital markets (World Bank, 2013). According to World Bank's 2013 Global Private Participation in Infrastructure (PPI) Update, private sector participation in infrastructure reached USD 150 billion in 2013 in developing and emerging economies with an average project size of USD 276 million. The four main sectors by order of volume of PPI were telecommunications, energy, transport and water. Emerging economies such as Brazil, Turkey, India, Mexico, Russia and China attracted together 59% of all PPI commitments. (World Bank, 2014)

Factors influencing the financing approach for infrastructure projects include the state of development of the asset; the technologies involved and the sequencing of the projects, all of which can impact the risk-return profile of projects. Infrastructure projects should be distinguished between ***greenfield*** or primary projects pertaining to new infrastructure development at a specific location; and ***brownfield*** or secondary projects which aim to upgrade or further develop already operational or existing infrastructure assets (OECD, 2014; Preqin n.d). Greenfield projects usually involve higher upfront costs and entail additional risks related to the development of the asset (OECD, 2014). These are however relatively easier to 'green' as the infrastructure asset is developed from scratch and can benefit from the latest state-of-the-art technologies (Merk *et al*., 2012).

A typical greenfield infrastructure project has three distinct phases – planning, construction and operational phases – each with different risk-return characteristics;

incentive problems and time frames. These will influence the sources of financing as well as the financing approach and instruments (Ehlers, 2014).

Fig. 8 – Phases of infrastructure projects and their characteristics

Phase	Economic and contractual issues	Financial characteristics	Potential sources of finance
Planning	• Contract is critical and can take time to negotiate among different parties.	• Procuring authority needs to find equity investors. • Equity sponsors need to secure funding from debt investors (e.g. banks). • Debt comes at higher cost during this phase. • Credit rating, credit insurance and guarantee can help to secure debt finance.	• Equity sponsors with high level of expertise e.g. construction companies and or governments. • Banks are primary source of debt finance in this phase.
Construction	• Monitoring incentives are essential. Private sector involvement can ensure that.	• High risk and complex phase • Lot of uncertainty e.g. unexpected events, delays, risk of default. • No cash flow generated. • Extending commitments by debt investors.	• Refinancing or additional financing difficult and costly to obtain. • Equity sponsors may have incentive to provide additional finance if risks materialise.
Operational	• Ownership and volatility of cash flows are key • Depend on demand risks.	• Positive cash flows • Lower risk of default	• Refinancing of debt from the initial phase through bonds, bank loans or government funds

[Source: adapted from Ehlers, 2014:5]

Respondents confirmed that the financing approach is likely to depend on the risk-return ratio of different types of infrastructure projects and on the availability of clear and predictable funding streams over the lifetime of the projects. This suggests that sustainability may not be directly relevant to the financing approach and choice of financial instruments. Investment in sustainable over conventional infrastructure seems to depend on a clear business case and risk-return profile. As subsequent sections explore, public policies supported by public finance instruments can influence the risk-return equation of sustainable infrastructure projects in a way that makes them more attractive for investment.

Box 2 - Respondents' investments in infrastructure

About 20% of the participants who took the questionnaire reported having investments in infrastructure. Of these, 35% indicated investment primarily in brownfield projects (i.e. the upgrading and replacement of existing infrastructure) and 30 % invested primarily in greenfield (i.e. new) infrastructure projects. The remaining 35% either invested in both or did not know for sure due to the more indirect nature of their investments. Respondents invested in equal proportions directly or indirectly. The majority (81%) stated they invest prior or during construction phase rather than afterwards during the operational phase. In terms of location, investments were primarily located in Europe, followed by North America and Asia, which is not too surprising given that the majority of respondents were located in Europe.

The results suggest that the preferred size of investment depends on the type of investor with smaller firms, corporate financiers, bond investors and individual investors among our respondents stating that they preferred to invest below 25 million USD while banks, wealth managers, institutional investors among our respondents reported a minimum investment size of USD 50 million and above. Private equity and asset management firms as well as cities among our respondents tended to be in the middle, i.e. between USD 25 and USD 50 million.

4.2. Financial instruments

This section provides an overview of financial instruments across public, debt and equity finance that are commonly used to finance infrastructure. For each type of finance, relevant financial instruments are analysed according to their advantages; limitations and requirements. Further, their underlying potential to encourage the transition towards sustainable infrastructure is analysed using a low, medium and high scale. Performance against the scale is assessed according to the degree to which the scope and design of instruments can encourage investment in sustainable infrastructure.

Public finance instruments

Cities are key providers of infrastructure. Given fiscal and budgetary concerns, public spending may not be sufficient to finance the required urban infrastructure upgrading and development. Cities have a range of public finance instruments and leverage tools that they can use to mobilise additional sources of finance or to generate funding (e.g. via user or development charges) which can then leverage finance for infrastructure.

The range of instruments at cities' disposal and the extent to which they can be deployed to support sustainable infrastructure financing and development will tend to vary depending on local contexts including institutional and legal frameworks; government structure and the degree of interaction within and across government entities (e.g. local authority, provincial, state and central government). Some of these instruments (e.g. land sales or building rights) can be adapted in auction-based models, which may be more suitable in countries lacking the institutional capacity and/or systematic land valuation techniques. This suggests that cities should identify financial but also policy and administrative instruments at their disposal to support

sustainable infrastructure development and financing taking into account local contexts as well as best practice and guidance.

Figure 9 below provides an overview of major categories of financial instruments at cities' disposal, including asset sales and leases; taxes; user or development charges and fees; and grants.

Fig. 9 – Overview of public finance instruments relevant to infrastructure

Instrument	Potential	Explanation
Land sales	Low	One off source of finance, limited impact. Difficult to incentivise sustainable infrastructure development once land is sold.
Land or infrastructure asset leaseholds	Low	Would depend on government policies and targets. Contracts could stipulate sustainability performance objectives. Difficult to monitor.
Public-private partnerships (PPPs) & private-finance initiatives (PFIs)	Medium	Depends on the type of project and government policies and targets. Could include sustainability targets.
Taxes e.g. property or business tax	Medium to high	Depends on tax design and scope e.g. tax to favour density over urban sprawl or low-carbon energy over fossil fuel sources. Requires coordination across departments and tax incentives.
Land value capture mechanisms e.g. tax-based, building rights and development impact charges or fees	Medium to high	Depends on design and government policies and targets. Could mandate the achievement of sustainability objectives (e.g. energy efficiency targets).
User charges & fees	Medium to high	Depends on the integration of externalities and incentives encouraging sustainable usage of infrastructure (e.g. public transport) or resource conservation.
Grants and subsidies	Medium to high	Depends on design. Given limited public resources, these instruments should be targeted at projects that have significant potential of leveraging additional sources of finance while delivering sustainable benefits.
Building rights and planning permits	Medium to high	Depends if planning processes and permit allocation is tied to sustainability requirements.

Instruments like PPPs and taxes can be designed to support sustainable infrastructure over conventional infrastructure. Public-private partnerships (PPPs) can support local investment in capital-intensive sustainable infrastructure and mandate the achievement of specific sustainability targets and objectives. PPPs can be particularly suitable for types of sustainable infrastructure offering stable and predictable returns and relying on proven technologies. Taxes can be designed to support investment in sustainable infrastructure for example by favouring density

over urban sprawl or low-carbon energy over fossil-fuel sources. To be successful, tax design and implementation should be coordinated across policy areas. Public instruments such as land value capture instruments and user charges can be designed in ways that encourage sustainable infrastructure development while leveraging funding for finance. Cities with limited public resources should prioritise grants and subsidies to support projects, which have significant potential for leveraging additional sources of finance while delivering sustainability targets and objectives. Leverage tools such as building rights and permits can also be conditional on sustainable infrastructure targets and requirements being met.

The sale of government-owned land can provide finance for infrastructure development. Auction-based land sales can be particularly effective in countries lacking systematic land valuation. Land sales are however a one-time income flow and require a trusted and coherent legal framework, strong institutions and clearly defined and enforceable property rights (World Bank, 2013). Moreover, land sales are unlikely to incentivise sustainable infrastructure development in the absence of wider policy frameworks mandating sustainable infrastructure development.

Land or existing infrastructure assets (e.g. water and energy infrastructure) can be leased to private sector developers and/or operators at a price. **Leaseholds** are rental agreements between the owner of land or of an infrastructure asset (in this case a city or a public sector entity) and the land developer or asset operator (usually a company). The resulting revenue can be used as initial capital for upfront costs related to public infrastructure investments. Evidence suggests that land leaseholds should be primarily used to leverage new infrastructure assets tied to a city's land use plans to avoid the risk of inefficient or underused infrastructure development (e.g. development that does not meet local needs or that is not located where potential users are). Leasehold frameworks and related revenue stream should be systematically linked to a city's land use plans. Down the line, leaseholds are likely to need to be complemented by taxes and charges to pay for maintenance and expansion of infrastructure service provision. (World Bank, 2013)

In theory contractual arrangements such as leaseholds could include clauses mandating the achievement of sustainability-related targets (e.g. energy efficiency for new infrastructure development or existing infrastructure upgrading) and their allocation could be conditional on prospect developers and operators demonstrating how they could meet related targets. The monitoring of such clauses could prove difficult and expensive particularly in countries lacking the institutional capacity and legal framework. Respondents suggested that higher-level policy frameworks (e.g. policies mandating the achievement of carbon neutrality or energy efficiency targets for all newly developed buildings or upgraded buildings) could prove more effective in this case.

Public private partnerships (PPPs) are a form of project finance where a public service is funded and operated through a partnership between government and the private sector, typically structured under a long-term (20 to 30 years) contractual arrangement (Garner & Wright, 2010). Contrary to other forms of project finance, PPPs often involve greater government involvement both initially and over time, even if their financing structure can combine other financial instruments including equity and debt (Halland, *et al*., 2014). The UK and Australia are the most mature adopters with PPPs accounting for around 10% and 5% respectively of public investment in

infrastructure (OECD, 2014). PPPs are particularly attractive to raise finance for infrastructure locally. Further, PPPs are deemed to be particularly relevant in developing and emerging economies where cities' access to capital markets is constrained (World Bank, 2013). Contractual arrangements vary depending on the distribution of risk and returns, the responsibility for financing and the project governance between public and private sectors entities (Ehlers, 2014).

PPP's ability to enhance efficiency and effectiveness is contingent on a well-designed, well-implemented contractual arrangement and an adequate transfer of risks and returns (Merk *et al*., 2012). Respondents, particularly in the financial and infrastructure sector, confirmed the importance of design; regulatory certainty and predictability; and of a balanced distribution of risks and returns. In terms of distribution of risks, Ehlers (2014) suggests that only those risks should be transferred to private investors, which they are able to either control or insure against (e.g. project specific risks such as performance risk, construction risk).

Cities often use PPPs to deliver sustainable infrastructure objectives. PPPs can be designed in ways that encourage private suppliers to achieve sustainability targets and objectives. PPPs may not be suitable for all types of sustainable infrastructure projects particularly where resource conservation would imply decreased earnings for private sector supplier (e.g. water utilities) or for infrastructure projects with strong technological components, particularly those involving relatively new technologies where high uncertainty would increase the need for flexibility and thus possibly weaken PPP relationships. (Merk *et al*., 2012)

Interviewees and respondents from the financial sector confirmed the need for key framework conditions to support PPP's efficiency and effectiveness. These include:

- political certainty and predictability;
- clear long-term infrastructure policies and land-use development plans;
- clear procurement policies, timelines, processes and certainty including to a certain extent a higher degree of harmonisation of procurement at national or regional level;
- ensuring expertise and capacity on both public and private sector sides;
- well defined and predictable PPP design.

PPP design framework should be reasonably defined and predictable so as to avoid costly renegotiations of terms except in the event of set performance criteria not being met. Some interviewees in the public and financial sectors noted that private sector involvement in the financing and delivery of infrastructure in exchange of cash flows may not always be socially or politically acceptable. This was found to be particularly true in developed countries where infrastructure provision is seen as a function of government. It was recognised that rising debt levels in the same countries may however lead to change.

