



Public Policy &
Economic Research

Investment in
greener cities:
Mind the gap

Allianz 

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greener cities:
Mind the gap

Executive summary

Cities are the heart of the world's climate change dilemma: they account for three quarters of global greenhouse gas emissions – a share that is set to rise further as billions more move from rural to urban areas over coming decades. But cities also produce the bulk of global output and wealth. The world's top 600 cities alone generate half of global GDP.

Unless effective action is taken soon, the world will heat up to a devastating degree over the course of this century. Storms, floods and other extreme weather will hurt us all, and some coastal or otherwise exposed cities in particular.

Many governments use the gridlock in global climate talks as an excuse for inaction. Cities and municipalities will have to drive change instead. In much of Europe, local governments account for the vast majority of public spending on environmental policies. Not only Copenhagen, Chicago and Munich, but also Mexico City, Rio de Janeiro and Shanghai have ambitious programs to become greener.

The task is enormous. Various studies suggest that around USD 2 trillion will have to be invested every year over the next 20 years to upgrade urban infrastructure and make it more sustainable. Public budgets are under strain everywhere; they will not cover a fraction of these investment needs. The private sector will have to step in. However, banks, which have traditionally financed the majority of infrastructure investments, are struggling to repair or shrink their balance sheets. New regulation, such as the Basel III rules on capital, may make it difficult for banks to return to their previously prominent role in infrastructure finance.

Private institutional investors, such as pension funds and insurance companies, are another potential source of funding. They have some USD 70 trillion in assets under management in the OECD countries, and should, in principle, find sustainable urban infrastructure an attractive addition to their portfolios. But although some private entities are starting to invest in municipal projects for renewable energy or public transport, the sums are miniscule compared with need and potential. The area of energy savings, which should be at the heart of the municipal climate change agenda, is particularly undercapitalized. Already, most cities are falling woefully behind on their green targets.

The question of how to attract more private money into the modernization and greening of urban infrastructure is therefore crucial for sustainable growth worldwide.

Local governments need to get smarter in dealing with the private sector. But many of the barriers to private investment can only be overcome at the national or even supranational level, especially in the European Union. National governments need to improve the legal frameworks for private long-term investments and redesign the rules of public-private co-investments.

However, national governments should also look at the structure of the market in which sustainable urban infrastructure investment takes place. Urban investment projects tend to be small and highly diverse. For institutional and other investors, the costs of finding and assessing such projects are too high compared with the return they can expect. National governments should therefore set up centralized one-stop shops – we call them Green Cities Platforms – to package, market and sell urban infrastructure investments to the private sector. Institutional investors can offer their expertise and active participation in making such Green Cities Platforms work.

The world will not tackle climate change unless cities modernize their infrastructure. But cities cannot shoulder this responsibility alone. As one of the world's biggest insurers and institutional investors, Allianz is looking forward to helping foster this much-needed dialogue between the public and the private sector.

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1.

**Cities and
climate change**

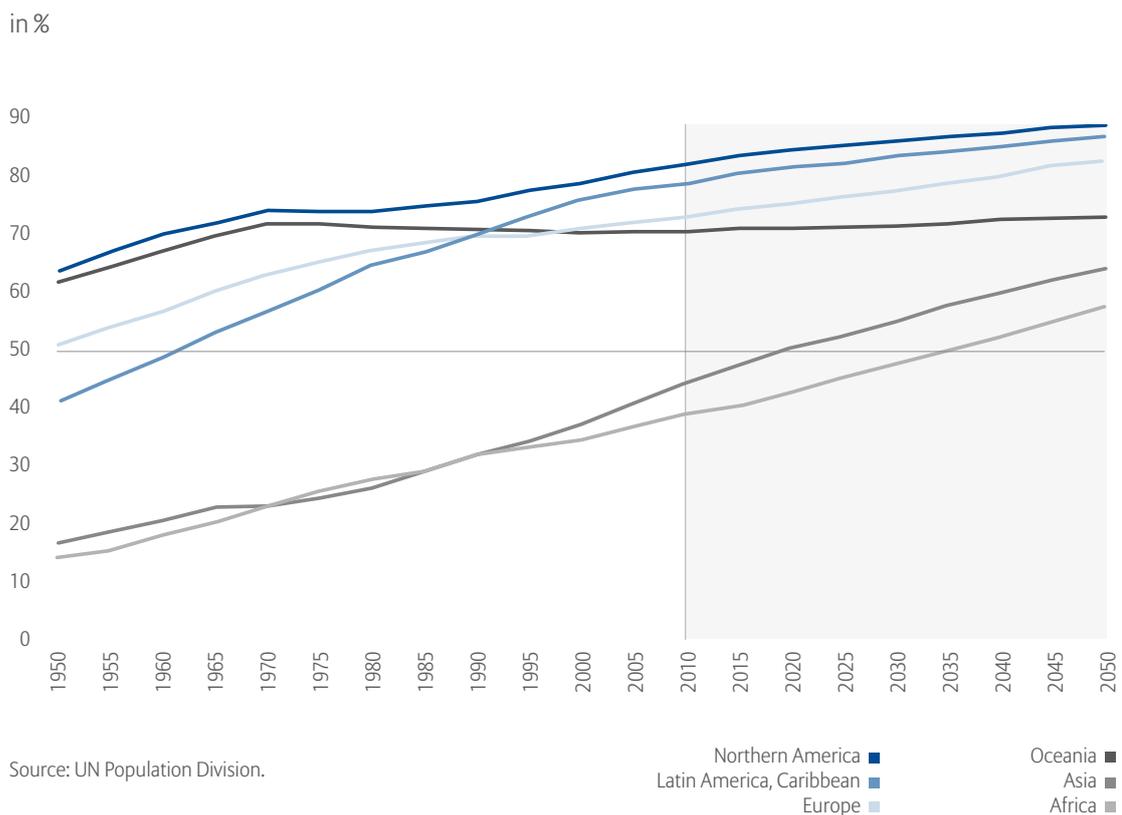
1.1 Why cities matter

Cities matter hugely for climate change. They already consume around 70% of the world's energy and they are responsible for over 70% of global emissions of greenhouse gases.¹ What is more, their contribution to global pollution will keep growing. Today roughly half of the world's 7.2 billion people live in urban areas. By 2050, this share is expected to rise towards three-quarters, with the fastest growth expected in emerging regions (see Chart 1). Since the world's population is projected to grow to 9.6 billion by 2050, there could be almost as many people living in urban areas in 2050 as are alive today.

Cities are also at the heart of global production and growth. Tokyo alone generates 40% of Japan's GDP; Paris makes up 30% of the French economy. The world's 600 major cities together generate over half of global GDP, with less than a quarter of the world's population. Over the next 20 years, almost two-thirds of global GDP growth will be generated by these cities.² This tremendous urban growth will lead to a further rise in the carbon emissions produced by cities – unless current trends change dramatically.

Although the dynamics and causal relationships of climate change are not yet fully understood, climate researchers broadly agree that increased atmospheric concentrations of greenhouse gases are the main reason. Most climate projection models show that unless effective measures are taken, the global mean temperature will increase by between 2.6°C and 4.8°C by the year 2100, while the global mean sea level

Chart 1: Increasing urbanization, share of total population living in urban areas



could rise by as much as 80 centimeters.³ The trend towards more extreme weather events, such as storms, floods, droughts, forest fires and extreme cold, is likely to accelerate.⁴ Climate change also has various indirect consequences. For example, weather-related disruptions at major supply hubs cause problems for businesses around the globe.

While effective action on climate change is becoming more urgent, the chances of a global accord on cutting greenhouse gas emissions remain uncertain. Successive UN climate change conferences have passed without an effective agreement. Some national governments are taking this lack of a global framework as an excuse for their own inaction. The world can no longer afford to wait for these intergovernmental negotiations to yield results. New actors below the national level must be found – actors who can take effective measures without further delay.

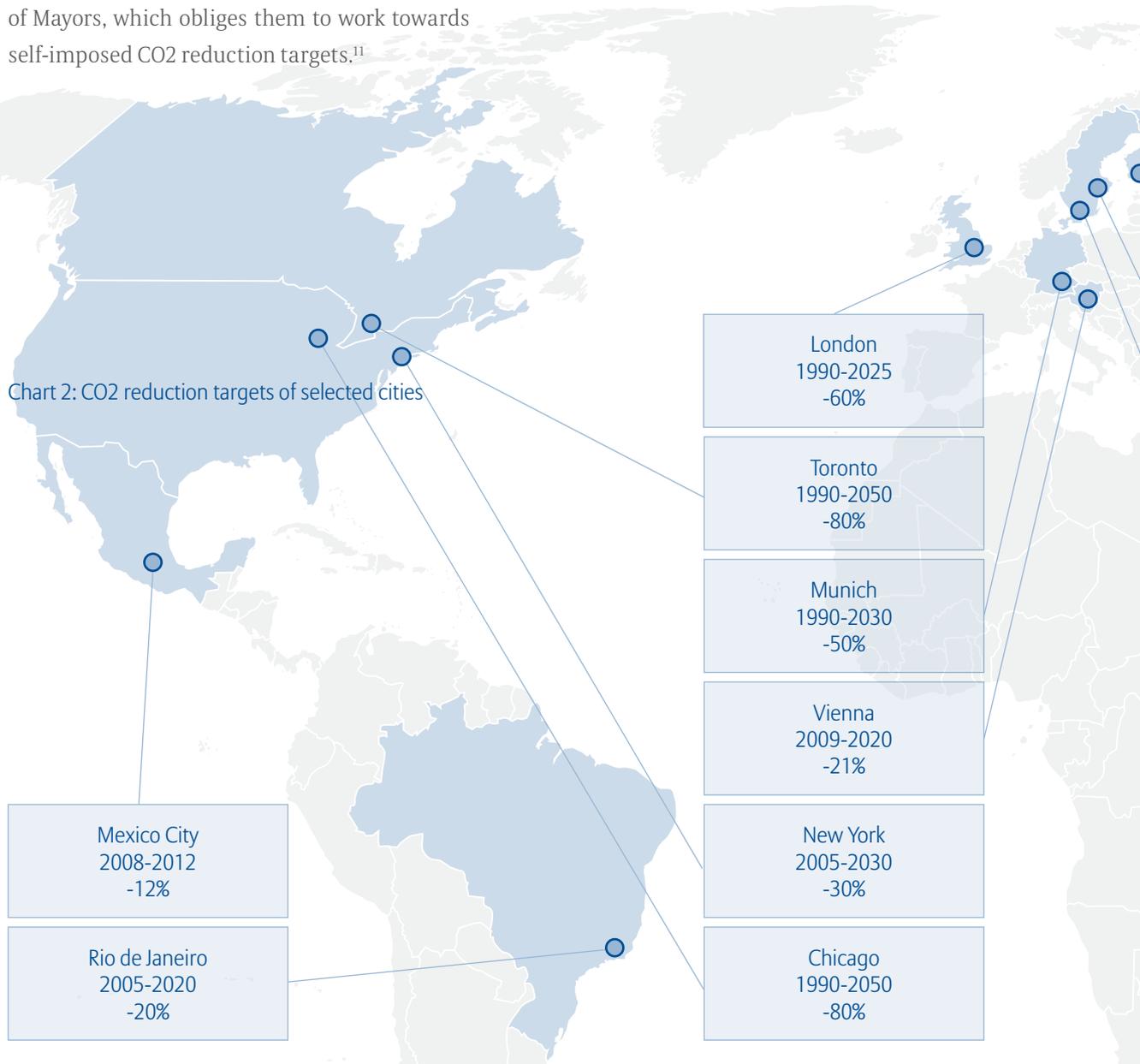
1.2 Cities to the rescue

In recent years, the focus has increasingly shifted towards cities as leading actors in the fight against climate change. Cities usually have a degree of autonomy in policy making, and they are often good at devising and implementing comprehensive strategies across various sectors. Also, urban areas tend to have a higher density of innovative businesses and experts than rural areas, and these are a vital ingredient to any green transformation. Many cities also have control over funds: The OECD estimates that in Europe local governments are responsible for 75% of governmental expenditures on environmental protection.⁵

Many of the world's cities are proactively adopting and implementing programs to become greener and adapt to climate change.⁶ Of the 90 cities around the world that responded to a survey by LSE Cities in 2012, a full 94% had adopted some sort of green strategy – although these strategies differed widely, from legally binding and monitored targets to vague sustainability commitments.⁷ All but two of the 27 cities included in the Siemens North American Green City Index have developed their own green energy projects, such as wind farms or thermal heating.⁸ Since 2007, 19 out of 22 cities in the Asian Green City Index have conducted an environmental review.⁹ If cities followed through on these climate change initiatives, they would have a significant effect on CO₂ reduction efforts worldwide. Chart 2 shows a selection of cities worldwide and their CO₂ reduction targets. Annex 1 has more examples of what cities, from Copenhagen to Shanghai, are doing to become greener.

Cities around the world are not only developing their own climate mitigation strategies, they are increasingly working together to exchange best practice and encourage each other. The largest climate-focused network of megacities worldwide is the “C40 Cities” (which has grown to over 50 cities). The C40 members, ranging from Addis Ababa to Yokohama, account for 18% of global GDP and pride themselves in having adopted over 4,700 measures to combat climate change.¹⁰ Within the EU, over 5,000 mayors of cities, towns and villages have signed a Covenant of Mayors, which obliges them to work towards self-imposed CO₂ reduction targets.¹¹

Many of these initiatives combine incentives for urban inhabitants and businesses to change their behavior with investment in new, or upgrading of old, infrastructure. For the purpose of this report, we summarize initiatives to make urban bus networks, apartment buildings, power supplies or care homes greener under the heading investment in “sustainable urban infrastructure”. In this, we also include infrastructure that is built to help cities cope with the consequences of climate change, for example flood defenses and more resilient roads and bridges.



Source: Green City Index Siemens, ERCD research

Without such “climate adaptation” infrastructure, many cities will be ever more vulnerable to the extreme weather events associated with climate change. The devastating impact that Hurricane Sandy had on New York and other East Coast cities was exacerbated by a lack of storm infrastructure in key areas.¹² Many of the one billion people who live in urban and suburban areas in developing countries are vulnerable to landslides and flooding – unless large-scale investment in environmental infrastructure takes place.¹³

Sustainable infrastructure must be at the heart of cities’ efforts to cut CO₂ emissions because three quarters of all emissions in rich countries come from just four types of infrastructure, namely power generation, buildings (or more specifically, the energy that is used in them), transport and waste management.¹⁴ Although urban sustainability programs encompass a vast array of measures (see Table 1 for examples), most cities have focused on three areas. They aim to:

- switch their energy supplies to renewable sources;
- make buildings, both residential and commercial, more energy efficient; and
- encourage the use of public transport or emissions-free private transport.

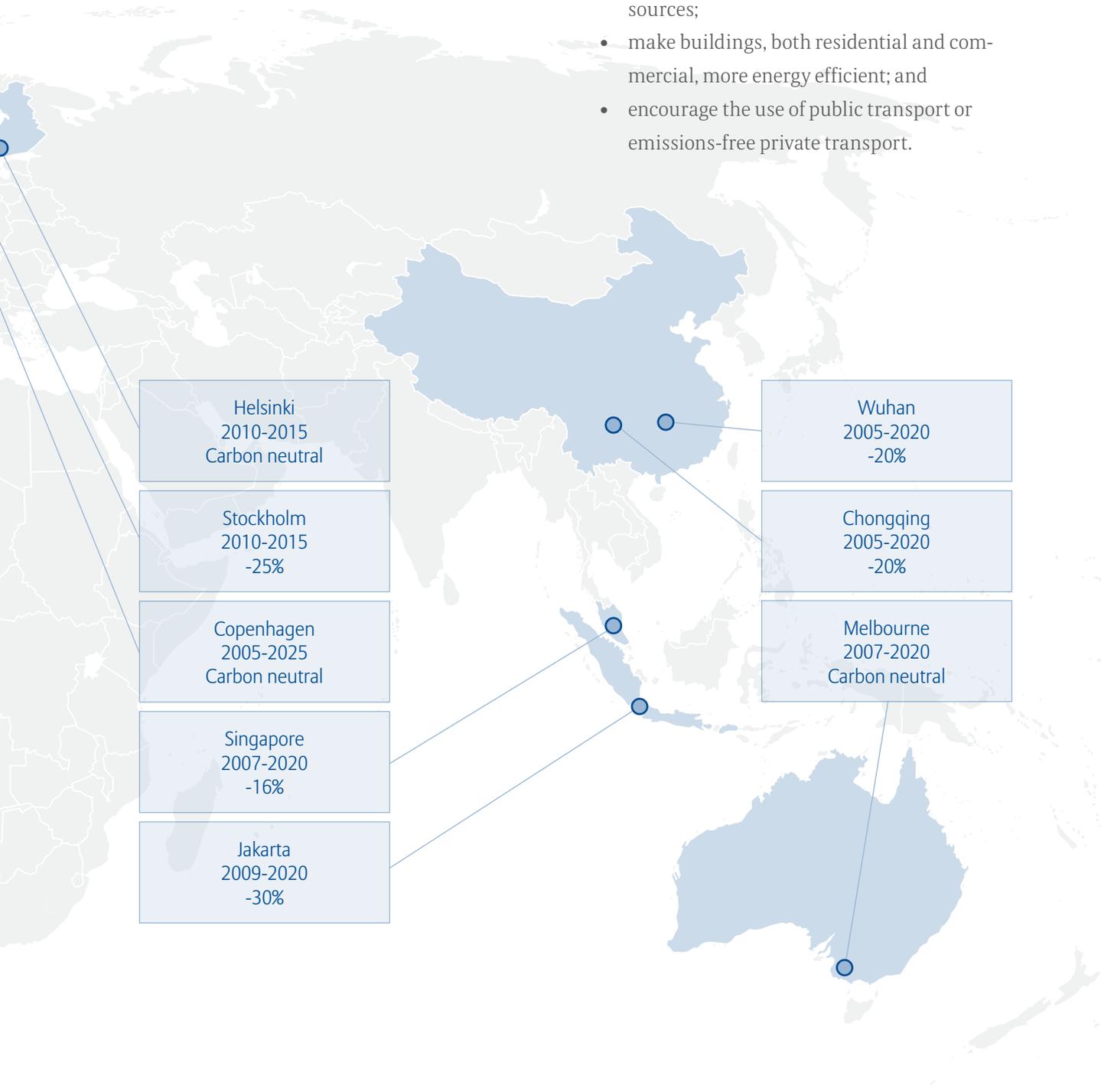


Table 1: Measures for making cities greener

Renewable energy

- Reducing reliance on energy coming from coal and oil while increasing the share of renewable sources, most notably wind, solar, biomass, hydro and geothermal. Natural gas, which produces less CO₂ than coal, can act as a bridge fuel where needed.
- Expanding district heating networks and making them more efficient
- Installing local, highly flexible energy storage capacities and small, natural gas-based local combined heat and power stations
- Converting landfill gas into electricity for local consumers
- Designating sites for local renewable energy production in urban planning

Energy efficiency

- Creating tax incentives and subsidies for investments in the energy efficiency of buildings
- Setting binding efficiency standards for existing and new buildings
- Using smart technology for lighting, ventilation and other installations in private and public buildings
- Designating pilot municipalities with exemplary environmental policies
- Saving electricity in the private and public sector, for example through LED street and underground lighting
- Employing new models of energy contracts for public, private, commercial and industrial buildings
- Using competitions and awards to encourage business and industry to become climate neutral
- Increasing housing density
- Demolishing buildings if climate-friendly upgrading does not make sense
- Constructing climate-neutral building in greenfield urban districts
- Mapping energy efficiency city-wide and monitoring all built infrastructure
- Offering maps of buildings' thermal losses on the municipal website
- Conducting an on-going dialogue with building occupants about energy upgrading and savings

Transport

- Reducing the use of private, conventionally fuelled cars through access restrictions, congestion charges and road capacity reduction
- Upgrading conventional busses for example through bio-diesel and filters
- Adding separate lanes for public transport and generally making public transport more attractive
- Establishing incentives for electric vehicles, for example through lower taxes, free parking and free recharging
- Encouraging climate friendly mobility technologies, such as LNG, hydrogen and fuel cells
- Extending public spaces for cycling and walking, designating car-free days

Cities do not operate in a vacuum. Sustainable urban infrastructure planning needs strong partnerships with regional and national governments and a solid national and international legal framework. Cities in countries or regions with ambitious climate targets tend to find it easier to implement their own climate initiatives. For example, cities in the European Union can count on the commitment of their national governments to meet EU climate targets, most notably to reduce CO2 emissions by 20% by 2020. In Germany, a national “Energy Performance Certificate” sets enforceable standards for all residential and commercial buildings nationwide and thus provides a clear framework for municipal policy.