Taxes are another category of instruments that cities and municipal authorities can use to raise funds for infrastructure development and maintenance. In OECD countries, governments earn the most revenue from taxes. In developing countries, in contrast, taxes only represent a small percentage of local revenues except perhaps in largest cities. Taxes are usually demanded by a government authority and levied upon income, property, sales etc. Taxes require a coherent and functioning tax regime, including effective tax collection. Property taxes are

particularly suitable to generate revenue for the maintenance and expansion of existing infrastructure provision. Taxing land value rather than property value provides owners with the incentive to develop and manage it to its most profitable use. There is scope for taxes to be designed in ways that encourage investment in sustainable infrastructure for example by favouring density over urban sprawl (e.g. multi-family over single-family properties) and by offering partial tax relief or deduction to owners investing in energy efficiency measures or other sustainability-related investments. (Merk *et al.*, 2012; World Bank 2013)

Land value capture (LVC) instruments result in the transfer of increases in private real estate value generated by public investment back to the public sector. Such revenue can be leveraged to finance public infrastructure development and improvement including public transport, urban development and regeneration, affordable housing and community amenity enhancement in designated areas. (Maier and Jordan-Tank; 2014)

Existing LVC instruments can consist of one-time charges of value gains or long-term revenue gains. **Tax-based LVC instruments** provide predictable funding streams, which can be leveraged for example on capital markets to finance upcoming infrastructure development in designated areas. Such instruments include increments on existing property or business tax within designated areas of improvement over specified period of time; betterment taxes or levies, i.e. one-time tax or levy on the land value gain by affected property owners; and, special assessment taxes collecting payments from property owners within a designated area of improvement. **Development impact charges and fees** are one-time charges applied by a local government to an applicant in connection with approval for a development project. These can be used to finance part of the cost associated with public facility development and service provision in designated areas. Such charges can support sustainable over conventional infrastructure as municipalities have the discretion to negotiate infrastructure improvements with developers when they make new land available for development (or redevelopment and regeneration) in many countries. Another type of land value-capture instrument is the **auction of additional and tradable building rights** (including for additional capacity or floor space) related to a designated area of improvement. The profit from the sale can support the financing of public infrastructure in corresponding areas. Auction-based models are likely to be particularly suitable in countries lacking systematic land valuation. (World Bank, 2013; Maier and Jordan-Tank, 2014; Merk *et al*., 2012)

Experts suggest “value-capture instruments to be applied primarily to projects where it is reasonable to expect that infrastructure investments will cause significant increase in land value” stressing the importance of accurate land value assessment prior to infrastructure investment (Maier & Jordan-Tank, 2014: 25). Evidence suggests that investment in transportation infrastructure (e.g. urban rail) can bring significant increases in property values in surrounding areas. Value-capture instruments are contingent on a functioning tax regime but also on well-functioning and transparent property markets with accurate property records and sound designation of land units or administrative areas. (Maier & Jordan-Tank, 2014; World Bank, 2013)

User charges and fees are a direct application of the ‘user pays’ principle and in effect require users to pay for designated infrastructure facilities.

User charges are typically tied to the cost of producing the service for which the fee is charged. This instrument is most suitable for infrastructure projects amenable to the collection of user charges such as toll roads, car parking space, water and electricity utilities. User charges and fees are an important source of funding to leverage finance for infrastructure development and maintenance. (Maier & Jordan-Tank, 2014)

User charges and fees can encourage the use of sustainable over conventional infrastructure services while raising finance for related infrastructure development and upgrading. Transport fees and charges such as congestion charges, variable parking fees and taxes, and high occupancy toll lanes can effectively encourage the use of public transport and non-motorised travel; reduce the share of car traffic and lead to reductions in car-related emissions and air pollution. Utility fees can be adapted to actual consumption and designed to encourage resource-efficient consumption particularly in relation to water, waste and energy provision. (Merk *et al.*, 2012)

Grants and subsidies can help to mobilise additional sources of finance and support sustainable infrastructure. Grants are financial awards given by a government institution (e.g. local authority, provincial or national government) or a development finance institution to recipients meeting set eligibility criteria. Subsidies are benefits given to eligible groups, companies or individuals in the form of a cash payment or tax reduction. Given limited public resource availability, respondents suggested that such instruments should be used as 'incentives' for infrastructure projects where they have the most chances of leveraging additional sources of finance, particularly in sectors that contribute directly to cities achieving set policy targets. Similarly **building rights and permits** as well as planning permissions, though technically not a financial instrument, can be contingent on sustainable infrastructure targets and requirements being met.

Debt finance instruments

Debt finance instruments relevant to infrastructure can be divided into four broad categories: loans; bonds; de-risking and credit-enhancement instruments; and refinancing instruments.

Fig. 10 – Overview of debt finance instruments relevant to infrastructure

Instrument	Potential	Explanation
Loans	Medium	Depends on instruments.
• Concessional or flexible loans	Medium to High	Depends on design and scope. Terms and conditions should stipulate specific sustainability objectives when possible e.g. energy efficient mortgages.
• Syndicated loans	Low to Medium	Depends on sustainability being integrated into lending criteria.
Bonds	Medium	Depends on scope and purpose. Can be combined with tax efficiency measures.
• Infrastructure bonds	Medium	Depends on sustainability being integrated into design and scope and on disclosure.
• Green bonds	High	Depends on standards and disclosure. Project selection criteria should be specified upfront and monitored throughout.

Instrument	Potential	Explanation
Debt funds	Medium	In theory possible. Depends on scope of the fund and integration of sustainability criteria.
De-risking & credit enhancement instruments E.g. guarantees – credit, partial risk	Medium	Depends on whether they are targeted at sustainable infrastructure projects that need credit status enhancement.
Debt refinancing instruments E.g. securitisation techniques including forfeiting and subordinate debt financing	Medium to High	Could provide refinancing for long-term sustainable infrastructure projects e.g. renewable energy. Further development of 'green securitization' market required.

Depending on how sustainability is integrated into their design or scope, instruments like bonds and loans have the most potential to encourage investment in sustainable infrastructure. Securitisation and other refinancing mechanisms are found to be particularly relevant for sustainable infrastructure, particularly for long-term capital-intensive projects such as renewable energy projects. Loans and guarantees from government and development financing institutions can support debt finance provision in developing countries where domestic financial markets are underdeveloped or access to capital markets is restricted.

Loans provide borrowers with upfront finance in exchange for repayment along with interest, based on pre-determined timeframes and interest rates (Venugopal & Srivastava, 2012). Loans are usually more common for the initial phases of infrastructure projects (Ehlers, 2014). The creditworthiness of the parties involved is key to access and eligibility. Loans require functioning financial system and institutions. Loans (as well as bonds) to public sector entities will require strong regulatory frameworks for borrowing as well as some degree of coordination particularly between national and city government debt (World Bank, 2013).

Lending terms and conditions will vary depending on the nature and scope of the instrument but also on the issuer. Evidence suggests that development finance institutions are often in a position to offer more competitive terms for their loans given privileged access to capital markets, their size and reputation. Debt financing by multilateral development banks (DBs) can be blended with technical assistance grants and can help to leverage additional sources of finance like other DB or commercial banks. At the same time, DBs' reputation is contingent on low to zero default rates, which implies rigorous due diligence processes and feasibility assessments. Loans from commercial banks may be more difficult to access in countries where financial markets are less developed and can prove more expensive especially when banks lack in-house expertise to assess related risks and returns (for example in the case of project involving novel technologies such as renewable energy or energy efficiency technologies).

Different types of loans exist. **Concessional and flexible loans** include special features like no or low interest rates, extended repayment schedules and interest rate modifications during the life of the loan (Venugopal & Srivastava, 2012).

Such loans are often blended with some sort of public or multilateral finance support such as technical assistance grants. **Soft loans** are a type of concessional loan with more flexible terms and repayment periods commonly used to finance infrastructure projects, including social infrastructure. Soft loans are often used as a development finance tool by development finance institutions (e.g. multilateral DBs) in developing countries. Eligibility criteria can target specific sectors such as environmental technologies and thus support investment in sustainable urban infrastructure. (Fritz & Raza, 2014) **Syndicated loans** are loans issued by a syndicate of banks rather than a single bank. Syndicated loans enable the diversification of the large risks of a single project across a group of banks. Such loans are common for the debt financing of larger infrastructure projects. (Ehlers, 2014)

The potential for loans to support investment in sustainable infrastructure depends on the type and scope of the loan as well as on the issuer's lending criteria. Concessional loans in particular offer medium to high potential provided that the flexibility of their terms and conditions and how they are granted is contingent on achieving set targets and objectives.

Bonds are fixed-income securities through which investors lend money to an entity that borrows the funds for a defined period of time at fixed interest rate. The type of bond often depends on the issuer. Sovereign or municipal bonds are issued respectively by national or city governments; multilateral development finance institutions can issue bonds to provide debt financing for projects; and companies issue corporate bonds. **Project bonds** are corporate bonds issued by project-specific special purpose vehicles (SPVs), generally in the operational phase of the project when the infrastructure project starts to generate positive cash flows (Della Croce & Gatti, 2014; Ehlers, 2014). **Infrastructure bonds** can be defined as corporate bonds aiming to finance infrastructure projects of public interest under certain concessions and regulations (Inderst, 2013). Often issued in emerging and developing countries, infrastructure bonds are usually subject to PPP contracts with the public sector and often linked to public guarantees (Rudolph, n.d.; Inderst, 2013).

Bonds can be issued with specific purposes such as social impact, development and sustainability. Of these, **green bonds**, defined as "fixed-income securities issued in order to raise the necessary capital for a project which contributes to a low-carbon, climate resilient economy" (Della Croce *et al*., 2011: 31), are the most relevant to promote investment in sustainable infrastructure. Green bonds can be issued at city, country, financial institution (e.g. multilateral DBs), corporate or project level. Bonds (including green bonds) assorted with tax incentives could contribute further to finance sustainable urban infrastructure. Green bonds hold promising prospects for issuance at city level to finance sustainable urban infrastructure as illustrated by recent bond issuance from cities like Gothenburg and Johannesburg and as confirmed by many respondents across sectors.

Bloomberg Energy Finance anticipated green bonds issuance to surpass USD 40 billion in 2014, three times the volume issued in 2013 (BNEF, 2014). The USA already have a well-developed market for tax-efficient municipal bonds, including Clean Energy Renewable (CREBs), Qualified Energy Conservation Bonds (QECBs), Property Assessed Clean Energy Bonds (PACE bonds) (Della Croce *et al.*, 2011). Green bonds however only account for a tiny portion of the fixed income universe to date, as illustrated by a mere 1% share of the US bond market in 2013

(BNEF, 2014). Moreover, a significant share of green bonds is issued for refinancing purposes (see for example CBI & HSBC, 2013).

A number of issues have also been raised with respect to green bonds' size and tenure as well as to the absence of clear standards for what constitutes a green bond and what does not (Inderst *et al*., 2012). Multilateral DBs like the World Bank have taken early steps towards greater transparency by proposing eligibility criteria for low-carbon and climate resilient development and by monitoring and reporting progress and impact to investors (World Bank, n.d.). Multi-stakeholder initiatives such as the Climate Bonds Initiative are working to address these shortcomings by developing appropriate standards, by tracking market development and through demonstration projects. In 2014, a consortium of investment banks comprising bonds investors, issuers and underwriters released the Green Bond Principles to encourage transparency, disclosure and integrity in the development of the green bond market (Green Bond Principles, 2014)[5].

Debt funds are pooled investments in debt of several projects and/or companies (Venugopal & Srivastava, 2012). Debt funds aim to preserve capital and generate income. Asset managers acting as delegated agents with full responsibility for the selection process and monitoring of investments, usually manage debt funds. The asset allocation strategy is often defined before the fundraising phase. Debt funds only account for a minority of all infrastructure funds. These are nevertheless considered a suitable solution to approach infrastructure investment opportunities for less experienced investors (including institutional investors) who do not necessarily have in-house capacity to invest directly in infrastructure assets (Inderst, 2013; Della Croce & Gatti, 2014).

De-risking and credit enhancement instruments improve the risk-reward profile of an investment and thus increase debt providers' confidence by increasing their ability to reduce or manage the investment risks better (Venugopal & Srivastava, 2012). Such instruments typically include **guarantee schemes** and insurance products which try to overcome some sort of missing insurance against default (e.g. collateral) by bringing a third party guarantee for the loan that a prospective borrower might receive (Potts *et al*., 2011). Guarantees are particularly useful in building trust between borrowers and financial intermediaries (e.g. commercial banks). Guarantees mechanisms include:

- credit guarantees or insurance, which cover partially or fully losses in the event of a debt default, regardless of the cause of the default (i.e. commercial or political);
- partial risk guarantees or insurance (including political risk guarantees) which cover losses from a debt default as a result of political events such as expropriation, war and civil disturbance; currency and transfer risk; and breach of contract by governments; and,
- export credit guarantees or insurance which cover losses for exporters or lenders financing projects and are usually tied to nationality of the supplier, lender or project developer. (OECD, 2012; Matsukava & Habeck, 2007)

[5] The principles are governed by an executive committee comprising 18 organisations across investors, issuers and underwriters and are managed by the International Capital Market Association (ICMA), which was appointed as secretariat (ICMA, 2014)

Governments often sponsor guarantees as a way to support investment in infrastructure (e.g. UK's HM Treasury Guarantee) or at the request of multilateral DBs. Public guarantees add risks to government balance sheets and should therefore be targeted where they can most effectively support private sector financing of infrastructure projects (Ehlers, 2014). Multilateral DBs have also developed their own risk mitigation instruments (e.g. World Bank's Multilateral Investment Guarantee Agency (MIGA); EU-EIB's Project Bond Credit Enhancement Facility) to support private financing in infrastructure projects, including in developing and emerging countries. Such guarantees are sometimes criticised for being used primarily for large-scale strategic projects; involving higher transaction costs; and for the difficulties in determining the circumstances under which a guarantee can be claimed particularly for risks whose impact on project revenue might be less straightforward than commercial and other political risks (OECD, 2012). In theory, guarantees and credit enhancement measures could be targeted at sustainable infrastructure projects though evidence of their current potential to encourage investment the transition towards a low-carbon world is scarce.

Debt refinancing instruments are important mechanisms to generate liquidity for infrastructure assets and projects over long-term life cycles. Debt refinancing often consists of **securitisation**, i.e. structured finance techniques that transform illiquid assets (in this case infrastructure assets) into securities (e.g. asset-backed securities) that can be issued and traded on capital markets. Securitisation differs from other debt instruments in that the loans or other financial claims (e.g. receivables) are assigned or sold to a third party, typically a special purpose vehicle or company (SPV/SPC). The SPV in turn issues debt instruments (e.g. bonds), whose interest and principal payments are dependent on the cash flows coming from the underlying assets (Giddy, 2000; Practical Law, 2014). Project or company credit rating by designated third party (e.g. infrastructure ratings by Standard & Poor's) is often required. Securitisation techniques include **asset-backed securities** as described above and **forfeiting**, a form of refinancing involving the transfer of future receivable from one party (the cessionary) to another (the buyer i.e. a financial institution). Forfeiting is particularly relevant when the receivables (cash flow) can serve as main collateral. (Marino *et al*., 2010; Rezessy & Bertoldi, 2010)

Subordinate debt financing, sometimes called mezzanine financing, refers to capital that sits midway between senior debt and equity. Subordinated debt helps to generate liquidity and reduce risk to senior debt lenders. This type of capital is normally provided directly by insurance companies, subordinated debt funds or finance companies. Subordinate loans are repaid through project revenue (e.g. user charges) after senior debt which makes them more risky though they allow the debt of a project to be split into more or less risky forms and ultimately improve a project credit rating. (UN ESCAP, 2013; Rezessy & Bertoldi, 2010) **Government can sponsor subordinated loans** by providing loans to implementing agencies (e.g. Transport Infrastructure Finance and Innovation Act (TIFIA) in the USA) (PwC, 2011). Government-sponsored subordinate debt should be targeted at large strategic infrastructure projects, which can leverage significant private financing in the form of senior debt and where revenue (funding) is stable and predictable.

Refinancing instruments are primarily used in developed countries and emerging economies with advanced financial system and institutions. Securitised debt issuance for energy efficiency and renewable energy, in particular asset-based

securities (ABS), offers long-term, low-volatility yields that match well institutional investors requirements. 2013 saw the issuance of green ABS products[6] in the USA backed by receivables associated with renewable energy but also energy efficiency projects (BNEF, 2014). Scale in this market could be achieved through standardised terms for purchase power agreements to simplify due diligence; stable and predictable cash flows; accurate rating and pricing of such issues through historical data; and, some form of credit enhancement especially for early ABS (Fulton & Capalino, 2014). Respondents confirmed that more efforts should be devoted to developing a secondary debt market for sustainable infrastructure.

Equity finance instruments

Equity is an important vehicle for private infrastructure finance. Equities (and related funds) are usually distinguished depending on whether the companies' shares are traded on public markets (listed equities) or not (unlisted equities). Listed and unlisted equities (and funds) provide complementary though distinct opportunities for investment in infrastructure (RARE, 2013).

Most equity instruments have potential to support investment in sustainable infrastructure. As owners of significant amounts of infrastructure assets, listed equities could have medium to high potential depending on their capital expenditure strategy towards low-carbon infrastructure, how they integrate sustainability into core business and policy requirements. Thematic funds (e.g. oriented towards clean tech, renewable energy or water) exist and could help direct investment towards sustainable infrastructure provided that disclosure of how sustainability is integrated into investment decision-making becomes more systematic. Equity-funded direct investments in infrastructure such as special purpose vehicles (SPVs) and joint ventures (JVs) are commonly used to structure the finance for capital-intensive infrastructure projects, including sustainable infrastructure such as renewable energy and public transport infrastructure.

Fig. 11 – Overview of equity finance instruments relevant to infrastructure

Instrument	Potential	Explanation
Infrastructure equities – listed	Medium to High	Own significant amount of infrastructure assets. Depends on companies' capital expenditure strategy towards low-carbon infrastructure and on policy requirements.
Equity funds – listed/unlisted	Low to Medium	Depends on stock selection strategy, scope of the fund and disclosure.
Equity-funded direct investments in infrastructure	Medium	Depends on type of infrastructure, investment strategy and government policy. Future potential depends less on the instrument and more on the suitability of sustainable infrastructure projects being financed through this type of vehicles.
• Special purpose vehicles (SPVs)	Medium	Commonly used for renewable energy projects. Depends on type of infrastructure and government involvement.
• Joint ventures (JVs)	Medium	Depends type of infrastructure and JV scope.

[6] Hannon Armstrong Sustainable Infrastructure issued a $100m security backed by cashflows from over 100 wind, solar and energy efficiency installations ; SolarCity issued a $54.4m solar-backed ABS (BNEF, 2014 : 4, 9)

Listed equities, i.e. companies listed on public exchanges, are the most sizeable owners of infrastructure assets and providers of infrastructure services. **Infrastructure equities** are estimated to account for about 6% of the estimated global stock market, with a capitalisation of USD 3.25 trillion. Utilities have been an important element of stock markets for some time, following privatization in many countries. (Inderst, 2013)

Listed equities represent an important though perhaps indirect investment opportunity in infrastructure, depending on the definition of infrastructure and the sector of investment. Capital expenditure of infrastructure companies is an important signal of on-balance sheet corporate investment in infrastructure, whether to renew, replace or develop infrastructure or to meet environmental targets. (Inderst, 2013) More stringent climate and environmental policies globally could increasingly affect the valuation of corporate assets, primarily for fossil fuel companies but also utilities (see Carbon Tracker, 2013; Fulton & Capalino, 2014).

Infrastructure equity funds invest in companies who own and operate infrastructure assets. Evidence suggests that such funds tend to focus investment in developed countries (Inderst, 2013). Listed funds generally only invest in shares of listed companies while unlisted funds tend to invest more directly in the underlying infrastructure assets (Haill, 2013). Such funds have often emerged in response to rising interest for the infrastructure investment theme in the 2000s. Infrastructure funds provide an alternative exposure to the infrastructure asset class compared to direct investment in equity. Listed funds tend to represent more liquid and diversified investment opportunities compared to unlisted infrastructure equities and funds (Haill, 2013). Thematic equity funds such as clean tech, water or renewable energy funds can effectively contribute to channel investment towards types of sustainable infrastructure.

Multi-stakeholders initiatives like the UN Principles for Responsible Investment have developed work streams and programmes to encourage infrastructure funds (particularly unlisted) and related investors to more systematically take into account environmental, social and governance (ESG) factors when assessing investment opportunities and document best practice (see for example UN PRI, 2011). Considering material ESG factors in investment risk assessments is deemed particularly relevant given the long life span of infrastructure assets.

Investment in listed infrastructure companies (and related funds) is found to have medium to high potential to support investment in sustainable infrastructure given the volume of infrastructure investments of related companies. Whether this potential can be delivered depends however on the extent to which companies take into account future liabilities and policy targets to support capital expenditure strategies towards sustainable infrastructure; the degree to which investment strategy and stock selection integrates ESG factors; and present and upcoming climate and environmental policies.

Equity-based vehicles for direct investment in infrastructure are commonly used to finance the development of new infrastructure asset and projects. Due to their direct nature, these investments are usually more exposed to underlying risks including construction risk; contract renegotiation risk (particularly for vehicles under

PPP contracts) and regulatory risk. For sustainable infrastructure projects, additional risks related to power price fluctuations and technological risk may apply.

Special purpose vehicles (SPVs) (also called project companies or infrastructure companies) are equity-funded companies set up to finance, build, develop and operate large capital-intensive infrastructure projects. SPVs are typically funded by a consortium of funds which can include government-entities as project sponsors in the case of SPV set up under PPP contracts for public infrastructure. Private SPVs typically own the tangible infrastructure assets contrary to SPV set up to develop and operate public infrastructure assets. In both cases however, SPV captures projected cash flows, which are leveraged to raise debt finance. Evidence suggests that the risk of cost overrun is higher for publicly financed projects with an SPV structure compared to privately funded infrastructure projects (all of which have an SPV structure). SPVs are also an instrument of risk mitigation as the project SPV enters in a web of contracts (including debt, construction and operation contracts) which define the commitment of the relevant parties (including project sponsors, developers and operators). (Blanc-Brude, 2013; OECD, 2014)

Joint ventures (JVs) are entities created through equity participation of multiple firms to do business in a particular area. Contrary to SPVs, JVs are not project specific and can be more appropriate to finance and develop larger and more complex projects. JVs can be required for construction companies to access large public infrastructure projects. Private equity JVs can support investor's access to equity-based infrastructure investment opportunities in other countries (e.g. Macquarie SBI Infrastructure Fund (MSIF)).

Given the direct exposure to infrastructure development risks, equity-based direct investment vehicles require significant in-house expertise. Such financial instruments are particularly suitable for companies involved in the delivery of infrastructure projects or for investors who wish to fully own infrastructure assets like some institutional investors but also unlisted infrastructure and other private equity funds.

Equity-funded direct investments in infrastructure such as special purpose vehicles (SPVs) and joint ventures (JVs) are commonly used to structure the finance for capital-intensive infrastructure projects, including sustainable infrastructure such as renewable energy and public transport infrastructure. Whether there is additional potential to use such vehicles for investment in sustainable infrastructure is unclear. In this case, it is likely to depend less on the design and scope of the instrument (whether SPV or JV) and more on the availability a pipeline of projects, which could benefit from being structured using this type of vehicles.

4.3. Financing energy efficiency building retrofit

Different financial instruments can come into play to finance sustainable infrastructure projects depending on the type of infrastructure; the technology involved; the stage or phase of development; the availability of clear and predictable revenue and the overall risk-return profile of the investment.

Energy efficiency (EE) projects at city level include street lighting, retrofit of buildings, new investments in, and replacement of, energy-using plants and related machinery and equipment (Baietti *et al.*, 2012). This sub-section focuses on EE retrofit of

buildings to illustrate how a combination of instruments can come into play to finance such projects depending on the type of project and repayment time frame, related policy incentives as well as well functioning debt market and products. Moreover, local circumstances including the nature of tenancy agreements and local authority processes may vary from city to city thus directly impacting on energy efficiency requirements and implementations.

In 2010, buildings accounted for 32% of total final energy consumption (IEA, n.d.), 19% of energy-related green house gas emissions (including electricity-related) and one third of black carbon emissions (Lucon *et al*., 2014). At the same time, buildings offer the largest low-cost potential for climate change mitigation globally (Ürge-Vorsatz, 2008). Governments around the world are increasingly adopting policies recommending energy efficiency measures.

The financing approach for EE projects depends on the type of project and the time frame for repayment. For existing building stock, EE projects can either consist of measures with short- to medium- term payback (< than 10 years) which generate less than 30% energy savings on average or 'deep renovation measures' with longer payback times (between 15 and 40 years) but which generate up to 80% savings (Bullier & Millin, 2013)). EE measures can also be integrated into new building construction projects. This is particularly relevant as new building stock faces rising EE or even carbon neutrality requirements by law in developed countries but also increasingly in emerging and developing countries.

EE projects are mostly financed through debt instruments such as loans to the end user with on-bill repayment or through energy-efficient mortgages; or loans to the project developer, owner or energy service company (ESCO). EE-related loans usually come with some form of public finance instrument including subsidies. Common instruments include soft loans and public sector-driven energy performance contract markets. Soft loans, a mechanism whereby public funding decreases the cost of the loans, are used to make the investment in house retrofitting attractive to homeowners. Their impact may be limited however to homeowners who are able to take on additional debt. Energy performance contract (EPC) is an integrated contract in which an ESCO designs and implements energy conservation measures and guarantees the energy savings for the duration of the contract. The energy savings are used to repay the upfront investment costs, after which the contract usually ends. Evidence from developed countries suggests that the EPC model is rarely used for deep renovation projects; does not necessarily provide access to new financing and is often driven by the public sector. (EEFIG, 2014; Bullier & Millin, 2013)

Supporting the development of private EPC markets can be achieved through market facilitation using intermediaries between ESCOs and clients and through the aggregation of EPCs to increase scale and bankability. The aggregation of EPCs can be combined with guarantee programmes such as first loss absorption or partial loss guarantee which can further support investment in both developing and developed countries. The aggregation of EPCs can help to attract private equity investment either in a portfolio or directly, particularly in relation to industrial or commercial buildings. ESCOs can be financed through soft loans, loan guarantees and portfolio guarantees supporting longer-term debt. Energy performance insurance products can help ESCOs address the risk of technical defects particularly in the first

few years of a project. Enabling the refinancing of ESCOs through the assignment of their claim on future energy services to specialised vehicles through securitisation (e.g. forfeiting) and subordinate debt could also contribute to support the financing of deep renovation projects. According to experts and respondents from the financial sector, efforts should focus on developing this secondary market as it could open opportunities for investment by institutional investors in particular.

Instruments and mechanisms aiming to support deep renovation projects with longer repayment time horizons are emerging, though primarily in developed countries. These connect the burden of the debt to the building rather than the owner. Property Assessed Clean Energy (PACE) programmes enable municipalities and counties in the USA to form special tax districts to help property owners finance energy retrofits by allowing a property owner to place an additional tax assessment on his or her property. Property owners who invest in EE measures and small renewable energy (RE) systems repay these assessments over 15 to 20 years via additional annual payments on their property tax bills. PACE programmes eliminate large upfront investment costs and tie the repayment obligation to the property rather than the owner. Municipal financing districts or finance companies then issue tax-efficient municipal bonds on the back of PACE-backed tax districts to finance the retrofit of both commercial and residential properties while protecting their own debt rating (NREL, 2010). In the UK, the Green Deal is a government-led third party scheme set to provide loans to finance EE measures. Loan amounts are based on projected energy savings associated with the EE measures considered and are repaid through savings made on energy bills. The responsibility for repayment is tied to the property's energy meter rather than owner or tenant. (UK Green Building Council, 2013; Which?, 2013)

Several barriers and market failures can impact on the financial viability and thus investment attractiveness of EE projects. Such projects require relatively high upfront investment relative to the size of the project. They often consist of fairly small projects spread across sectors and technologies, which makes them difficult to compare from a risk assessment perspective. Related to this, EE investment opportunities often lack the visibility and scale required by most investors. Commercial finance institutions, particularly in developing and emerging countries, may lack in-house expertise to assess the risk-return of EE projects due to the range of technologies involved and their novelty (Barysch *et al*., 2014; Rezessy & Bertoldi, 2010). Other issues including capital market gaps such as obstacles to debt financing and confidence gaps in relation to the level of market coordination and the perceived higher risks of these projects can further prevent investment in EE projects (Baietti *et al*., 2012). Respondents confirmed that the lack of expertise and market capacity might be more pronounced in developing and emerging countries and suggested that additional public or development finance support in the form of guarantees might be required to encourage local commercial banks to provide EE-related loans.