2.

**Investment in
sustainable urban
infrastructure**

2.1 The investment gap

Estimates of global infrastructure investments needs are daunting. Climate change aside, most infrastructure in developed countries was built 30 to 50 years ago and must now be renovated or replaced. Developing countries have their own huge infrastructure requirements, to allow them to catch up economically and accommodate their growing populations. Both developed and developing countries face the challenge of reducing the greenhouse gas emissions of existing and new power stations, buildings and means of transport. As explained above, a lot of this will need to happen at the local level. Moreover, both continued urbanization and climate change will mean additional strains for urban

infrastructure. For example, water and sewage systems may not cope with additional precipitation, while dikes and flood defenses will be overwhelmed by more frequent and more violent storms.¹⁵

Estimates of infrastructure requirements differ widely, not least since economists use different methodologies and timeframes and refer to different scenarios, for example the costs of keeping current infrastructure intact or the costs of making infrastructure carbon neutral. Estimates are therefore not usually comparable and many of them overlap with cost estimates of fighting climate change. But, as Table 2 shows, economists agree that the world will have to invest tens of trillions over coming decades to upgrade infrastructure, make energy systems greener and keep cities livable. Available studies imply that for urban infrastructure alone, the global investment requirement could be USD 40 trillion over the next 20 years, that is USD 2 trillion per year.

Table 2: Infrastructure investment needs

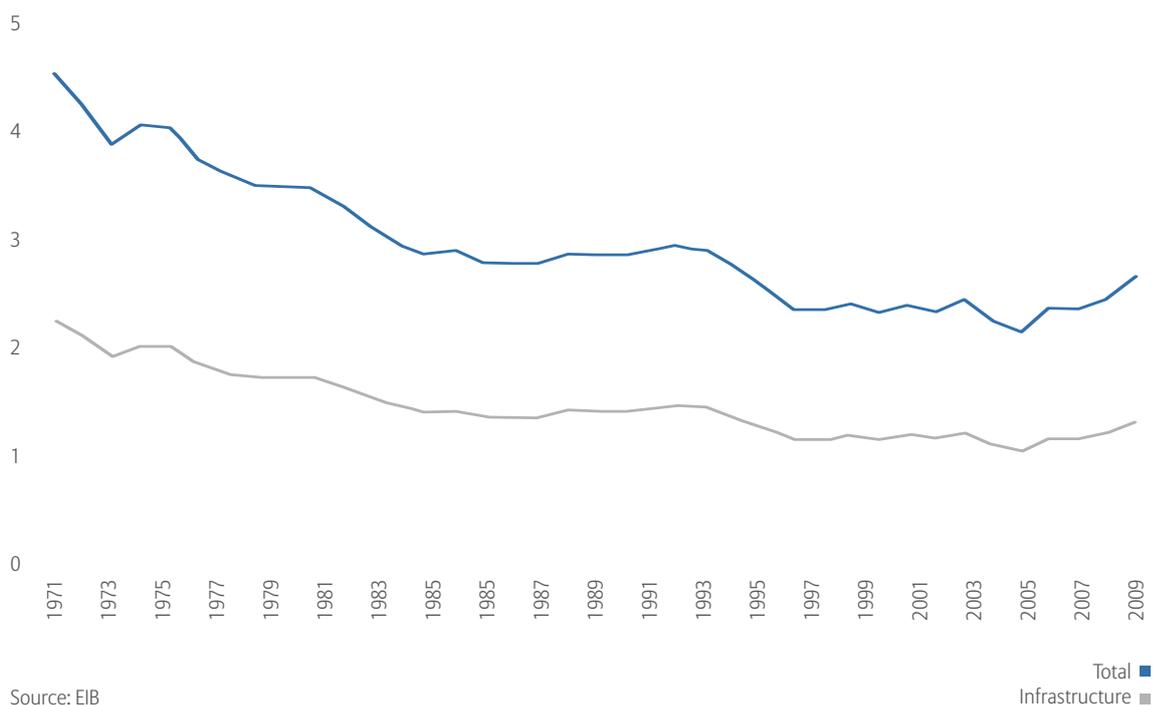
How much?	For what?	When?	Source
Over USD 40 trillion	Global infrastructure investment most of which will be spent on urban infrastructure development and maintenance	2012 - 2037	KPMG (2012)
Around USD 41 trillion	Amount that cities worldwide will need to invest in expanding their water, power and transportation systems	2005 - 2030	Booz&Company (2007), quoted in Siemens (2010a)
Around USD 50 trillion	Global infrastructure requirements	2007 - 2030	OECD 2006/07 estimates, quoted in OECD (2013c)
USD 57 trillion	Global infrastructure investment needed (even without green targets and development goals)	2013 - 2030	McKinsey (2013)

Public infrastructure investment has actually been falling in many countries, both as a portion of overall public spending and as a share of GDP. In the US, for example, public investment in infrastructure fell to a 20-year low of 1.7% of GDP in 2013, compared with rates of around 5% in the 1960s.¹⁶ In the EU-15 countries, public infrastructure spending fell by more than 1 percentage point of GDP between 1970 and the onset of the financial crisis, when public stimulus programs drove the numbers up a bit (see Chart 3).

In most developed countries (and some emerging markets, too), the need to consolidate public finances and to accommodate the requirements of ageing populations suggests that government investment is more likely to fall than rise in the future. Budgetary pressures also exist at the local level. Some countries, like the US, have long-standing debt limits for local governments, while others have adopted them in the wake of the financial crisis. Germany's constitutional debt brake (which will come into force in 2016 for the federal government and in 2020 for the Länder) will not apply directly to cities and municipalities. But it will affect them indirectly because Länder governments are likely to transfer some of the burden of balancing their budgets down to the local level.¹⁷

Chart 3: Public investment in infrastructure in Europe

Ratio of government investment to GDP EU-15



As a consequence, even less public money might be available for municipal infrastructure in the future. In a 2009 worldwide survey of public officials involved in infrastructure, more than half of the respondents said that a “lack of funding” was the biggest infrastructure issue.¹⁸ Standard & Poor’s estimates that the gap between infrastructure financing needs and what the public sector can pay for could be USD 500 billion a year globally – provided public infrastructure spending does not decrease further in the future.¹⁹ Boston Consulting Group puts the gap between demand and investment in infrastructure even higher, at over USD 1 trillion a year worldwide between 2013 and 2030.²⁰

Given this dearth of funding, it is perhaps not surprising that most cities are falling far short of their sustainability goals. For example, British cities had met only 5% of their carbon emission reduction targets by 2008, leaving 95% to be achieved in the years to 2020.²¹ In Germany, only one quarter of the cities that have adopted emission reduction targets were on course to meet them in 2010. Most of the successful cities were in the eastern part of Germany, which implies that their emission reductions were mainly due to the industrial decline that set in after 1990.²²

2.2 The investment case

With public sources severely constrained, private investors are expected to finance a rising share of the world’s infrastructure, including what is needed to make cities low-carbon. Already in the past, the private sector accounted for around two-thirds of infrastructure spending in Europe²³, and this share is more likely to rise than fall in the future. The World Bank reckons that the private sector will have to finance 85% of the investment gap in sustainable infrastructure.²⁴

Today, the vast majority of private investment in infrastructure comes from the companies that own and operate power stations, toll roads or hospitals (often referred to as owner-operated assets). Outside investors help to finance infrastructure mainly through investing in such companies. However, utilities, construction groups and health care providers usually do a myriad of other things apart from operating infrastructure. Therefore, investors’ exposure to infrastructure – and the specific benefits they hope to gain from this asset class – can become diluted.

Many investors are therefore looking for more targeted and tailored ways of investing in infrastructure. There are a variety of ways in which investors can put money into infrastructure projects (see Table 3 for examples) but broadly speaking, infrastructure investments come in two forms, namely debt and equity.

- Debt

Lending to infrastructure ventures often takes the form of project finance. Project finance is a type of financial contract in which the investors gets repaid through the cash flow that is generated by a particular infrastructure asset, such as the toll collected from a new road or the electricity sold by a power station. Project finance was traditionally the domain of banks and it can also take place alongside governments in a PPP framework (see below). A smaller share of infrastructure lending comes in the form of concessionary loans from governments or their public lenders.

Beyond project finance, investors can acquire the debt issued by infrastructure ventures outright, for example through buying infrastructure bonds, or they can invest in infrastructure debt funds. These markets are still developing.

- Equity

Investors can buy infrastructure ventures such as solar power stations or water works outright. They then keep these assets on their balance sheet, although they usually do not operate them themselves. However, only a very limited number of investors has the financial muscle and the in-house expertise to invest in infrastructure ventures directly.