The viability of EE projects may also depend on exogenous factors. First, the extent to which distortions in an economy (e.g. fossil fuel subsidies) favour conventional technologies over cleaner and more sustainable technologies can affect purchase decisions for both new and replacement investments. Second, many such projects are financed on the strength of an entity's balance sheet (e.g. corporate entity, municipal government, other public enterprise or joint stock company) suggesting

that access to financing depends on the overall condition of the entity rather than purely on the project's attractiveness for investment. Third, incentives such as tax incentives to replace or upgrade assets, including assets that have not yet reached the end of their lifecycle, contribute to determining the cost benefit ratio of energy-efficient projects. (Baietti *et al*., 2012)

4.4. Financing renewable energy projects at city level

Renewable energy (RE) infrastructure projects vary in terms of capital intensity, technology (e.g. solar, wind, biomass), asset ownership structure and geographical distribution. All of these factors are likely to impact on the financing approach and the choice of financing instruments. This section focuses on RE infrastructure projects at city-level and provides high-level considerations on relevant financing approaches and instruments, particularly in relation to public policy and finance support.

Cities around the world are gradually adopting policies and targets to support a shift towards RE and help achieve national and regional targets. Some cities are going a step further by adopting ambitious plans to become 100% renewable, meaning that zero fossil or nuclear fuel content is used in operational or embodied energy, in stationary use or in transport (Droege, 2010). In 2009, Munich committed to achieving 100% renewable electricity by 2025 by prioritising self-sustainaing and cost-efficient projects relying on water, geothermal, solar and wind sources (Stadtwerke München (SWM), 2009). Distributed solar power generation is increasingly gaining ground across cities and villages in developing countries particularly in Africa as illustrated by the solar energy initiative in Cameroon (see SIRDEP & FHCG, 2011) or the City of Cape Town's solar water heater programme (City of Cape Town, 2014).

Cities' approaches towards RE are likely to be influenced by a number of factors, suggesting that related infrastructure development and upgrading strategies should be tailored to local conditions. These factors (adapted from Droege (2010) and UNEP (2014)) include :

- local climate;
- local renewable energy resources;
- degree of control over energy generation and distribution assets;
- market structure;
- institutional capacity;
- availability of technology and skills locally;
- level of global trade dependence;
- state of development and prosperity;
- relation to national government and institutional capacity;
- civil society involvement.

RE technologies such as wind and solar are becoming increasingly cost-competitive compared to fossil-fuel energy generation. Nevertheless renewable energy generation and distribution, including at city level, often relies on some sort of public support. Support can be provided by cities directly or by provincial and national governments. The fact remains that public policy, financing instruments and incentives are likely to play a critical role to support the transition towards renewable

energy in cities[7]. Relevant public finance instruments include pricing policies (e.g. associated with long-term renewable power purchasing contracts) and tax instruments (e.g. Feed-in Tariffs (FiT)) to support the development of RE generation plants as well as distribution facilities and companies (e.g. Renewable ESCOs on a similar model as outlined in section 4.3). Public incentives and instruments such as tax reliefs should focus on encouraging the adoption of renewable energy infrastructure particularly where cities do not directly control the energy use, such as private and commercial buildings (Droege, 2010).

Among the cities interviewed, some suggested that instruments such as taxation and public grants combined with planning incentives are relevant to support the adoption of RE sources in projects aiming to develop or upgrade local energy generation plants, particularly for such plants that are not owned (or managed) by the city or local authority institutions. Evidence from case studies focusing on district energy strategies confirms that planning guidance and regulations are critical to create the conditions for technical and financial viability, market demand and reduced capital investment risk (see for example UNEP, 2014). Other cities, particularly in developing and emerging economies, mentioned how local authorities can provide guidance on renewable energy standards and support the certification of accredited providers particularly for distributed RE solutions such as solar panels. This type of public support not only encourages the uptake of renewable energy and energy efficiency solutions but can also support local economic development.

Experts in the finance sector stress however the importance of balancing public policy and instruments promoting RE with the cost to government and consumers. Failing to maintain such a balance is shown to have clear implications for policy risk in relation to incentive cutbacks or other sudden regulatory changes. Policy risk affects risks and returns for investors, their confidence in government and ultimately their willingness to invest in RE. (Wilkins, 2012)

Cities can support renewable power asset investment in several ways including by issuing bonds; leveraging their own assets (e.g. district energy plants); and entering in PPP agreements, contracting arrangements or cooperative set ups. Droege (2010: 14) highlights two interesting financing approaches backed by public government support, which could support RE uptake and development further.

- Virtual utilities can be set up as policy instruments in the absence of real public power companies for large metropolitan areas or at provincial or state level for an alliance of smaller cities. Such utilities can be designed to raise finance on capital markets by issuing bonds in order to finance relevant RE development, as illustrated by Delaware's Sustainable Energy Utility example in the USA.
- Long-term renewable power purchasing contracts allow cities to act as non-profit agents to acquire renewable elecricity at large-volume rates and pass the savings on to end-users by distributing electricity.

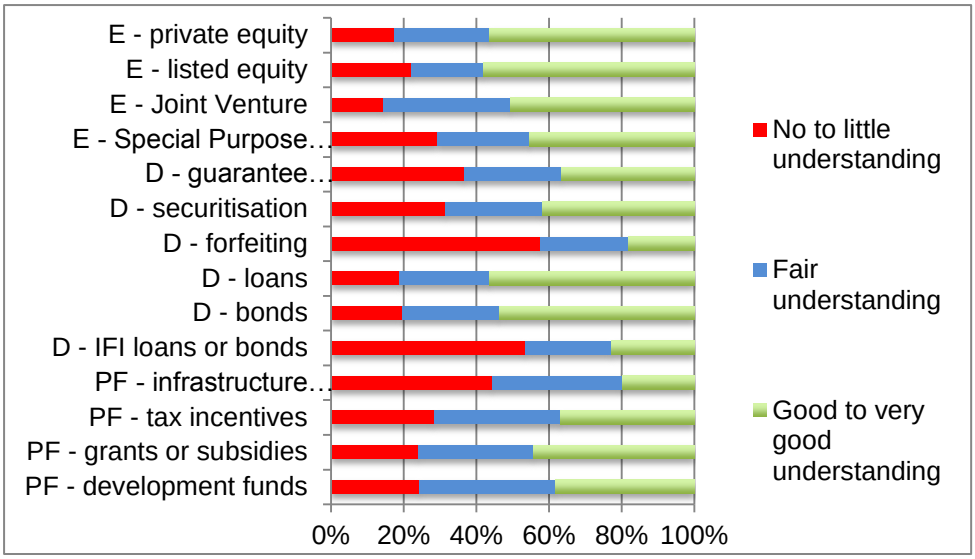
While cities (and national governments) have a role to play in setting up conducive policy frameworks and plans, the development and financing of RE is likely to require multi-stakeholder collaboration to support capacity building, financing and implementation (UNEP, 2014).

[7] For more information on cities that have successfully adopted measures to promote renewable energy and sustainability see for example IRENA's "Renewable Energy Policy in Cities : Selected Case Studies" (2013).

Box 3 – Respondent's understanding and perception of financial instruments

As shown in Figure 12, most financial instruments were fairly well understood by respondents, particularly listed and private equity as well as bonds and loans.

Fig. 12 – Respondents' understanding of financial instruments



Understanding was less significant for financial instruments such as forfeiting or loans and bonds issued by international financial institutions. The latter may not be surprising given a significant share of respondents (68%) working in the private sector who may not necessarily be familiar with multilateral or national development finance products and processes.

Respondents suggested that bonds would most likely rise in importance and use to finance sustainable infrastructure, possibly across a range of scopes e.g. infrastructure, green, development, and social impact bonds. Private equity models were also mentioned repeatedly, particularly in cases where the actual ownership of the asset matters more than guaranteed returns. Respondents stressed the importance of land value capture mechanisms and tax efficient financing structures (e.g. real estate investment trusts[8] and master limited partnerships[9]) as ways to leverage alternative sources of private finance and to incentivise sustainable infrastructure development though recognised that these depend on adequate regulatory frameworks and well functioning institutions.

[8] Financing structure which owns income generating real estate and engages in the financing of real estate. Popular in the USA.
[9] Public traded limited partnerships between provider of capital and managers of that capital. These partnerships have to derive most of their cash flow from real estate, natural resources or commodities.

5. TOWARDS A 'PRODUCT & MARKETING' APPROACH TO SUSTAINABLE INFRASTRUCTURE FINANCING

This chapter analyses how cities (and government institutions) can effectively support sustainable infrastructure financing and development, based on interviews and survey results. Building on Chapters 3 and 4, it suggests that cities should favour a 'product & marketing' approach to infrastructure financing if they want to successfully finance and deliver required sustainable infrastructure over the coming decades. Section 5.1 analyses requirements to overcome barriers to investment in infrastructure in general and sustainable infrastructure in particular. Section 5.2 raises some issues and challenges with the 'needs- & tax- based approach' that has dominated so far. Section 5.3 lays out the foundations for a 'product & marketing' approach to sustainable infrastructure financing and provides evidence of its early stages.

5.1. Overcoming barriers to investment

Generally speaking, respondents working in finance feel that the lack of investable projects is the main issue preventing infrastructure investment at scale rather than the lack of finance. Respondents working in multilateral finance mentioned the difficulty of meeting lending targets. In the current low-interest rate environment, investor interest in infrastructure is rising but the number of actual opportunities is limited. Investors with a history of direct infrastructure investments expressed concerns over the volume of capital chasing higher yield opportunities, combined with the relative inexperience of recent entrants which is driving asset prices up, thus adding pressure on returns.

A pipeline of 'investable' infrastructure projects would meet large investors' visibility and scale requirements and thus allow them to commit a greater share of their resources to infrastructure. In Europe, the European Commission has announced the development of a pipeline of 2,000 infrastructure projects worth an estimated EUR 1.3 trillion, of which EUR 500 billion worth of projects could be implemented over the next three years (EC & EIB, 2014). However, as highlighted by Standard & Poor's in a recent report, there is not much information on the projects to assess their sustainability impact, their financial viability or to get a better understanding of prioritisation, procurement and financing methods (Standard & Poor's, 2015).

Three critical conditions seem to determine the success of infrastructure projects:

- a strong underlying business case, generating an economic return through sufficient and lasting demand for the new or refurbished infrastructure;
- a robust project structure to achieve bankability, legal enforceability, political and social buy-in and environmental compliance;
- sustainable funding sources, either from user charges alone or in combination with predictable, stable and credible public sector support. (Maier & Jordan-Tank, 2014)

At project level, the main causes for failure relate to poor project design causing delays and cost overrun; the inadequate sharing of risks and rewards between project sponsors and other stakeholders, particularly for PPP contracts; and the lack of expertise in structuring and financing infrastructure projects (see for example Ehlers, 2014). At macro level, the success of infrastructure projects depends on a

stable and predictable regulatory environment including long-term infrastructure plans; a trusted and coherent legal environment, and well functioning institutions including financial institutions.

As outlined in section 3.3, sustainable urban infrastructure projects can be perceived as entailing relatively higher costs and risks compared to conventional infrastructure projects. Evidence however increasingly demonstrates how investment in sustainable infrastructure can boost infrastructure productivity and result in accumulated savings over time. Sustainable infrastructure projects should be structured, marketed and ultimately financed through the monetisation of anticipated savings and more generally quantifiable sustainability benefits. For projects where technological risk or project uncertainty is more pronounced, public financial instruments or leverage tools can improve their risk-return profile. Further, tools and resources providing independent and expert guidance on sustainable infrastructure options and proven technologies can inform cities' decision-making particularly in areas where they lack in-house capacity and expertise.

The risk-reward profile of infrastructure projects largely determines the 'investability' (or 'bankability') potential and thus their attractiveness to private finance investors such as banks, institutional investors and specialist funds. The lack of robust funding streams (e.g. through user charges) is a major obstacle to the private financing of many infrastructure projects especially as easy funding options through general tax revenue have been exhausted in many places (Maier & Jordan-Tank, 2014). Some respondents suggested that funding could pose additional problems for types of sustainable infrastructure where clear repayment sources are lacking or do not fully cover the costs. For example, the extra cost of adaptation to improve infrastructure climate resilience may not have a clear repayment source and will likely require some form of public finance support or policy incentive to be delivered. Respondents by and large confirmed that the lack of expertise and market capacity in relation to new technologies was more pronounced in developing and emerging countries and could hinder private sector financing of sustainable infrastructure projects even when funding streams are available. Demonstration and capacity building through multi-stakeholders projects involving public, private and development finance actors might help in this case.

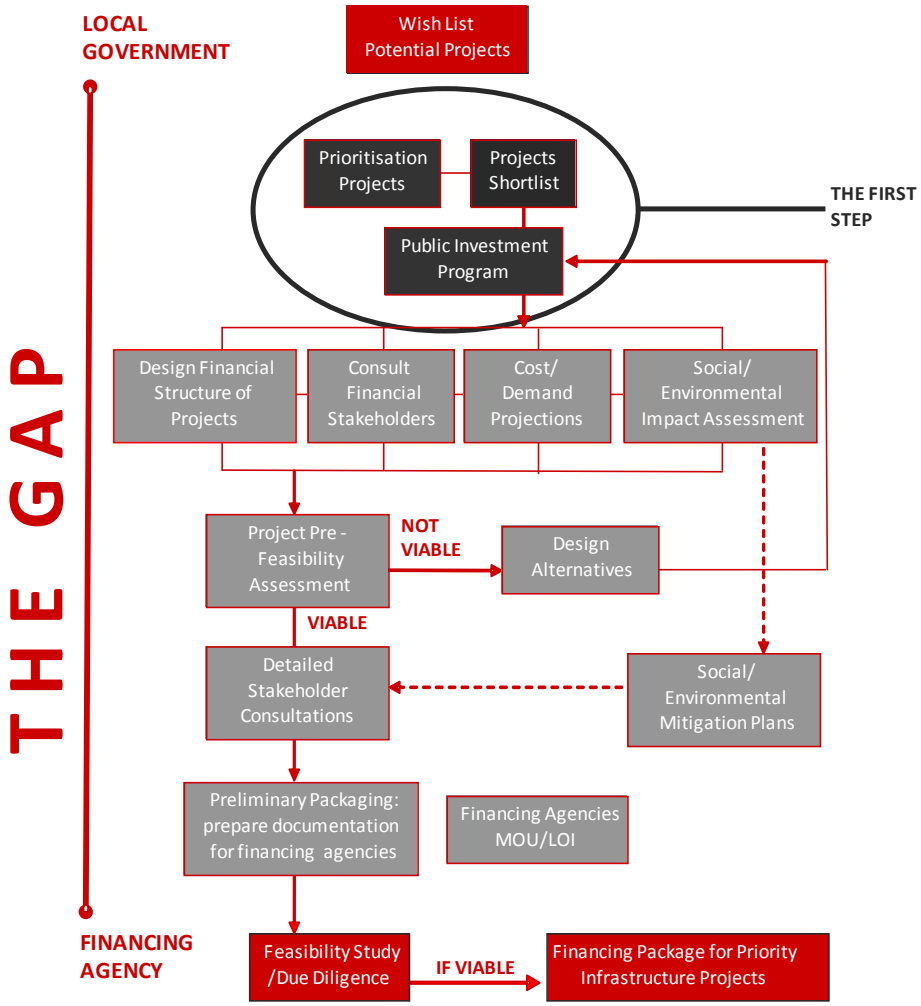
Small size or the lack of scale is another regularly mentioned issue preventing the financing of sustainable infrastructure at city level. Some international financial institutions are tailoring products for municipalities as illustrated by EIB's municipal infrastructure framework loans, which allow municipalities to obtain loans for a series of infrastructure projects that would individually fail to meet minimum amount criteria.

Project aggregation at sector level or geographic scale can facilitate access to finance, including from private sources such as infrastructure and private equity funds. As outlined in section 4.3 and confirmed by respondents, project aggregation could be particularly relevant in the case of residential or commercial energy efficient building retrofit as well as distributed renewable energy generation schemes (e.g. solar panels).

Project prioritisation and preparation are critical to raising finance for infrastructure. Project prioritisation helps cities or local authorities to narrow down a shortlist of projects that match local priorities and resources and can be presented to

developers and financiers. Project preparation helps to assess the viability of shortlisted projects through financing structures; stakeholder consultation; cost revenue projections; and, social and environmental impact assessments. Figure 13 provides an overview of project prioritisation and preparation.

Fig. 13 – Step by step - infrastructure project prioritisation & preparation



[Source: CDIA, 2010: 1]

Initiatives like Cities Development Initiative for Asia (CDIA) work closely with cities on project prioritisation and preparation including feasibility assessment and financing options. Such initiatives tend to be primarily supported through grant finance. Development banks (MDBs in particular) also play a critical role in supporting project preparation, particularly in developing and emerging countries. Support for project preparation primarily relies on grant financing (e.g. technical assistance grants) suggesting that there is a challenge in finding a commercially viable financing model to leverage additional sources of finance including from the private sector. Global Infrastructure Basel (GIB) is currently exploring the establishment of a sustainable infrastructure project bankability facility blending philanthropic and commercial capital to address the financing gap for project preparation (including feasibility and business plan development) for infrastructure projects in developing countries (Schneider-Roos, *et al.*, 2014; Schneider & Wiener, 2013).

Some respondents suggested that risk capital provision for early stages infrastructure projects could be best supported through a fund structure blending private and public finance capital (possibly including development finance); using a portfolio approach to risk diversification combined with project preparation support and screening; and linked to later stage follow on investment opportunities in entities and projects that successfully reach realisation.

Other organisations such as the Global Fund for Cities Development (FMDV), ICLEI and the World Bank have also developed tailored initiatives to support local authorities in planning and financing sustainable infrastructure projects through technical assistance and capacity building, support for planning and project preparation and advice on relevant financing instruments and structures. ICLEI for example will be releasing in the course of 2015 a Finance Tool as part of its Solutions Gateway. Currently undergoing peer-review of the concept, the tool is expected to include a project feasibility assessment tool; guidance on financing decision-making; and a database allowing users to browse information on international and national funding resources and their requirements, as well as case studies documenting best practice. ICLEI will seek to establish partnerships with organisations that currently already provide information on available funding resources at national, regional, and global levels to avoid duplicating efforts and generating synergies.

There is rising interest for multi-stakeholder and interdisciplinary approaches to support sustainable urban development as illustrated by the wealth of initiatives and organisations working on topics related to finance, cities and sustainability (see ***Addendum B*** starting page 59). Research and data-driven initiatives are essential to provide evidence and data on issues, gaps and challenges but also to monitor progress and identify possible solutions. Innovation, best practice and policy-driven initiatives contribute to testing, and experimenting with, new approaches; identifying what works, where and how; disseminating knowledge and best practices globally; and shaping a conducive policy agenda. Finally, infrastructure development and financing platforms or initiatives are critical to provide expert advice and facilitation to support cities in achieving their sustainable urban development vision.

5.2. Limitations of the conventional ‘needs- & tax- based’ approach to infrastructure financing

The largely ‘need- & tax- based’ approach to infrastructure financing, whereby governments have financed most of the infrastructure development through general tax revenue, is weakening.

There is general recognition that governments alone cannot finance the scale of infrastructure required globally over the next decades. Given fiscal and budgetary constraints, governments in many places, including municipalities, have exhausted the possibility of using general tax-based revenue to leverage finance for infrastructure development. Many governments need to rein in their debt to maintain their credit worthiness, which constrains further their ability to borrow on capital markets.

Infrastructure is, and has always been, political. This however should not excuse a failure to achieve wider socioeconomic objectives. Infrastructure project selection

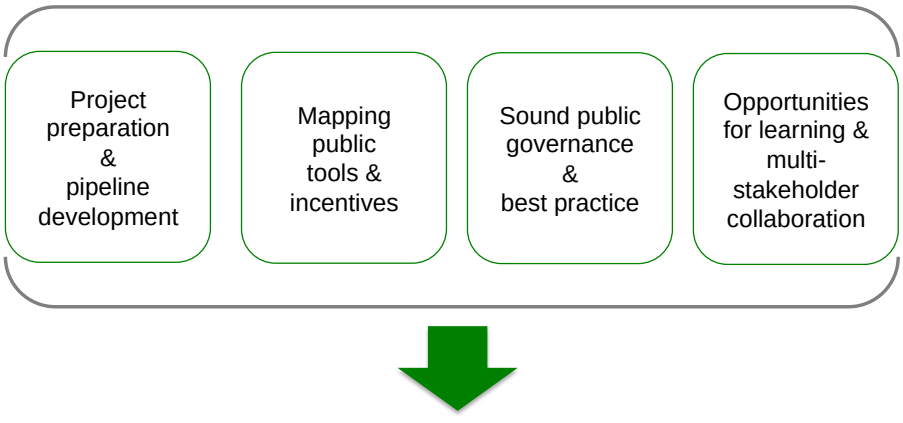
and execution supported by adequate expertise; accountability and balanced risk-reward sharing schemes, has probably better chances of being financed and delivered than projects driven by visibility and political support (Standard & Poor's, 2015).

The literature and respondents state repeatedly their concerns over a widening infrastructure financing gap of a scale incomprehensible to most but governments who are increasingly aware of it. There seems to be some sort of 'expectation' for this gap to be filled by alternative sources of finance such as institutional investors and private finance institutions, almost out of 'necessity'. Private finance sources such as institutional investors, banks, specialist funds and investment firms have different risk-return profiles depending on the regulations they face; the duties and responsibilities they have (e.g. fiduciary duty); the type and degree of risk they are able to take and manage through their investments; and their liabilities. As outlined in Chapter 4, when surveying financial instruments relevant to infrastructure and sustainable infrastructure, there are opportunities for private financing of infrastructure provided that conducive policy and project conditions are in place. Investors will only support infrastructure development out of 'market' and 'investment opportunity' matching their specific risk-return requirements.

5.3. Towards a 'product approach' to sustainable infrastructure financing

In a changing world, cities increasingly find themselves on the front line as places where the physical, financial, social and human capital needed to support economic growth and development concentrate. As illustrated by ratings such as the Global Financial Centres Index (GFCI), cities' attractiveness and competitiveness as economic centres is increasingly tied to wider and interconnected factors such as liveability and sustainability. Sustainable infrastructure is a key element defining cities' ability to meet inhabitants and business demands but also to support their attractiveness beyond boarders.

Fig. 14 – A product approach to infrastructure financing



This report argues that cities should develop a 'product & marketing' approach to infrastructure financing.

This would involve developing infrastructure projects in the form of 'products' that can be marketed to different prospect investors, depending on their risk-return profile. Such an approach could help cities and governments raise the finance needed to support infrastructure delivery while meeting sustainability and environmental policy objectives. Cities' support of infrastructure financing and delivery is unlikely to disappear but its nature, format and conditionality are likely to evolve significantly to match changing realities and encourage investment towards sustainable urban infrastructure. As outlined in Figure 14, we see this approach to consist of four core pillars: sustainable infrastructure project preparation and pipeline development; public finance instruments and incentives mapping; sound governance and best practice development; opportunities for multi-stakeholder collaboration.

1. Sustainable infrastructure project preparation and pipeline development
Cities should first have a sound understanding and reasonable estimate of their infrastructure needs. They should focus their efforts on project prioritisation and preparation to assess projects' feasibility, sustainability impact and risk-return profile. Project prioritisation and preparation are prerequisites to understanding the risk-return profile and to determining which and how projects can be structured in ways that meet different prospect investors' risk-return requirements while delivering against set policy targets and objectives. Project preparation should in turn facilitate the development of a pipeline of projects, structured according to their sustainable impact, 'investability' and risk-reward profile.

Cities should primarily aim to leverage 'external' sources of finance for projects that have reasonable prospects of meeting investors' requirements for example in the building, transport, water and energy sector where projects tend to have clear revenue streams which can be leveraged for finance. Government support in this case should take the form of low-cost tools and incentives such as building rights and permits or soft tax incentives and medium-cost tools such as targeted guarantees. Cities should prioritise public finance support in the forms of higher-costs tools and policy reform for projects that can deliver substantial sustainability benefits but which lack clear repayment streams and entail relatively higher uncertainties, whether technological or political.

2. Mapping public sector instruments, incentives and tools
Recognising the diversity and importance of local contexts, cities should undertake a comprehensive scoping and mapping exercise of the policy, administrative and financial instruments, incentives and tools which they can use to directly support the first pillar of this approach. Relevant instruments include public finance instruments outlined in section 4.2 but also administrative leverage tools relevant to planning processes and permits. All of these tend to vary across local authorities depending on their mandate and powers.

Given different contexts and legal frameworks, this step is deemed necessary for cities to better understand what can be done, how and in what context in order to leverage financing for sustainable infrastructure while meeting sustainability policy targets and objectives. This process should build upon existing resources documenting best practice and providing guidance on sustainable infrastructure options and financing. Such an exercise could help to identify opportunities for process improvement, e.g. in relation to tendering and procurement processes or monitoring and accountability; and areas where cities need the most support from

other government entities or other stakeholders (e.g. private sector, development banks).

3. Sound public governance and best practice development

Cities should endeavour to strengthen investor and public confidence by improving the transparency, accountability and sustainability of public finances and administration. Public governance is one of ten key policy areas identified in the OECD Policy Framework for Investment to support domestic and foreign investment (OECD, 2006). Regulatory quality and public sector integrity are two dimensions of public governance that critically matter for the confidence and decisions of investors and for reaping the development benefits of investment (OECD, 2015).

Some cities are already taking steps to improve transparency and accountability of public sector management. In Europe, Barcelona led the launch in June 2014 of the City Economic & Financial Group (CEFG), a group of six cities (including Dublin, Hamburg, Vienna, Milan and the City of London) who are working together to reform and harmonise public sector budgeting, accounting and financial systems in order to improve the comparability of financial data and to enhance the effectiveness and accountability of public sector management (CEFG Group, 2014). MDBs such as the World Bank offer training courses to municipalities on public finance management and transparency (World Bank, 2014).