Some infrastructure projects are big enough to get financing through initial public offerings on stockmarkets. Investors can then buy their equity outright. Equity investment can also take place through specialized infrastructure equity funds. For investors, such funds have the advantage that the projects are chosen by experienced professionals and that they can buy into a portfolio of infrastructure assets, which can help them to manage risk.

If the infrastructure fund is listed on an exchange, the shares are also tradable. However, the value of listed infrastructure funds often depends on broader stockmarket movements, which makes them less suitable for investors who want to diversify their portfolio with the aim of smoothing the impact of market movements. Unlisted infrastructure funds are not subject to market movements but they tend to be illiquid and often incur high fees.

Table 3: Risk-return profiles of infrastructure investments

		Equity				Debt			
		Direct investment		Funds		Direct investment		Investment funds (infrastructure bond or loan funds)	
		Shares	Project investment	Infrastructure equity funds	Unlisted infrastructure funds	Infrastructure bonds	Infrastructure loans		
Type of assets	Shares in a company	Physical object	Shares in a company	Shares in an existing company	Security	Loan	Security		
Investment volume	Minimum 1 share	Typically over EUR 100 million	Minimum 1 share	Typically more than EUR 5-10 million	Minimum 1 security	n/a	Minimum 1 share		
Market depth	Broad availability	Limited availability (since 2001 in Europe incl. UK only about 1,000 PPP-projects)	Broad availability	Limited availability (globally 350 funds, excl. closed German funds, plus 10 FOF)	Limited availability	Broad availability	Limited availability		
Leverage	No leverage	Typically 60-70% leverage for project financing, up to 90% for PPPs	No leverage	Typically 70-80% for the fund	Typically no leverage for funds	No leverage	Typically no leverage		
Time horizon	Short- to long-term	Long-term	Short- to long-term	Medium- to long-term	Short- to long-term	Medium- to long-term	Short- to long-term		
Yield expectation (p.a.)	5-9%, depending on region/ project	Early stage 10-15%, later 7-9%	5-9%, depending on region/ project	8-14% for a diversified portfolio	Gov.: 3-7% Corp.: 4-10%	2-5% depending on the rating	6-10%, depending on region		
Know-how requirements	Stock investment and sector-specific know-how	Very high	Stock investment and sector-specific know-how	Very high	Bond investment and sector-specific know-how	Expertise in credit markets	Bond investment and sector-specific know-how		

Source: Steinbeis Research Center for Financial Services (2012)

Note: The table is for illustration purposes only and not exhaustive. Numbers with regard to investment volumes, leverage, projects and yield expectations vary in practice.

Increasingly, infrastructure projects combine public and private capital. The most widely used frameworks are public-private partnerships, or PPPs. A PPP is a medium to long-term collaboration between a government body and private companies to finance, build, and in some cases operate an infrastructure project such as a road, school or hospital. PPPs can take a variety of forms and involve both equity and debt investment. Usually, the private investor provides the capital and takes over some of the risks of the project, for example the construction and performance risk. In return, the investor receives a share of the operating profit. After a fixed period of, say, 20 to 30 years, ownership of the asset might revert to the public sector.

PPPs were pioneered by the UK in the 1990s and are now used in about half of the world's countries. Nevertheless, many private investors shy away from them because they find them slow, complicated and bureaucratic. Some governments have had mixed experience with PPPs that had large cost-overruns or performed poorly. On the other hand, investors have become cautious after some governments renegotiated PPP contracts half-way through the projects lifespan. In many places, there are now efforts to redesign PPPs to make them more attractive to both governments and investors.

Although there is some disagreement whether infrastructure can be treated as a distinct asset class, infrastructure projects tend to have certain features in common that can make them attractive to private investors:

- **Potential to increase risk-adjusted returns**

Infrastructure investments can in principle offer good returns with comparatively low variability (Sharpe ratios²⁵) and low default risk.²⁶ Infrastructure assets often benefit from a so-called illiquidity premium, which arises from the fact that for most infrastructure assets there is no liquid secondary market. Investors are required to commit large sums for a long time, without being able to exit the project prematurely at acceptable costs. This means that infrastructure investments are less vulnerable to hard-to-predict market risks than other assets; instead, operational and general macro-economic and political risks dominate, which are, under certain circumstances, better manageable.

Many traditional infrastructure assets, such as power stations or motorways, have a quasi-monopoly over the service they supply. The profits that private investors make from building or operating them is then usually regulated and should therefore be predictable. Other infrastructure projects, such as renewable energy projects, receive public support in the form of tax incentives or subsidies, which can further increase post-tax returns for private investors.

Given the diversity of infrastructure investments, it is not possible to make generalizations about their historical performance. But infrastructure equities have performed well relative to other equities on a risk-adjusted total return basis, as shown in Chart 4. And some unlisted infrastructure funds have significantly outperformed bonds and slightly outperformed equities.²⁷

- Longevity

In theory, and depending on how the investment is structured, infrastructure assets can offer steady, predictable returns over a period of at least ten years and sometimes up to 30 years.

- Portfolio diversification

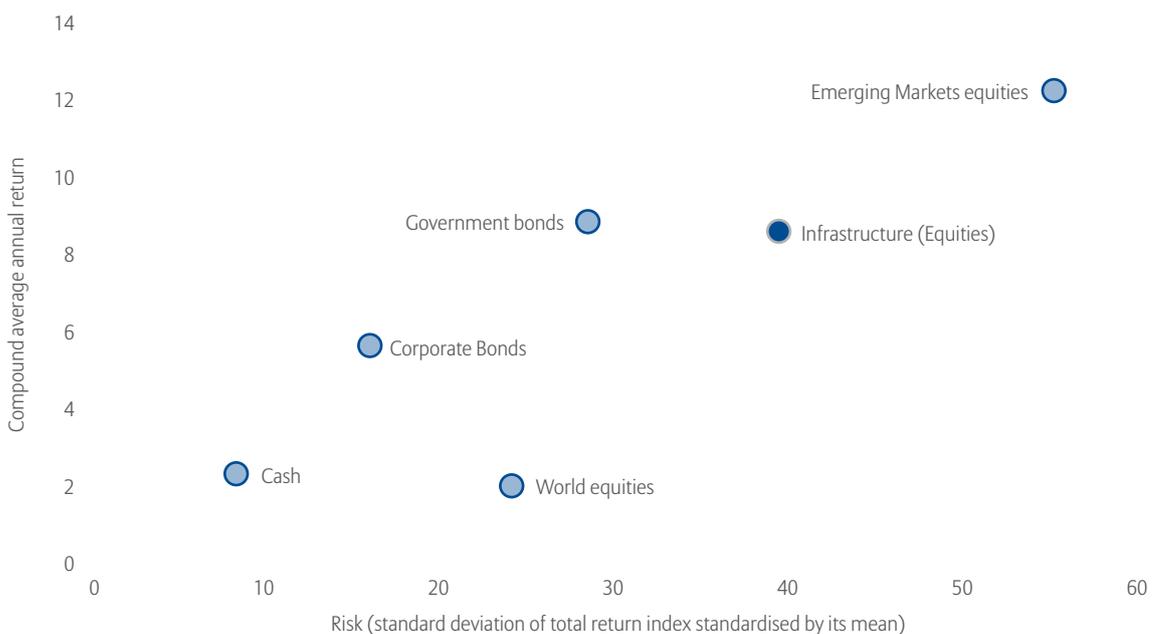
Depending on the investment vehicle chosen, the returns on infrastructure investments can have a low correlation with other asset classes such as corporate equity or government bonds. Infrastructure investments also tend to be countercyclical, which means they are expected to lose less value in economic downturns than other assets. During the recent financial and economic crisis, infrastructure earnings continued to grow.

- Inflation hedge

Infrastructure asset contracts often have inflation-adjustable tariffs. For example, a regulated utility may pass on higher input costs and / or rising prices through its fees. Such mechanisms not only secure stable nominal returns, but can also guarantee stable real returns over the entire lifespan of the investment.

Investment options differ depending on the stage of infrastructure development. For the construction (or greenfield) phase, large capital outlays are needed. These typically come from governments or project finance, or a combination of the two in a PPP. The greenfield phase can yield capital gains but is also considered riskier than the operational (or brownfield) phase. During the brownfield phase, which can last decades, infrastructure tends to provide a steady stream of long-term income while capital gains are less likely.

Chart 4: Actual infrastructure risk-return profile 2000-11 (Euro terms)



Source: Thomson Reuters Datastream, Allianz SE

Investment options also differ depending on the sector. The markets for private investments in mobility and transport, both key to urban environmental sustainability, have been functioning for a while, both for greenfield and brownfield investments. Private investors have owned and operated airports, toll roads, ports and railways for decades. Going forward, participation of private operators in public transport will increase further, as will competition from new, private entrants.

The same can be said of energy-related investments. Corporate investments by private, semi-private or public utilities have provided the bulk of today's energy infrastructure. In more recent years, energy finance has changed, as many governments have provided incentives, such as feed-in tariffs²⁸, to get private investors engaged in renewable energy projects. Such subsidies are not the only reason why renewable energy can offer good investment opportunities with relatively high long-term certainty – provided the policy and regulatory environment is supportive and predictable.²⁹ Investment in clean energy rose from USD 40 billion in 2004 to a peak of USD 279 billion in 2011 (although it then fell slightly in 2012).³⁰

While transport and energy will continue to attract private investment, other areas of sustainable infrastructure, for example energy efficient buildings, are lagging behind (of which more below).