4. Opportunities for learning and multi-stakeholder collaboration

Financing and delivering sustainable infrastructure to meet the needs of cities around the world is not an easy task and is likely to require collaboration among a range of stakeholders. Local authorities should encourage collaboration internally, among departments, and externally, with government entities at other levels (e.g. provincial or national). Improving collaboration between departments in charge of sustainability, environmental services and energy and those in charge of planning, finances and procurement could help to identify areas where synergy is possible.

Stakeholders in the private sector, civil society and academia have a role to play in supporting cities' efforts. Financial but also professional services institutions can share expertise in structuring the finance and the contracts underpinning infrastructure development, particularly around project aggregation, risk diversification and financial instruments targeted design and implementation. Development finance institutions, whether bilateral or multilateral, can share expertise in supporting the financing and delivery of infrastructure in places with more fragile institutional and market environments. Relevant thematic and multi-stakeholder networks and initiatives (see *Addendum **B***) should continue their efforts to identify gaps; disseminate best practice and lessons learned; and favour multi-stakeholder dialogue. National governments could empower cities and support these in their efforts through adequate and consistent regulatory frameworks and incentives and by encouraging best practice in public sector management and governance. Collaboration on sustainable infrastructure financing and development among cities and countries can support further learning and best practice sharing as illustrated by relevant city networks (e.g. C40, ICLEI) and the announcement by G20 countries in 2014 to set up a Global Infrastructure Initiative, a multi-year programme to support public and private investment in infrastructure (G20, 2014).

Early signs of innovation

While this 'product & marketing' approach is still in early stages, evidence suggests that there are encouraging signs of cities' creative and innovative use of financial instruments in both developed and developing countries to support investment in sustainable urban infrastructure development.

Cities are increasingly tying low-carbon requirements to planning application processes and tax incentives in relation to new infrastructure development or the upgrade of existing infrastructure. Cities like Vancouver (Canada) and Pune (India) have introduced energy efficiency (or carbon neutrality) requirements. Vancouver has also been using incentives (such as grants, land-based tax abatement) to leverage the low-carbon upgrading of district energy utilities (see Vancouver's Neighbourhood Energy Strategy).

Cities and government institutions at provincial or national level are seeking to leverage economies of scale by setting up independent entities such as SPVs to advice, pilot and fund projects across municipalities and sectors. The Western Cape government in South Africa for example has set up Green Cape, an independent SPV to advice municipalities on options to achieve green economy objectives through sustainable infrastructure and to pilot financing mechanisms across regions. In India, the government created a SPC – Solar Energy Corporation of India (SECI) to invest in all kinds of solar power using a mix of financing sources including grants, concessional debt, commercial debt and private equity. Cities can also leverage economies of scale for the upgrading and maintenance of common infrastructure (e.g. public transport, road network, water reservoirs) across municipalities and regions. This is particularly relevant for large and mega cities which can regroup different municipalities or equivalent administrative units or for regions where urban agglomerations are fairly close to one another.

Cities can leverage land value capture (LVC) mechanisms to raise finance for sustainable infrastructure on domestic or international capital markets. The Greater London Authority in the UK successfully combined a tax increment on business property tax with a municipal bond issuance backed by the projected tax revenue to finance part of its share of the cost of the high speed rail corridor known as the Crossrail project (for more information see Maier & Jordan-Tank, 2014 or Medda & Cocconcelli, 2013). In Brazil, the City of Sao Paulo auctions on Sao Paulo's financial exchange certificates of additional construction potential bonds (known as CEPACs) for designated areas. In this case the compensation given by projects developers in exchange for building rights is given before the project begins and the revenue from the sale allows the public administration to finance the construction of public infrastructure and amenities in the same designated areas (see Maier & Jordan-Tank for more information).

Cities are also experimenting with novel applications and implementations of known instruments. Cities like Chicago in the USA is raising off-balance sheet finance for transformative urban projects by structuring PPPs through the Chicago Infrastructure Trust, a separate entity involving private actors. Though off to a slow start in reaching financial close for its first energy efficiency project 'Retrofit One' targeting municipal buildings, the trust is seen as a promising approach to raise finance for sustainable urban infrastructure projects from sources other than state or federal government (Holeywell, 2013). Cities like Gothenburg (Sweden) and

Johannesburg (South Africa) have issued special purpose bonds in the form of green city bonds, and are working internally – across departments, and externally – with intermediaries, to improve transparency and accountability on how the funds are being used to deliver sustainable infrastructure projects (see for example Gothenburg green-bond dedicated website for more information).

6. WHAT NEXT?

This research aimed to provide an overview of financing instruments commonly used to finance infrastructure and to assess their potential to support investment in sustainable infrastructure, with a focus on energy efficiency and renewable energy projects at city level.

This report identifies four areas where cities and relevant stakeholders could collaborate to strengthen cities' case for sustainable urban infrastructure and to gradually support the shift towards a coherent and effective 'product & marketing' approach to sustainable urban infrastructure financing.

First, cities, infrastructure developers and those who provide financing for infrastructure need guidance and better understanding as to what environmental sustainability for infrastructure means. More importantly, they need guidance on how the sustainability impact of a project can be understood, integrated, quantified and monetised throughout the lifetime of the project, starting from the planning phase to the operational phase. Sustainability impacts and benefits vary depending on the type of infrastructure, the technology but also local contexts. The development of adequate guidance should build upon existing efforts documenting sustainable benefits across a range of sustainable infrastructure options (e.g. ICLEI's Solutions Gateway); on the experience and findings of sector-specific sustainable standardisation efforts (e.g. green building and energy efficiency standards and certification schemes); and on on-going discussion around standards for sustainable infrastructure (see GIB, 2015).

Second, a holistic framework approach that enables cities to work across departments and issues could provide a guide to cities in the process of identifying, assessing and mapping public sector tools, incentives and financing instruments which can be used to leverage finance for sustainable infrastructure. Such a framework could take the form of a step-by-step assessment of political, financial, legal, administrative processes and tools across departments which are relevant to sustainable infrastructure financing and development. It should take into account the specifics of local contexts. Well-designed it could help to assess how cities can prioritise, fund and deliver infrastructure projects seamlessly.

Third, a global database of case studies and urban infrastructure projects documenting best practice in the use of such tools and incentives for sustainable urban infrastructure could be created. Such a database should involve multiple stakeholders including financial institutions and investors. It should aim to consolidate relevant information available through existing initiatives such as World Bank's Private Participation in Infrastructure (PPI) Database or Go 100% Renewable's survey of 100% renewable energy projects around the world. This would allow the gathering of comparable information and data on sustainable urban infrastructure projects across sectors, their financing structure and the scope and format of government involvement. Further, it could facilitate a comparison of projects according to cost and access for capital. Over time, such a database could be used as a reference resource for cities to develop projects.

Fourth, more consideration should be given to finding ways of recognising good practice and innovation in this space. Recognition should be targeted at efforts to address existing gaps, for example in relation to project design and preparation; methodologies for evaluating investment in infrastructure from a sustainability perspective; and capacity building on sustainable infrastructure financing and delivery.

WWF and Long Finance welcome comments on this report and would like to invite stakeholders to express interest in potential future collaboration to explore some of the findings and recommendations.

Addendum A – Sources of finance for infrastructure

This addendum provides an overview of sources of finance for infrastructure and highlights the potential for sources other than government and banks to finance infrastructure development and upgrading, based on relevant literature and trends.

Governments

Historically, governments have financed most of the infrastructure development, often viewed as a central component of economic and human development, through direct funding from taxation, government-sponsored financial and corporate institutions.

Current average infrastructure investments by governments globally amounts to about 3% of global GDP (Standard & Poor's, 2014). In OECD countries, public infrastructure investment has declined over past decades, from above 4% of GDP in 1980 to about 3% in 2005 (Della Croce & Yuermo, 2013). In Europe, public investment in infrastructure has fallen from about 5% in the 1970s to about 2.5% in the 2000s (Inderst, 2013). Austerity measures in the Eurozone since 2008 have also contributed to this downward trend in government spending in infrastructure. In the USA, government spending on infrastructure has dropped to 1.7% of GDP. In emerging economies, the allocation of public spending to infrastructure is higher particularly in China (8.5% of GDP; of which a larger portion is invested outside its borders) and in India (4.7% of GDP) (Standard & Poor's, 2015).

Government ability to continue to finance infrastructure is decreasing due to budgetary constraints globally. Governments in developed economies face significant budgetary deficits and sovereign debt levels, which prevents them from financing infrastructure through direct funding or borrowing on capital markets. Governments in developing economies often lack the institutional capacity to plan, and the financial resources to fund, the unprecedented level of new infrastructure required to accommodate their rapidly growing urban population. Infrastructure often competes for limited public resources with other socio-economic policy priorities (e.g. education, health, ageing populations etc.) (Maier and Jordan-Tank, 2014).

Banks

Banks have traditionally provided long-term infrastructure financing, with about 300 USD billion per year lent to infrastructure projects specifically (Standard & Poor's, 2014). Bank lending is increasingly constrained following the financial crises and new regulations for capital, funding and liquidity requirements such as Basel III being implemented (Della Croce & Yuermo, 2013). This in turn has led to lower volumes of global bank lending particularly in developing and emerging economies (Inderst & Stewart, 2014). With mostly short-term liabilities and rising capital requirements, banks are often not well placed to hold long-term illiquid assets on their balance sheets suggesting that a broader group of investors and financiers should be targeted (Ehlers, 2014; Standard & Poor's, 2015).

Development finance institutions

Multilateral, regional and bilateral development institutions play a significant role in financing infrastructure in both developed and developing economies, often combining financing with technical assistance and other grant-funded support. It is

estimated that multilateral development banks (MDBs), including IADB, ADB, EBRD, EIB and the World Bank, provide over USD 130 billion for infrastructure annually (World Bank, 2014).

DBs' support (from MDBs in particular) often provides 'additionality' by leveraging expertise and financing, and by strengthening private sector and market capacity (see for example EBRD, 2012; IFC, 2009). As MDBs usually get involved from the very start of a project, they play a pivotal role in guiding the project design and financing structuring. MDB's usually provide only a portion of the funding (e.g. EIB: maximum 50% of the whole project costs) but their involvement adds to the credibility of the project and can help to leverage additional financing from other MDBs, national development banks and local commercial banks. MDBs often also provide project selection support to governments and help to strengthen and develop local institutional and private sector capacity, including financial system and institutions, a prerequisite for local banks to finance projects like infrastructure. (Canuto, 2013; Inderst & Stewart, 2014)

Multi-donor alliances and funds can help to channel support for sustainable infrastructure financing in targeted sectors and/or countries. The Private Infrastructure Development Group (PIDG) is a multi-donor alliance which supports private sector participation in infrastructure in low-income developing countries (PIDG, 2008). The Eastern Europe Energy Efficiency and Environment Partnership (E5P) is a multi-donor fund managed by the EBRD to facilitate investments in energy efficiency and environmental projects aiming at reducing greenhouse gas emissions in targeted countries.

Export credit agencies

Export credit agencies (ECAs), private or quasi-governmental agencies that support domestic exports via loans for business activity abroad, have become an important source of finance for infrastructure, particularly since the financial crises. Financing can take the form of credit insurance and guarantees, or both (PPPIRC, n.d). As global banks are curbing their long-term lending activity, ECAs' annual support of project finance-lending activity has grown from USD 10 billion to over USD 30 billion since 2009. ECAs' role is set to increase in infrastructure particularly in emerging markets, where debt markets are often underdeveloped and country risk may prevent private finance actors to get involved (Timms, 2014).

Institutional investors

With over USD 80 trillion in assets in OECD countries, institutional investors – i.e. pension funds, mutual funds, insurance companies and sovereign wealth funds – are often cited as an alternative source of long-term capital (Inderst & Stewart, 2014; Della Croce, 2014). Institutional investors' interest in infrastructure investment opportunities, including green infrastructure, is rising. Infrastructure investment is seen as a way to both diversify portfolios and match institutional investors' long-term assets and liabilities. In theory, infrastructure can help investors deal with the current low interest rate environment and provide stable and predictable cash flow as well as a low correlation to existing investments (Inderst & Stewart, 2014).

Although interest is growing, the level of institutional investment in infrastructure remains fairly small to date (with an average 1% of pension funds' assets allocated

to infrastructure). Two notable exceptions are Canada and Australia where pensions funds invest higher proportions in infrastructure, respectively 5% to 6% in Australia and about 5% in Canada on average, with 7% to 8% for larger pension funds not uncommon (Inderst & Della Croce, 2013). Based on industry-stipulated asset allocation targets, Standard & Poor's estimates that institutional investors' allocations to infrastructure could rise to an average 4%, providing about USD 200 billion per year in additional infrastructure financing (Standard & Poor's, 2014). In a recent survey of nearly 80 institutional investors across 26 countries, nearly 60% expected their allocation to infrastructure to rise while 30% see it stabilising over the next 18 months (IPE & Stirling Capital Partners, 2015).

Institutional investment in infrastructure in developing and emerging countries is less sizeable, partly because there are significantly fewer assets under management (about USD 10 trillion). There are encouraging signs of asset accumulation in developing and emerging countries' pension funds, which could open new opportunities for investment in infrastructure. Asset accumulation as a proportion of GDP could increase more rapidly as governments increasingly seek to reform and develop pension systems. New sovereign wealth funds are also being set up in natural resource-rich countries (particularly in Africa). There are also examples of local insurance assets being invested in domestic or regional infrastructure (Inderst & Stewart, 2014).