2.3 What private investors are doing

The financial crisis has not only constrained public investment, it has also hit private sector infrastructure financing. Banks, which have historically provided most project finance, have cut back their lending as they have sought to repair balance sheets, cope with new regulation and adjust to a more uncertain economic environment. Loans for project finance fell in most parts of the world during the financial crisis, but most precipitously in Europe, where they dropped by 38% in 2012 alone.³¹ Some of Europe's most active project finance banks have either gone bankrupt or they have largely withdrawn from that market, taking with them their experience and inhouse expertise in this area. Looking ahead, Basel III requirements for banks to have sufficient liquidity levels and to hold more capital against long-term debt (such as project finance) make it unlikely that they will return to predominance in infrastructure finance.³²

Therefore, many people are now looking to institutional investors, notably pension funds and insurance companies but also mutual funds and sovereign wealth funds, to help bridge the infrastructure investment gap. Of course, institutional investors cannot cover the world's infrastructure finance needs. But, in theory at least, they should be in a good position to make a valuable contribution:

- Institutional investors in the OECD countries alone have over USD 70 trillion in assets under management.³³ This sum is likely to grow as populations age and countries supplement pay-as-you-go pension systems with fully funded pension solutions. Since institutional investors need to diversify their investment portfolios, only a fraction of their assets under management would, in principle, be available for infrastructure. Nevertheless, they could cover a substantial part of sustainable infrastructure investment needs.³⁴
- Both pension funds and life insurers need long-term stable investments to match the long-term liabilities they have vis-à-vis their clients (this is called asset/liability matching). The stable long-term cash flows offered by infrastructure could be a good match for the financial promises (in terms of fixed returns or annuities) that insurers and pension funds give to their clients.
- Insurers in particular often have good knowledge of the risks associated with infrastructure projects because they also insure these projects and know their lifecycles.
- At present, low interest rates and volatile equity markets are encouraging institutional investors to diversify their portfolios away from their traditional investments in bonds and shares.

Although there are no consistent and comparable data for institutional investment in infrastructure, it is clear that investors' interest in this asset class has been growing in recent years.

In a 2013 survey of European financial institutions involved in infrastructure finance, 84% of the respondents confirmed that insurers and pension funds are currently "extremely interested" in infrastructure investments.³⁵

Anecdotal evidence seems to corroborate such surveys. Among the insurers, for example, Swiss Re in 2012 earmarked USD 500 million for Northern European infrastructure opportunities identified by the Macquarie Infrastructure Debt Investment Solutions platform.³⁶ Aviva has committed 1.5% of its assets to infrastructure investments.³⁷ Allianz has to date invested more than EUR 1.7 billion in renewable energy projects; and in January 2013, Allianz launched an infrastructure debt fund in the UK with initial planned assets of GBP 1 billion. In France, AXA in June 2013 announced that it would invest EUR 10 billion in infrastructure over the next five years.³⁸

Among pension funds, the Australian superannuation funds and Canadian pension funds were the first to raise significantly their infrastructure exposure. For example, the Ontario Municipal Employees Retirement Scheme (OMERS) had almost 15% of its assets in infrastructure in 2012 and was planning to increase that share to 20%.³⁹ AustralianSuper aimed for 14% of its assets in infrastructure in 2013.⁴⁰ Funds in other countries have been following, albeit often from a low base. CalPERS, one of the largest pension funds in the US, increased its target allocation to infrastructure from 2% to 3% of total plan assets in 2012.⁴¹ In the UK, the Universities Superannuation Scheme (USS, Britain's second largest) increased its target allocation to 7%, earmarking GBP 2 billion for infrastructure in the three years following 2013.⁴²

On the whole, however, institutional investors' engagement in infrastructure has so far remained limited – although tracking down the exact numbers is difficult. In the European Union, dedicated infrastructure funds had attracted 1-3% of pension investment funds' asset allocation in 2011, according to one study.⁴³ The numbers are even smaller when it comes to sustainable infrastructure. Generally, institutional investors have so far made only a very small contribution to climate finance.⁴⁴

2.4 Why is investment falling short of potential?

Why is there such a mismatch between demand for new infrastructure and actual private investment? The financial crisis is one major reason, as explained above. But there are also structural challenges that are holding back potential investors. Many investors appear unconvinced that the risks and costs involved in infrastructure investments are sufficiently compensated through the returns available.

2.4.1 Policies and politics

One set of obstacles that is facing institutional investors is related to the fact that the profitability of infrastructure investments – more than that of other assets – is determined by their political and economic environment.

- **Political risk**

The profitability of many infrastructure projects depends on governments honoring previously made commitments – often over very long periods of time. Such commitments could be to allow the investor to collect a certain amount of tolls or tariffs, or to keep the regulatory framework or market structure unchanged. Circumstances, however, might change: new technology becomes available; public opposition to an infrastructure project rises; or new international commitments require the liberalization of previously protected markets. Governments then often react with policy changes that affect investor interests.

What is more, government incentives often depend on the electoral cycle and other political considerations.⁴⁵ For example, a government might be tempted to lower usage fees as part of its social policy program; it might decide that a previously negotiated concession was overly generous to the investor; or a new government might simply not feel obliged to honor commitments made by its predecessor. Politics can thus undermine an investor's ability to recoup the capital he has invested in water supplies, energy provision or roads.

For example, in December 2012, the UK government re-evaluated the previous administration's use of "private finance initiatives" (PFI, a type of PPP) and renegotiated the terms of previous deals in order to save some GBP 2.5 billion for taxpayers. Portugal in 2011 started renegotiating dozens of PPP contracts, especially in the transport sector, triggering a wave of compensation claims.

The temptation of governments to re-define the terms of a project, and to cap private profits earned through the provision of "public" services, means that infrastructure investments have potentially many downside risks but very little upside risk for private investors.

- **Externalities**

Sustainable infrastructure tends to depend even more on government action than conventional infrastructure. The reason is that so-called externalities (for example the pollution caused by a coal-fired power plant) are not usually priced into conventional infrastructure, which then looks relatively more profitable than sustainable infrastructure. Government action is often needed to level the playing field between sustainable and conventional infrastructure. This can be done through laws, taxes, subsidies or market mechanisms, such as emissions trading

schemes. However, governments might later decide to alter rules and subsidy regimes because of fiscal considerations or technological change, rendering the initial private investment unprofitable. For example, the Spanish government in 2011 retroactively reduced subsidies for solar power installations, as did Bulgaria in 2012.

- **Legal framework**

Laws and regulations – local, national or supra-national – can impede or even prevent private finance flowing into infrastructure. In the US, for example, tax regulation makes public financing of infrastructure more competitive than private funding. Furthermore, US federal law prohibits toll collection on interstate highways, which complicates the establishment of public-private partnerships that could be attractive for private investors.⁴⁶

Another example is EU financial regulation that discourages long-term investment. Solvency II (the EU's directive that sets the amount of capital that insurers must hold to mitigate risk, due to come into force in 2016) and Basel III (stricter rules on bank capital and liquidity) impose onerous capital requirements for investments in infrastructure and renewable energy. Some regulations have unintended consequences for investors. For instance, the EU's rules on "unbundling" of energy generation, transport and distribution are designed to foster competition in previously monopolistic markets for power and gas. But they can also make it harder for institutional investors to invest in different segments of infrastructure at the same time.

- **Bureaucracy**

Even when the policy framework is stable and favorable, the sheer complexity of regulation and slow-moving bureaucratic procedures can be a drawback for investors. In the UK, for instance, it takes almost three years on average to conclude a PFI tender.⁴⁷ In Brazil, it can take five years to secure the environmental licenses required for large infrastructure projects.⁴⁸ In India “regulatory hassles” associated with large infrastructure projects can be so burdensome that one fund manager asks poignantly why private investors would bother with them at all.⁴⁹

Investors also often struggle with public administrations that lack the capabilities needed for attracting private money for public projects. In one survey, executives working for infrastructure companies said that an ineffective public sector was the main obstacle for private sector involvement in infrastructure.⁵⁰ Some governments have established national bodies to facilitate such public-private partnerships, like *Partnerschaften Deutschland* or *Infrastructure UK*. But at the local level, only very few city officials have experience in working with private institutional investors; in some cities civil servants may even harbor suspicions of doing so.

2.4.2 Matching funds and projects

Another set of hurdles exists on the side of the institutional investors themselves. Infrastructure projects are often very complex undertakings. They are also illiquid and tend to require large upfront payments, which means that investment mistakes can be expensive and hard to undo. Many projects, in particular in the sustainable infrastructure sector, depend on new and untested technologies, which can increase the “hurdle rate” that investors consider before they commit funds. Many infrastructure projects depend on networks (such as power grids or road networks) for their functioning and profitability, so they cannot be evaluated on a stand-alone basis.

In short, investing successfully in infrastructure requires the kind of expertise and experience that can only be provided by a team of dedicated professionals. Project finance banks and some specialized funds have that expertise, as do some very large institutional investors. But most smaller financial institutions do not.

In a 2013 survey of German-based institutional investors, just 4% said that they had “good knowledge” of the infrastructure sector.⁵¹ Another study reckons that only 150 institutional investors worldwide are large enough to warrant setting up teams for direct investment in renewable energy.⁵² Some institutional investors are trying to overcome the lack of in-house expertise by teaming up with others, or by “tagging along” with a bigger investor that has more experience and proficiency. For example, in 2013 ten UK pension funds came together to launch the *Pension Infrastructure Platform*, which is supposed to help them invest their money in this new asset class more effectively.⁵³

Even those institutions that have dedicated teams for infrastructure or green investing can find it hard to find suitable projects. A few very large projects have usually been oversubscribed. Most smaller ones have struggled to get funding. One reason is that the plethora of projects that fall under the heading “infrastructure” or “sustainable infrastructure” are very diverse. They do not (yet) constitute a fully distinct asset class for which regulators could set standardized rules (for example for capital) and to which investors could apply standardized practices regarding asset allocation and risk management. Often there are not sufficient data on the performance of (unlisted) infrastructure assets to allow investors to plan their asset allocation with confidence.⁵⁴

Another reason is that, in the eyes of the institutional investors, smaller projects do not warrant the effort that would be required for finding, evaluating and monitoring them. Most sustainable urban infrastructure projects are small from an institutional investor point of view.

Infrastructure or green investment funds can bundle smaller investment projects and thus make them more easily accessible for institutional investors. However, such investment funds tend to seek high short-term returns and therefore engage in practices, such as leveraging and churning their portfolio or reinvesting cash flows instead of paying out dividends, that undo some of the potential benefits that institutional investors hope to gain from (sustainable) infrastructure, including low risk, longevity and predictable returns.⁵⁵ Moreover, in one 2013 survey, over 70% of the institutional investors polled took issue with the high management and performance fees typically charged by infrastructure funds.⁵⁶ While pooling of both projects and investment funds will be necessary to attract more institutional money into sustainable urban infrastructure, the conditions will have to be tailored more specifically to the needs of long-term investors.

2.4.3 The special case of energy efficiency

In this report on sustainable urban infrastructure, the issue of energy efficiency warrants specific treatment. Residential and commercial buildings alone contribute around 40% of the greenhouse gas emissions of an average metropolitan area. Research shows that cities could most quickly reduce their carbon emissions by renovating their housing stock⁵⁷ and that the potential for emissions reductions in public buildings ranges from one quarter in hospitals to over half in schools.⁵⁸

Although energy efficiency investments are critical for climate policy, they tend to get little public attention or political support. “Spending to save” is a tough investment proposition at the best of times, but especially for the public sector in times of stringent budget constraints. With the exception of district heating and cogeneration⁵⁹ – which can achieve significant energy savings – most energy efficiency projects tend to be small and often hard to sell. Politicians often prefer to support (visible and popular) renewable energy projects, rather than the obscure and hard-to-explain energy efficiency agenda. While spending on the energy efficiency of a big new development, such as London’s Olympic Park, may have some public appeal, retrofitting projects often do not.

So far, at least in Europe, most energy efficiency financing is provided by state-owned or sponsored financial institutions, such as KfW Förderbank in Germany or the European Energy Efficiency Fund (EEEF)⁶⁰, as well as by utility companies under national programs. Private investors, meanwhile, face multiple challenges:

- The interests of the various stakeholders are hard to align. In many cases the building’s owner or landlord is supposed to pay for an energy efficiency renovation; but it is the tenant who reaps the benefits in terms of lower electricity or gas bills, while the wider benefits of lower emissions accrue to all the city’s inhabitants or the whole global population.⁶¹
- Energy efficiency investments do not only involve various stakeholders, they are also usually characterized by a large number of small projects that are spread across many sectors and technologies. They are difficult to scale up without becoming prohibitively expensive and complex.
- Energy efficiency investments tend to have high upfront costs, their credit risk is hard to assess because so many parties are involved, and pay-back times can be very long.
- There is no established third-party financing model, like there is for other infrastructure sectors.
- Energy efficiency investments are often amalgamated with financing for other activities, for example when a utility issues a bond for general corporate finance. Energy efficiency is therefore not a separate investment with distinct risk and return characteristics.

Box 1: The UK Green Deal

At the beginning of 2013, the British government launched the Green Deal to encourage businesses, house owners and tenants to make energy efficiency improvements to their homes or premises. Property owners and tenants can install new technologies without taking on a large loan. Unlike conventional loans, the Green Deal loans stay with the building if the tenant or owner moves. The new resident then assumes the debt. The loan is repaid through the energy savings generated over a period of up to 25 years.

For Green Deal loans to work, the expected savings in energy costs have to equal or outweigh the initial investment. Accredited Green Deal assessors evaluate the buildings to make sure that only properties in which the finances add up are admitted to the scheme.

The loans can be used for the insulation of lofts, floors, walls and windows; metering and controls of water, gas and power; and improvements to the heating and hot water system.

Green Deal Providers can be energy companies, consumer companies or specialized finance providers. They may use funds from their retained earnings, raise them on capital markets or sell the Green Deal Receivables to a third party financier. One financier is a consortium supporting a new special purpose vehicle, the Green Deal Finance Company (TGDFC), which provides finance to Green Deal Providers across the market. The British Department for Energy and Climate helped TGDFC with a GBP 7 million implementation loan. As of 2013, however, take-up was lower than the government had hoped for.

Some countries have started addressing the investment gap in energy efficiency. Germany in 2000 established the Deutsche Energie Agentur (German Energy Agency), a public agency with private-sector participation that provides expertise, advice and support to municipalities and private investors for projects in energy efficiency.⁶² The UK in 2013 launched the Green Deal to incentivize property owners and tenants to make energy efficiency improvements to their homes (see Box 1). The US State of Vermont has achieved notable results through a free-standing efficiency utility.⁶³ The EU has adopted several initiatives to prompt its member states to do more to encourage energy savings and efficiency (see below). Nevertheless, energy efficiency investments remain far below what is needed – and even well below the sums available to renewable energy. This underinvestment is the main reason why the EU is likely to miss its energy savings target of 20% by 2020 by a wide margin.

3.

**How to narrow
the financing gap**

Private capital is urgently needed to help cities manage their climate change challenges. Although there are some encouraging signs that institutional investors are becoming more engaged in this sector, the financing gap remains daunting. The policy and regulatory framework needs to be more conducive for this gap to be narrowed. With other investment opportunities looking lackluster, and cities' need for green infrastructure growing fast, now is the time to begin a dialogue on how to facilitate greater investment. We see scope for improvements at several levels.

3.1 Local initiatives

Urban agglomerations will be the immediate beneficiaries of improved infrastructure, and there are good reasons to assume that they are particularly well suited for driving the efforts to attract more private finance into sustainable infrastructure (see Box 2). Provided they have the authority, municipal governments could attract more private financing through adopting and publishing long-term infrastructure and climate policy plans – and sticking to them through the political cycle. Larger cities could set up exchanges to match infrastructure projects with financial backers, as Chicago has already done with some success (see Box 3). Smaller ones would benefit from regional, national or supra-national institutions that help them find private funding at acceptable terms. City officials could also use such institutions (such as the “Green Cities Platform” we propose below) to share their experience with private infrastructure finance and to collaborate on specific projects to attain a scale that makes them attractive to private investors.

Box 2: Why cities are key to attracting private finance into infrastructure

- Cities and municipalities feel the pressures of ageing or inadequate infrastructure more acutely than national politicians in far-away capitals. They may therefore be highly motivated to attract additional sources of finance for improvements and renewal.
- Cities can be more directly accountable and less bureaucratic than national governments. They should be able to implement initiatives faster and more economically.
- People living in cities have a more direct connection to “their” roads, hospitals and metro lines than to, say, overland gridlines, motorways or wind parks. This could have the following implications:
 - a) greater acceptance of infrastructure construction (less NIMBYism)
 - b) broader application of the user-pays principle
 - c) deeper understanding of the benefits – in terms of efficiency and transparency – that can stem from private sector involvement.
 - d) Potential for urban citizens to invest in local infrastructure.
- Most cities are growing, some of them very fast. This means:
 - a) up-front financing of infrastructure is even more important, as urban infrastructure should be larger than current requirements – which in return puts excessive strain on current budgets
 - b) the consequences are particularly severe if short-term budgetary considerations prevent a much-needed expansion and improvement of infrastructure
 - c) a privately-funded shift of current expenditures to future users could be more bearable.

Box 3: The Chicago Infrastructure Trust

In March 2012, the city of Chicago established the Chicago Infrastructure Trust (CIT). The CIT is an exchange that matches public infrastructure projects and private investors.

The city is paying for the CIT's USD 2.5 million running costs, while financial institutions, including Macquarie Infrastructure and Real Assets, Ullico, Citibank and JPMorgan, have committed to investing some USD 1.7 billion in the scheme.

According to initial plans, the CIT itself will provide some capital, bond financing and grants as well as offering tax-exempt debt to attract more investment. Returns on investment could vary from 3% on tax-exempt bonds to 8% for equity partners.

The city hopes to raise about USD 7 billion in total to finance improvements to streets, parks, water and sanitation, schools, commuter rail and O'Hare airport. The private sector will invest money in projects and receive returns via tolls, user fees, premium pricing or tax breaks.

The CIT's first project is a USD 13 million investment to make 62 city buildings more energy-efficient due to start in March 2014 (the scale of the project was reduced significantly from over USD 100 million during the preparation phase). Other projects discussed in 2013 were the conversion of some of Chicago's 340,000 street lights to energy efficient lighting and replacing almost 4,000 city-owned cars and trucks with gas-driven vehicles.

City governments need to redesign their PPPs and usage tariffs in such a way as to attract private finance while at the same time providing incentives for consumers to save resources. At present, most private concession operators receive profits in the form of usage fees, and hence it is in their interest to maintain or increase usage levels. For example, a privately run water provider has little incentive to conserve water since this reduces income and makes it harder to recoup the initial investment. Cities could, for example, use mixed payment systems in which users pay usage fees to operators while taxes cover public goods such as the reduction of water use and the prevention of leaks.⁶⁴

3.2 National policies

Often policy at the national level matters as much, if not more, for local investment conditions than action at the municipal level. The national government can provide a framework for pro-green investment policies that benefits all cities. On the broadest level, governments can help to level the playing field between sustainable and conventional investments by making sure that investors account for externalities such as climate change from emissions. This can be done, for example, through putting a price on carbon, either through emissions trading or taxation. Fuel taxes can encourage the use of public or emissions-free private transport, while energy or carbon taxes can encourage a switch to renewable energy as well as energy savings. Many countries are seeking to adopt a more holistic approach to sustainable infrastructure investment. For example, the British National Infrastructure Plan, first published in 2010 and since updated annually, aims to encourage investment in existing and new infrastructure, also with the aim of fulfilling the UK's climate change objective.⁶⁵

Governments could redesign the national legal frameworks for PPPs, to make them more attractive for private investors. They could, for example, reduce the complexity of tendering processes and involve private investors more deeply in the set-up of PPP projects by allowing them to identify suitable projects.⁶⁶ Looking forward, governments should explore the use of alternatives to the traditional PPP model, such as the “regulatory asset base” model (RAB, a type of contract that guarantees private investors their capital in, say, a utility while also balancing the interests of consumers and public policy) and more sophisticated risk-sharing models.