A number of collaborative initiatives have emerged in recent years to encourage the pooling of institutional investors capital for infrastructure finance. Either market- or government- led, these initiatives rely on a range of financing models including co-investment platforms such as the Pension Infrastructure Platform in the UK (NAPF, 2014); equity funds such as Meridiam; and public seed capital such as the Philippine Investment Alliance for Infrastructure Fund (PINAI) and the Pan African Infrastructure Development Fund (PAIDF (see AfDB, 2007)). (OECD, 2014)

While there is both potential and expectation for institutional investors to allocate higher proportion of assets to infrastructure, many barriers persist in both developed and developing economies. The three most significant barriers are:

- First, institutional investors need a clear pipeline of infrastructure projects with clear visibility on risks and returns over the lifetime of projects. Size matters as institutional investors are likely not to invest below a certain scale. The lack of suitable investment opportunities (and vehicles) was highlighted as one of the main reasons not to invest in infrastructure in a recent survey of institutional investors (IPE & Stirling Capital Partners, 2015).
- Second, infrastructure development and investment depends on government support. Infrastructure investment requires stable and predictable regulatory environments, a trusted and coherent legal system, long-term government political commitment and effective institutional capacity. Related policy and country risks are perceived to be relatively high particularly in developing countries.
- Third, not all institutional investors have the required expertise to invest in infrastructure. Related to the latter, more and better information on the risks specifically associated with infrastructure investment is needed, including more comparable data on infrastructure projects. (Inderst & Stewart, 2014; Standard & Poor's, 2014; Della Croce, 2014)

Specialist infrastructure funds, private equity and other investment funds can help to channel investment, including from institutional investors, to infrastructure. An equity fund is a collective investment scheme investing in equities. Private equity funds can play an important role in providing mezzanine financing to a project, taking more risks than traditional lenders but less than project sponsors. The nature of the investments by a private equity fund will depend on the nature of that fund and the extent to which they bring significant infrastructure financing experience or not. (PPPIRC, n.d.)

Such funds have proliferated significantly since the 1990s though evidence suggests that related investments tend to focus on the upgrading of existing infrastructure primarily in Europe and North America (Orr & Kennedy, 2008; Inderst, 2013). Respondents from the financial services sector confirmed the multiplication of intermediaries and funds in this sector but stressed that the key issue at present seems to be the lack of investable projects.

Capital markets enable the trading of equities and debt and as such represent the largest and deepest pool of financing. Capital markets' ability to provide long-term financing for infrastructure should not be underestimated, whether in relation to public equity, private equity, or bond markets. Evidence confirms that countries' access to international capital markets depends on a number of factors including good economic growth prospects, inflation under control, sound trade balance and public debt management, and a stable currency and policy environment (IMF, 2003). Respondents stressed the necessity to strengthen local and regional capital markets particularly in developing and emerging economies as a prerequisite for financing to flow, thus reinforcing the argument for sound financial infrastructure.

Smaller cities or regions may not be able to gain direct access to capital markets because they lack the required financial infrastructure and local capacity. National governments can facilitate city or regional access to capital markets through financial intermediaries such as bond banks, or by pooling smaller municipalities' resources to allow them to issue joint municipal bonds (World Bank, 2013).

Private sector companies, such as technology and infrastructure providers, can provide finance for infrastructure projects in public private partnerships or other contractual arrangements involving private participation in infrastructure. Leading companies, particularly in the infrastructure sector, increasingly have dedicated units, centres and tools to provide expertise on relevant technologies and infrastructure project design options which maximise cities' environmental improvements and economic benefits and support city's decision-making on infrastructure (see for example Siemens's City Performance Tool (Siemens, 2014)). Companies already active in the design and delivery of infrastructure (e.g. technology or construction companies) are increasingly getting involved with the financing of public-private partnerships particularly for projects where they are also delivery partners and in some cases establishing dedicated infrastructure financing equity funds (e.g. Aecom and other private sector companies with Meridiam).

Communities also contribute to financing infrastructure, though their contribution is primarily indirect through taxation or the purchase of bonds and equities. More direct and participatory approaches are gaining ground regarding the financing as well as the prioritisation, design and implementation of infrastructure projects (see for example the New Garden City movement and C20, 2014). The City of Gothenburg reported that citizens enquired about how they could subscribe to the green city bonds issued by their city. Aggregated savings schemes can play a critical role in supporting infrastructure development and encouraging poverty alleviation in developing and emerging countries. Shack/Slum Dwellers International (SDI) for example has been active in supporting the establishment of savings federations, i.e. savings groups constituted at the street and community levels in informal settlements, in more than 30 countries to support urban development projects and to leverage the accumulated savings to finance such projects (SDI, n.d.). More recently, SDI established Urban Poor Fund International a subsidiary aiming to provide access to capital for urban development projects undertaken by affiliated federations (SDI, n.d). Respondents suggested that community-led financing of infrastructure including crowd-funding and local equity schemes should be explored further.

Addendum B – The sustainable cities universe: relevant initiatives

Many networks, initiatives and organisations work on urban growth, infrastructure, sustainability, policy and finance issues. This appendix attempts to provide an overview of initiatives relevant to sustainable infrastructure and infrastructure financing globally. Though not meant to be exhaustive, this section categorises initiatives according to their primary focus.

Taken together these initiatives illustrate the rising interest for multi-stakeholder and interdisciplinary approaches to support sustainable urban development including sustainable infrastructure. Research and data-driven initiatives are essential to provide evidence and data on issues, gaps and challenges but also to monitor progress and identify possible solutions. Innovation, best practice and policy-driven initiatives contribute to testing, and experimenting with, new approaches; identifying what works, where and how; disseminating knowledge and best practices globally; and shaping a conducive policy agenda. Finally, infrastructure development and financing approaches are critical to provide expert advice and facilitation to support cities in achieving their sustainable urban development vision.

Research & data-driven initiatives

The first group of initiatives comprises organisations, initiatives and projects that work to advance research in relation to urbanisation, population and development. These include infrastructure data driven programmes and tools.

Fig. 15 – Research and data-driven initiatives

Name	Description
Africa Infrastructure Knowledge Programme (AIKP)	Initiated by AfDB, AIKP builds on the Africa Infrastructure Country Diagnostic (AICD), a comprehensive study on the state of the infrastructure in Africa commissioned by the World Bank between 2005 and 2009. AIKP works to ensure that critical data collection and analysis of Africa's infrastructure sectors will continue into the future on a sustainable basis.
Global Commission on the Economy and Climate – New Climate Economy	International initiative comprising former heads of governments, ministers of finance, leaders in the fields of economics and business which was created to analyse and communicate the economic benefits and costs of acting on climate change. The New Climate Economy is the Commission's flagship project providing independent and authoritative evidence on the relationship between actions, which can strengthen economic performance and those, which reduce the risk of dangerous climate change.
LSE Cities	LSE international centre whose mission is to study how people and cities interact in a rapidly urbanising world, focuses on how the design of cities impacts on society, culture and the environment through research, conferences, teaching and projects.
New Cities Foundation	Foundation which aims to shape a better urban future for all by generating and scaling ideas and solutions through events, research and urban innovation projects and by working with leaders from business, government, academia, civil society, the media and the arts.

Name	Description
World Bank's Urbanization Knowledge Partnership	The partnerships aims to put the world's best knowledge and data in the hands of policymakers and practitioners, in order to harness urban growth for better development outcomes. It focuses on four thematic pillars: rural-to-urban transition; social inclusion and mobility; sustainable urban growth; and creating accountable cities and towns.
WRI Ross Center for Sustainable Cities	Recognising that the majority of urban growth will occur in the developing world, the centre aims to galvanize action that will help cities grow more sustainably and improve quality of life in developing countries. The centre aims to reach out to established and emerging cities, building on the work of WRI's EMBARQ Network in transport and urban planning.

Other research centres focusing on regional dynamics of urbanisation exist. These include the African Centre for Cities, the Urban Knowledge Network Asia and IGES's Kitakyushu Urban Centre.

Innovation, best practice & policy initiatives

The second group of initiatives consists of multi-stakeholders and city networks working to share and disseminate best practice, identify solutions and innovations and in some cases shape the policy agenda in relation to cities, sustainable infrastructure, urban development and climate change. Initiatives outlined in the table below include initiatives focusing on renewable energy and energy efficiency commitment and practice.

Fig. 16 – Innovation, best practice and policy initiatives

Name	Description
C40 Cities Climate Leadership Group	Network of the world's megacities committed to addressing climate change. C40 offers cities an effective forum where megacities can collaborate, share knowledge and drive meaningful, measurable and sustainable action on climate change.
Cities Alliance	Global partnership for urban poverty reduction and the promotion of the role of cities in sustainable development with the overall strategic objectives of supporting cities in providing effective local government, an active citizenship and an economy characterised by both public and private investments. Members include local authorities, national governments, NGOs and multilateral organisations.
Compact of Mayors	Launched at the Climate Summit 2014, the Compact of Mayors is an agreement by city networks (C40, ICLEI and UCLG) and then by their members to undertake a transparent and supportive approach to reduce city-level emissions, to reduce vulnerability and to enhance resilience to climate change, in a consistent and complimentary manner to national level climate protection efforts.

Name	Description
ICLEI – Local Governments for Sustainability	Leading network of over 1000 cities, towns and metropolises committed to building a sustainable future. ICLEI is an international association of local governments. ICLEI's mission is to build and serve a worldwide movement of local governments to achieve tangible improvements in global sustainability, with a specific focus on environmental conditions through cumulative local actions. ICLEI hosts the World Mayor Council on Climate Change and is the focal point for local governments and municipal authorities at the UNFCCC negotiations.
Metropolis	World association of 130 major metropolises with more than 1 million inhabitants. Created in 1985, its mission is to provide a forum to explore issues and concerns common to all big cities and metropolitan regions, and to support cities in mutual learning, innovation, governance, technical and financial assistance, international presence and debate.
United Cities and Local Governments (UCLG)	UCLG represents and defends the interests of local governments on the world stage, regardless of the size of the communities they serve. The organization supports international cooperation between cities and their associations, and facilitates programmes, networks and partnerships to build the capacities of local governments.
Urban Infrastructure Initiative	Joint WBCSD and ICLEI project to catalyse collaboration between cities and business globally. The project explores how companies can support urban and infrastructure planning by engaging with cities to implement more effective and affordable solutions to manage inter-connected challenges. The first phase of the initiative mobilised multi-sector expertise from 14 leading companies to help 10 cities around the world identify innovative and effective solutions to realize their sustainability visions.
WWF's Earth Hour City Challenge	Created to mobilize action and support from cities in the global transition towards a climate friendly one-planet future, the challenge invites cities to submit inspiring and credible urban development plans that increase the city's use of renewable energy. In 2015, 163 cities from 17 countries participated. An international jury then reviews the finalists and identifies one sustainability leader per country as well as an overall global leader.

Other regional and country specific networks and programmes exist including the Covenant of Mayors, a European movement involving local and regional authorities voluntarily committing to increasing energy efficiency and use of renewable energy sources on their territories; Energy Cities, a European association of local authorities in energy transition which represents more than 1,000 towns and cities in 30 countries in Europe; and the Global Cities Initiative, a five-year, USD 10 million collaboration between the Brookings Institution and JP Morgan Chase that aims to equip business, civic and government leaders from USA and global metropolitan areas with the information, policy ideas and global connections they need to thrive in the global economy.

Infrastructure development & financing initiatives

The third and final group of initiatives is probably the most directly relevant to sustainable infrastructure financing. This group includes initiatives aiming to:

- provide technical assistance and build capacity;
- support project preparation including the structuring, feasibility and financing of project;
- match infrastructure projects with sources of finance;
- rate infrastructure projects according to their sustainability; and,
- support the development and piloting of relevant tools and frameworks.

Fig. 17 – Initiatives focusing on infrastructure development and financing

Initiative	Description
Cities Development Initiative for Asia (CDIA)	Established by ADB and the Government of Germany in 2007, CDIA works with medium-sized cities to bridge the gap between their development plans and the implementation of their infrastructure investment. CDIA focuses on capacity building; infrastructure projects prioritization and preparation. CDIA also provides support to link projects with potential financiers. Relevant resources include the City Infrastructure Investment Programming and Prioritisation Toolkit and Pre-Feasibility Studies Guidelines.
Energy Efficiency Finance Institutions Group (EEFIG)	EEFIG comprises 51 institutions and focuses on how to overcome the barriers to long-term financing for energy efficiency. Established as a permanent working group by the European Commission in late 2013, as a result of the dialogue between EU DG Energy and UNEP FI.
Global Fund for Cities Development (FMDV)	Created by Metropolis, UCLG and 34 founding members comprising cities and city networks, FMDV aims to strengthen solidarity and financial capacity by and among local authorities. FMDV supports projects developed by local authorities and their partners through technical assistance and financial engineering to facilitate access to appropriate financing instruments e.g. through needs appraisals, economic feasibility studies and territorial business plans.
Global Infrastructure Basel (GIB)	Not for profit organization working to promote sustainable and resilient infrastructure globally. GIB helps to meet the challenge of designing, implementing and financing sustainable infrastructure projects particularly but not exclusively during the early stage of the project cycle. GIB's work includes the development of a voluntary standard and grading system for sustainable and resilient infrastructure; efforts to make the infrastructure asset class more sustainable by providing measurement and backtracking of performance indicators; and capacity building with selected partners such as city representatives, project developers and financing institutions.