However, one of the biggest hurdles to institutional investment in sustainable urban infrastructure is that such projects tend to be small, sporadic and spread across various sectors and locations. To open this entire sector to private capital, a new approach beyond project-related public-private partnerships is needed. Both municipalities and private investors would benefit hugely from an institution that can aggregate projects, match investment demand and supply and provide knowledge-based advice.

Governments should therefore establish national “Green Cities Platforms”. These would be one-stop shops with the sole task of attracting private finance into sustainable urban infrastructure. Semi-public institutions might work best, combining government support with private-sector participation (perhaps fee-based) and the technical and financial know-how that some private investors can bring.

In the first stage, the Green Cities Platform would collect and disseminate data on sustainable urban infrastructure, provide consultancy services and be a forum for knowl-

edge sharing. It would intermediate between city officials, many of whom have only limited experience with private finance, and potential investors. It would thus foster a more focused and effective dialogue between the public and the private sector than can be achieved through sporadic conferences or project-based cooperation. The Platform could help to design public guarantees for investment projects that require them. City officials could use the new Platform to exchange experience and best practice among themselves with regard to sustainability planning, energy efficiency, PPPs and risk sharing.

In the next step, the Green Cities Platform would act as an aggregator by packaging, standardizing, marketing and selling urban infrastructure investments to the private sector, and handling their administration. Questions of which cities and projects could participate and who is liable for the jointly issued debt would have to be answered beforehand.⁶⁷ By consolidating the sellers from different municipalities and departments, the Green Cities Platform would help to streamline processes, reduce transaction costs and develop economies of scale.

Once the Green Cities Platform has reached a critical size, it could perhaps also start raising capital in the markets to co-invest in sustainable urban infrastructure projects. Governments could make such an expansion of mandate dependent on the availability and activities of national or regional development and infrastructure banks. In a final stage, the Green Cities Platform could seek to sell sustainable urban infrastructure investments also to retail investors.

3.3 The European framework

The natural locus of measures to stimulate investments is the local or national level. However, policy developments at the international or supranational level also determine whether institutional investors find urban infrastructure attractive or not. Nowhere is this truer than in Europe, where environmental targets, market structures and financing conditions are increasingly determined by EU directives and policies.

The EU member states agree the broad framework for their climate change policies at the EU level. The EU has firm targets for the use of renewables, CO₂ emissions and energy savings to 2020 and, at the time of writing, was discussing a 2030 target of reducing CO₂ by 40% compared with 1990 levels. Beyond 2030, there is only a general commitment to reduce carbon emissions by 85-90 % by 2050. Since infrastructure investment horizons are often measured in decades, the absence of binding longer-term targets leaves potential investors with a degree of uncertainty.

The EU's key instrument for combatting climate change is supposed to be the Emission Trading System (ETS).⁶⁸ The price for emitting a ton of carbon fell from around EUR 30 in 2008 to a low of EUR 3 in early 2013 and by the start of 2014 had recovered only modestly, to EUR 7 – a level that is inadequate for encouraging investment in energy savings or a widespread switch away from fossil fuels and polluting industries. In November 2013, EU governments agreed to reduce the number of permits that will be issued over coming years in an attempt to prop up the carbon price. But more wide-ranging proposals on how to fix the system are still under discussion. Progress is needed here to increase the relative attractiveness of sustainable investments.

More specific questions of urban policy and planning have been mainly left to the member states under the EU principle of subsidiarity. The EU has launched some urban policy initiatives under its existing competences, such as environmental or regional policy, but there is no EU-level legal or institutional framework for urban planning or investment. What programs did exist were aimed more at urban renewal, support for the local economy or reducing inner-city poverty than fighting climate change.

More recently, the EU has launched a couple of policy initiatives designed specifically to make European cities greener. The JESSICA program seeks to leverage the EU Structural Funds to attract additional resources into green urban infrastructure (See Box 4) while the European Innovation Partnership on Smart Cities and Communities (EIP-SCC) brings together cities, industry and civil society to produce ideas for better urban planning, innovation and energy efficiency.

Box 4: The EU's JESSICA program

Joint European Support for Sustainable Investment in City Areas

JESSICA was set up as cooperation between the European Commission and the European Investment Bank (EIB) for the use of EU Structural Funds (grants from the EU budget for regional development in EU countries) for the 2007-13 budget period.

EU countries can allocate money from the Structural Funds into Urban Development Funds (sometimes via holding funds) and then use it for public-private partnerships and other projects that are part of an integrated plan for sustainable urban development. One example of a JESSICA supported project is the London Energy Efficiency Fund (LEEF), with GBP 100 million capital to be fully invested until 2015.

JESSICA is supposed to leverage Structural Fund allocation through private-sector capital while also resorting to the expertise of private investors in project management. The capital can be invested in form of equity, loans and/or guarantees. Project returns are supposed to be reinvested in urban development.

The European Investment Bank, the EU's main public lender, has billions of euros available for infrastructure development. However, since the EIB operates on the basis of EU treaties and within the confines of EU policy it has, until recently, not had a mandate to lend to urban infrastructure projects. Since 2008, the EIB's Sustainable Communities concept has provided a basis for targeted investments in sustainable urban infrastructure, although the overall share of EIB investments in urban infrastructure projects remains small. Through its co-investments and guarantees, the EIB could make a significant contribution to the development of a market for sustainable urban infrastructure investments in the future. The EU's new Project Bonds could also be harnessed for this purpose.⁶⁹ At present, however, both the Project Bond pilot phase and the European Commission's EUR 30 billion "Connecting Europe" infrastructure facility are focused on cross-border infrastructure for transport and energy as well as broadband provision. In 2014, the European Commission was discussing the possibility of expanding the Project Bond initiative to smaller, local infrastructure projects.

To address the gap in energy efficiency financing, the EU in 2006 adopted a directive on Energy Performance Contracting (EPC), a type of debt contract that allows private investors in energy efficiency projects to be recompensed through the energy efficiency savings achieved. EPC spread only slowly in the EU countries, and various EU countries implemented and interpreted the directive differently. In 2010, the EU added the Energy Performance of Buildings directive, and in 2012 the EU adopted a more ambitious package in the shape of the Energy Efficiency directive, which now obliges member countries to improve policy frameworks and financing opportunities for energy savings by mid-2014 and to renovate 3% of the public housing stock.⁷⁰ The European Commission, together with the European Investment Bank, has also launched a campaign to support the take-up of EPC across Europe.

Beyond climate change and investment policies, a large number of EU directives and policies affect the attractiveness of sustainable urban infrastructure. In March 2013, the European Commission published a Green Book on long-term investment in Europe, which is supposed to help define a more favorable framework for infrastructure and green investments.⁷¹ The Commission might want to follow this up with an audit of the EU rules and regulations that matter specifically for sustainable infrastructure in urban areas. It should then issue recommendations about which EU directives need to be abolished or modified and in which areas there is a need for new legislation to improve the investment environment for sustainable city infrastructure in EU countries.

3.4 What investors can do

Of course, it is not the sole responsibility of governments to tackle the investment gap in sustainable infrastructure; private sector investors have their role to play. The infrastructure investment market is still heavily fragmented. Most investors are too small to invest directly in infrastructure – or to be advocates for improved investment conditions at the national or European level. Smaller institutional investors should therefore be active participants in efforts to pool resources.

If governments decide to establish Green Cities Platforms, private investors should support and use them so that they quickly reach a critical size. Private investors could use such platforms to exchange experience and knowledge with regard to investments in sustainable urban infrastructure. They could also co-operate to help develop new financial products, in particular to facilitate public-private co-investment.

New financing instruments are urgently needed to encourage private funding of energy efficiency projects. At present, private investors find that the disadvantages of most energy efficiency investment projects – small size, difficult policy and regulatory environments, unattractive financial structure – tend to outweigh the potential benefits. Moreover, while there is already a range of distinct funding vehicles for renewables and infrastructure, there are hardly any funds focused purely on energy efficiency.⁷² New structures are needed to make sure that the returns from energy efficiency investments flow back to the investor (See Box 5 for examples).

Box 5: Ideas for energy efficiency funds

Energy efficiency funds could help to overcome some of the hurdles that private investors face when financing energy efficiency projects. Such funds could be established in cooperation with the public sector and could take one of the following forms:

- Real estate funds would acquire and renovate buildings to provide energy efficient office space. Since the investment would be in real assets, it would not require investable energy efficiency securities, and investors could benefit from the advantages generally offered by real estate investments, such as tax breaks, portfolio diversification and inflation hedging.
- PPP-related funds would provide senior and mezzanine loans for energy efficiency retrofitting. They would usually involve some form of public-private partnership, either through private entities investing alongside the public sector or the public sector providing a guarantee or fiscal advantage.
- Core energy efficiency funds could comprise an energy efficiency fund as well as investments in energy efficiency related technologies, smart grid companies, business services that support energy efficiency management, and construction companies that specialize in retrofitting of commercial buildings.
- Vendor financing would help both the manufacturers of energy efficiency equipment to sell their products and clients to buy or lease assets that it might otherwise not be able to finance. The repayment terms could be structured so that interest payments and capital repayments are below the energy efficiency savings.