Initiative	Description
ICLEI's Solutions Gateway	Online resource platform providing advanced guidance on Low Emissions Development (LED) Solutions to local governments. Solutions include sectoral and cross-sectoral packages of activities, structured along local government responsibilities and spheres of influence, to support cities in the development of low-emission strategies, plans, and projects and based on proven technologies and practices. Currently tested by Urban-LEDS project cities (37), the Solutions Gateway platform will be officially launched at ICLEI's World Congress in April 2015 and made available to ICLEI members. The Solutions Gateway will include a Finance Tool to be launched before August 2015 which would consist of a project feasibility assessment tool; a financing decision-making map; and a database allowing users to browse information on international and national funding resources and their requirements, as well as case studies.
Shack/Slum Dwellers International (SDI)	Shack/Slum Dwellers International (SDI) is a network of community-based organizations of the urban poor in 34 countries in Africa, Asia, and Latin America. Launched in 1996 when "federations" of the urban poor in countries such as India and South Africa agreed that a global platform could help their local initiatives develop alternatives to evictions while also impacting on the global agenda for urban development. SDI puts "*the urban poor at the center of strategies for urban development"* by supporting the establishment of savings groups and encouraging the development of urban development projects through accumulated savings and their leverage potential. SDI established Urban Poor Fund International (UPFI) a subsidiary aiming to provide access to capital for urban development projects undertaken by affiliated federations
World Bank's Low-Carbon Liveable Cities Initiative (LC2)	Helps rapidly growing cities plan for smart, sustainable, green, and inclusive growth. Working with partners (e.g. the Clinton Global Initiative, C40, the Rockefeller Foundation) the initiative focuses on planning – through diagnostics and tools; and financing – including working on developing new financing instruments for low-carbon investments at the city level, and creating pooled delivery mechanisms to attract private capital.

Appendix 1 – Acknowledgements

We received enthusiastic cooperation from everyone involved in this project. We would like to thank WWF International and country offices who have helped to promote and encourage participation in this project. We are particularly grateful to the cities of Cape Town, Chicago, Gothenburg, Pune, Sao Paulo and Vancouver for agreeing to share their vision and experience regarding sustainable infrastructure financing and development during semi-structured interviews. We would like to thank all the people who agreed to semi-structured interviews, who took the time to complete the online questionnaire and who participated in the webinar. Without assigning any responsibility for our conclusions, nor any endorsement of our work, people working at the following organisations were particularly helpful to us and we thank them:

Abquest Capital
Acclimatise
ADB
Aecom
Allianz Capital Partners
Allianz SE
AmCham Tajikistan
Aminex Plc
Aon UK Limited
Association of Professional Fund Investors
Assurity Consulting
Bank of England
Bank of New York Mellon
Beta Financial Ltd
Belo Horizonte
Boehme Eckhart LLC
British Bankers Association
Boston University School of Management
Busan Metropolitan City
C40
Cairneagle Associates
Capitalactiv
CDC Group
CEG Europe
Center for the New Energy Economy
Chuo University
City of Cape Town
City of Chicago
City of London
City of Sao Paulo
City of Vancouver
City University London
Cities Development Initiative for Asia
Climalia
Climate Policy Initiative
Close Brothers Asset Management
Derivatives Vision
DRisk Limited
DSTL
DVFA
Earth Security Group
EBRD
EIB
EIRIS
Ekspobalta UAB
Envisager
Eton College
Five Talents UK
Finance Montreal
Forestry Commission (UK)
Future Cities Catapult
Gazelle Group
Global Infrastructure Basel
Global Warning
GreenCape
Green Public Procurement Bhutan Project
Green Tide Turbines Ltd
GWG Energy
Green Alliance
Hauser Center for Civil Society – Initiative for Responsible Investment
HBS Angels of London
Herbert Smith Freehills LLP
HSSMI
ICLEI
IDB
IDEST
IISD
Inderst Advisory
Infrangilis
Institute of Directors
Interxion
JP Morgan
King & Wood Mallensons LLP
Kingdom Bank
Kuveyt Turk Katilim Bankasi AS
ING Commercial Banking
Lily Innovation Advisors

Liverpool City Region Local Enterprise Partnership
Lloyd's Bank
Loughborough University
MCO Europe Limited
Medellin
MHA MacIntyre Hudson
Oraculum Advisors
New Economics Foundation
New Finance
Notenstein Private Bank
Oregon State University
P3Planet
Pax World Management LLC
Premier Pensions Management
Pune Municipal Corporation
Pure Leapfrog
Quest University Canada
Sarasin & Partners
Siemens
Solar Ventures
Spinetic Energy Ltd
Staffordshire University Business School
Standard & Poor's
Stirling Capital
St James's Place Wealth Management Asia
SUSI Partners AG
SustainValues
Sustensis
Tax Research LLP
Technology Greenhouse
The Futures Academy
The Investment Association
TMX Technology Solutions
Transform Global
Tresauris
UCL
University of Cambridge
University of Oxford
University of Ottawa
University of Reading
UOIT
URBED
Weatherill Consulting
Western Cape
WBCSD
William Garrity Associates Ltd
Willis RE
WRI

Appendix 2 – Semi-structured interview template

Note: some of the questions may have been adapted depending on the interviewee's area of work and expertise.

Finance

1. Could you tell me more about your role (or your organisation)? How does it relate to the financing of urban infrastructure projects?

2. Do you invest in urban infrastructure projects? Through what type of financial instruments or products? Where (developing, emerging, developed cities/countries)?

3. What are the critical factors underpinning your investment process in relation to urban infrastructure?

4. What is the technical process you use to assess these investment opportunities?

5. How is sustainability taken into account (in terms of investment process and decision-making as well as investment products, depending on context)?

6. How to do you assess performance for investments in urban infrastructure (in a broad sense, not only financial)?

7. Let's talk through a specific example…

8. Which financing mechanisms or arrangements do you think are particularly well suited to finance energy efficiency projects? and why? Which are not? And why?

9. Which financing mechanisms or arrangements do you think are particularly well suited to finance renewable energy projects at city level? and why? Which are not? And why?

10. Do you have experience of public-private partnerships? If so, what do you think are key framework conditions for PPPs to work?

11. In your experience, which financial mechanisms can effectively leverage private investments for infrastructure projects? Why?

12. Beside financing mechanisms, what incentives or conditions are effective in increasing investments for sustainable urban infrastructure projects?

13. What are the main barriers or risks that you think should be addressed in order to encourage investment in sustainable urban infrastructure projects? and why?

14. To your knowledge, who is successfully innovating in the space of finance for sustainable urban infrastructure projects? Any specific achievement? Why do you think it was innovative and is successful? Where and how? Can it be replicated? What kind of innovation, if any, is needed on the financing side? Who are they partners? Was this critical in making it happen?

15. What opportunities and challenges do you foresee for investment in urban infrastructure? What needs to happen by whom?

Cities

1. Could you tell me a little more about your role? How does it relate to urban infrastructure development?

2. Could you clarify the institutional and political structure in your country - what is the room for manoeuvre of a city like yours in terms of financing and decision-making for urban infrastructure projects? Does it depend on state or central government institutions for funding (and/or project approval)?

3. What are your city's priorities in terms of urban development by 2050?

4. Is sustainability taken into account? If so, how? By whom?

5. How do you generally fund urban infrastructure projects?

6. Do you generally seek external assistance/ intermediaries or do you rely on internal capacity to develop sound and bankable project proposals for urban infrastructure projects? (e.g. in terms of sound project plans, identification of potential funding sources etc.)?

7. To what extent do you try to attract alternative finance (e.g. from private sources or development finance or multilateral finance sources) for your infrastructure projects? From which sources? What's your strategy?

8. Could you tell me more about [RELEVANT PROJECT or FINANCING SCHEME]? How does it work? How effective has it been to raise finance for infrastructure projects?

9. Have you or are you trialling any other innovative or recent financing mechanisms for energy efficiency projects? What instrument? For what project? Who's funding or investing? What progress has been made so far?

10. Have you or are you trialling any other innovative or recent financing mechanisms for renewable energy projects? What instrument? For what project in particular? Who's funding? What progress has been made so far?

11. Which financing mechanisms do you think are or could be particularly effective in leveraging private investments for sustainable infrastructure projects?

12. Do you have experience of PPPs? What has been your experience so far?

13. How do you monitor and evaluate the delivery of infrastructure projects?

14. How do you assess financial performance (or value added)?

15. In your experience what are the critical factors affecting the financing (and delivery) of sustainable urban infrastructure projects?

16. What do you think cities like yours can do to provide reassurance and encourage private investments for their future?

17. How does your city envisage the future in terms of financing urban infrastructure projects?

Appendix 3 – Online questionnaire

Section 1 – About you

1. First name
2. Last name
3. Your email
4. What is your job title / main area of responsibility?
5. The name of your organisation
6. Please select the category which best describes your sector of activity
   - Banking
   - Asset management
   - Fund management
   - Institutional investment
   - Professional services
   - Construction
   - ICT and engineering
   - Local authority/ city
   - Provincial or state government
   - National government
   - Regional government or organisation (e.g. E.U, ASEAN)
   - Multilateral and international organisations
   - Civil society
   - Academia
   - Financial services other – please specify (*free text*)
   - Private sector other – please specify (*free text*)
   - Other – please specify (*free text*)

7. Please indicate the city where you are based

8. To your knowledge, does your city have a sustainable infrastructure strategy in place? (*one choice*)
   - Yes
   - No

Section 2 – Investing in urban infrastructure

9. Do you (or does your organisation) invest in urban infrastructure? (*one choice*)
   - Yes
   - No

(*Q10 to 14 only follow if person answers yes to Q9)*

10. How do you primarily invest in urban infrastructure projects? (*one choice*)
    - Direct investments (e.g. project finance)
    - Through funds and other financial products
    - Other – please specify

11. Please state the preferred minimum amount (USD) for your investments in urban infrastructure (*one choice*)
    - <25 million

- 25 to 50 million
- 50 to 100 million
- 100 to 500 million
- > 500 million

12. Where are these investments primarily located? (*one choice*)
    - Africa
    - Asia
    - Australia
    - Europe
    - North America
    - Latin America and the Caribbean

13. At what stage are these investments generally made? (*one choice*)
    - Prior or during construction phase
    - After construction is completed

14. What type of projects do you primarily invest in? (*one choice*)
    - Brownfield projects
    - Greenfield projects
    - Other – please specify

Section 3 – Financing instruments

15. Please rate the following financing instruments (more information) from 1 to 5 according to how well you understand them, 1 being no understanding and 5 being very good understanding *(one choice per line)*

    - Public finance – development funds
    - Public finance – grants or subsidies
    - Public finance – IFI loans or bonds
    - Public finance – government tax incentives
    - Public finance – dedicated infrastructure finance facilities
    - Debt – bonds
    - Debt – loans
    - Debt – forfeiting
    - Debt – securitisation
    - Debt – guarantee programmes and credit enhancement
    - Equity – special purpose vehicles
    - Equity – joint ventures
    - Equity – investment delivery vehicles
    - Equity – listed equity
    - Equity – private equity

16. Please select which of the following financing instruments (more information) are most effective for what type of sustainable urban infrastructure at city level [*Select all that apply*]

Types of sustainable urban infrastructure (columns):

- Energy efficiency
- Renewable energy
- Energy – other
- Water
- Waste
- Transport (incl. roads)
- Buildings
- Climate resilient infrastructure

Financing instruments (lines)

- Public finance – development funds
- Public finance – grants or subsidies
- Public finance – IFI loans or bonds
- Public finance – government tax incentives
- Public finance – dedicated infrastructure finance facilities
- Debt – bonds
- Debt – loans
- Debt – forfeiting
- Debt – guarantee programmes and credit enhancement
- Debt – securitisation
- Equity – special purpose vehicles
- Equity – joint ventures
- Equity – investment delivery vehicles
- Equity – listed equity
- Equity – private equity

17. Are there any other relevant financing instruments that you think should be considered to finance sustainable urban infrastructure projects? (*free text*)

18. Which financing instruments do you think will rise in importance (and use) in the future? (*free text*)

19. Please use this space to share any additional comments on financing instruments. We are particularly interested in understanding what needs to happen, by whom and where in order to encourage more investments in sustainable urban infrastructure. (*free text*)

<u>Section 4 – Financing sources</u>

20. Please state for each of the following stakeholders whether they are likely to invest relatively more or less funds in urban infrastructure projects in the next 5 to 10 years.
    - Banks
    - National or federal governments
    - Local/city governments
    - Provincial or state governments
    - Institutional investors (e.g. pension funds, insurance companies)
    - Infrastructure specialised funds or investment firms
    - Community funding (e.g. peer-to-peer, crowdsourcing)

- Multilateral development banks
- Other international financial institutions
- National or regional development banks

21. In your opinion, financing for urban infrastructure projects should come from (*multiple choice*):
    - Public sources (e.g. government grants, government incentives, multilateral organisations financing)
    - Private sources – structured (e.g. listed equity, listed funds)
    - Private sources – unstructured (e.g. local corporate loans, angel investors, institutional investors, family offices, private funds)
    - Community sources (e.g. local savings or income or crowdsourcing)
    - A combination of sources (e.g. public-private partnerships, public finance initiative etc.)

22. Please use this space to share any additional comments on financing sources. We are particularly interested in forms of public sector support (beside financing) that can encourage other stakeholders to invest in urban infrastructure projects or in what makes a dedicated sustainable infrastructure financing facility effective. *(free text*)

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