Table 4: Ideas for greener cities

City governments	<ul style="list-style-type: none"> • Adopt transparent and reliable long-term infrastructure and environmental plans • Set up local exchanges to pair projects and potential investors • Re-design PPPs and usage tariffs to discourage resource consumption 	
National governments	<ul style="list-style-type: none"> • Establish a Green Cities Platform to package, market and sell sustainable urban infrastructure projects • Re-evaluate the investment framework with a particular focus on attracting private finance to sustainable urban infrastructure, including improvements to PPP frameworks • Use taxation or emissions trading to create a level playing field for green and non-green projects 	
The EU	<ul style="list-style-type: none"> • Help to provide long-term certainty for investors, for example by clarifying climate change targets beyond 2030 and fixing flaws in the ETS • Conduct an audit of EU rules and policies that affect private financing of climate-friendly urban infrastructure; modify those that impede long-term investment (including capital requirements for banks and insurers) • Harness existing policies, including Project Bonds, to support investment in sustainable urban infrastructure 	
Private investors	<ul style="list-style-type: none"> • Support and use Green Cities Platforms if these are established • Exchange expertise and experience on sustainable urban infrastructure • Explore new financing vehicles, in particular to facilitate public-private co-investments • Conduct a dialogue on the establishment of energy efficiency pilot funds 	

4.

Where next?

Urbanization and climate change are inextricably linked. More than 50% of the world's population already lives in urban areas, and that share is set to rise to around 70% by 2050. Cities generate most of the world's GDP, and global growth will continue to depend on them. But cities also account for around 70% of global greenhouse gas emissions. They are therefore the natural starting-point for establishing effective emissions reduction policies.

Cities will only develop economically while coping with both population growth and climate change if they invest much more in regenerating and upgrading their infrastructure. However, there is already a huge gap between most cities' infrastructure needs and the investment capital available. Public funding will not be sufficient to climate-proof and renovate infrastructure while bank lending is likely to remain constrained. Institutional investors will need to help bridge the gap. However, this will not happen unless the policies and interests of cities, investors, national governments and regional policymakers become more closely aligned.

Cities need to make sure that their policies and regulations are conducive to long-term private investment while also encouraging resource conservation. Local investment conditions also depend critically on national as well as supranational policy frameworks. Increased investment in sustainable urban infrastructure will therefore require strong partnerships between local and national governments as well as international cooperation, in particular in the EU. National governments need to do more to develop sustainable investment policies and to encourage private finance flows into infrastruc-

ture. The rules for public-private co-investments could be simplified and improved in many places. The EU could do an inventory of all its rules and policies that matter for private investment in sustainable urban infrastructure. Existing rules – from energy unbundling provisions to capital requirements for banks and insurers – should not impede long-term and sustainable investing.

Importantly, all players involved need to start a dialogue on how the marketplace for sustainable urban infrastructure could be improved. Even with the best regulations in place, many institutional investors will struggle with finding and evaluating urban infrastructure projects, which tend to be small, sporadic and highly diverse. National governments should therefore consider the establishment of new "Green Cities Platforms". These organizations would help to standardize, package and sell sustainable urban infrastructure projects to potential investors and thus help to overcome one of the barriers to private investment into urban infrastructure.

Private investors can do their bit to help bridge the investment gap. They can offer their expertise and active participation in making Green Cities Platforms work. They can help develop new investment products and opportunities in sustainable urban infrastructure. In particular, potential investors and public bodies should discuss how to establish pilot energy efficiency investment funds that could stimulate increased investment both at the institutional and retail level.

Insurers – with ample experience as long-term institutional investors as well as a deep understanding of the risks involved in infrastructure – are in a strong position to advance sustainable urban infrastructure financing. They are also looking for new investment opportunities. With the right policy framework and market structure, institutional investment in sustainable urban infrastructure could grow significantly in future years, helping to narrow the gap between cities' financing needs and available public capital.

The time to act is now. If cities cannot find new financing to reach their carbon emission reduction goals, the global climate will heat up – and many cities will suffer from climate-related extreme weather and natural disasters. If, however, barriers to private sustainable urban infrastructure investment can be overcome, there is a greater chance to prevent climate change while at the same time creating new investment opportunities.

Annex: What cities are doing to reduce CO2

The cities of Nordic countries are the most advanced in their climate policies. Nordic societies, living at the edge of temperate zones, have long realized that adaptation to extreme weather conditions is a matter of survival. They became frontrunners in adopting long-term strategies to protect the environment and to achieve a sustainable balance between society and nature. In the post-industrial era, it was only a small step from there to comprehensive strategies for climate protection and the reduction of greenhouse gas emissions, with a focus on urban areas. Other European countries, including Germany, and parts of North America are not far behind, and cities in emerging market countries are now following suit in their efforts to become greener. Here are a few examples from cities around the world and below is a table of individual projects in OECD countries:

Copenhagen

The Danish capital wants to become 100% carbon neutral by 2025, according to its Climate Plan.⁷³ Copenhagen is well on its way to reaching this ambitious goal: it has already either completed or started 50 initiatives in energy production, transport, energy efficiency and other areas. At the core of the strategy is a move to sustainable energy production, which is supposed to cut emissions by 855,000 tons CO₂ per year. Greener transport, a city-wide cycling scheme and more energy efficient buildings are also supposed to make a significant contribution to carbon reduction targets.

Helsinki

The Helsinki City Council in January 2008 approved new energy guidelines that were aligned with EU objectives to reduce greenhouse gas emissions by 20% and increase the share of renewables to 20% by 2020. In February 2010, Helsingin Energia, the municipality-owned energy provider, adopted its “HelEn 2020+” development plan which foresees different paths to carbon neutral energy production by 2050 at the latest. Following the most ambitious path, greenhouse gas emissions from energy production could be reduced by up to 98% by 2030.⁷⁴ The main pillars of this strategy are: combined heat and power production based on the city’s district heating system; maximizing the energy efficiency of public and private buildings (existing and new-built); efficient public transport system with low emission buses; further waste reduction and intelligent waste treatment, including extended biogas energy production from organic waste; and, last but not least, enhanced environmental education.

Munich

In Germany, too, many cities have embarked on the path towards a climate-neutral urban environment, partly driven by the Nationale Klimaschutzinitiative (the National Climate Protection Initiative).⁷⁶ One of the most advanced German cities is Munich. The Stadtwerke München, the local power and water utility, is aiming to cover 100% of the city’s electricity demand from renewables by 2025, according to its “Renewable Energy Offensive”.⁷⁷ The strategy is based on several pillars: an increase in geothermal energy production; direct investments in on- and offshore wind; extension of the city’s hydro-electric sector, including the world’s first high-capacity hydro power station installed under a river bed; an increase in biogas energy capacities; a program for solar panel installation on municipal buildings; and increasing energy efficiency, for example of street lights. The city of Munich also has plans for transport, including hybrid buses and priority cycling lanes. Munich also wants to build Germany’s first climate-neutral residential areas (Freiham, Neuaußing).

Stockholm

The Swedish capital wants to be fossil fuel-free by 2050. As an intermediate step, it seeks to reduce emissions from today's 4 tons of CO₂ equivalent per resident to 3 tons in 2015. Stockholm is well known for an administrative system that mainstreams environmental issues and conducts environmental impact assessments for all policy and administrative decisions. Stockholm's climate agenda encompasses all key areas. In energy production, the city is increasingly relying on a centralized district heating and cooling system and renewable sources as well as energy from waste. To save energy, Stockholm is increasing subsidies for building investments and imposes standards for the energy efficiency of buildings when they are sold or rented. In the transport sector, it operates public buses running on electricity, ethanol or hybrid technologies, the city's entire car fleet is renewables-based and it operates a congestion charging zone to reduce traffic.⁷⁵

Shanghai

Shanghai's energy consumption is unusually high due to its agglomeration of energy-intensive heavy industries (steel, construction, automotive manufacturing). What is more, Shanghai relies mostly on coal to cover this heavy demand for energy: coal accounted for 95% of the city's electricity production and 47% of its total energy use in 2007 (although that was down from 65% in 2000). As a result, Shanghai, with its almost 20 million people, emits 9.7 tons of CO₂ per capita, which is more than twice the average of the 22 major Asian cities assessed in the Asian Green City Index.⁷⁸ However, Shanghai could become a frontrunner in moving from coal to renewables in coming years, through large long-term investments in wind, solar, and biomass. Shanghai built its first wind power station in 2003. By 2007, it had three of them, with a total capacity of 24 megawatts supplying power to 24,000 households. The city is planning to have, by 2020, 13 offshore wind farms producing a total of 2.1 gigawatts for more than 4 million households – Asia's largest offshore wind farm project. If the investments go according to plan, Shanghai would cut its coal use by 100,000 tons per year and its carbon emissions by 246,000 tons annually. Amongst many other low carbon projects, Shanghai aims to double the size of its metro system which is already the world's largest metro (with 420 km of track, compared with London's 408 km and New York's 368 km). Although the net effect of this expansion has not yet been quantified, it should lead to a substantial reduction in carbon emissions.

Rio de Janeiro

"Rio Sustainable", the city's climate change plan adopted in 2009, foresees a cut in greenhouse gas emissions of 8% by 2012 (from 2005 levels), 16% by 2016 and 20% by 2020. In contrast to Shanghai's dependence on coal, 88% of Rio's electricity comes from renewable sources, mainly hydropower. As a result, Rio's per capita emissions from electricity consumption is a fraction of the 17-city average in the Latin America Green City Index⁷⁹ (0.073 tons of CO₂ compared with 0.202). Rio – host of the agenda-setting first Earth Summit in 1992 – has a long track record of coherent environmental and clean energy policies. Rio was the first city in Latin America, for example, to publish a CO₂ emissions inventory. The city's mayor is now heading the C40 cities initiative. The preparations for hosting the World Cup in 2014 and the Olympic Games in 2016 are leading to further green initiatives, including: congestion reduction policies; massive expansion of public transport capacities, which will also help to protect the two large urban forests; closing the city's old Gramacho waste landfill in 2011 and replacing it by a new state-of-the-art waste facility at Seropedica; cutting CO₂ emissions by 1.4 million tons per year and generating biogas.

Johannesburg

Johannesburg faces the particular challenge that roughly half of its 4 million inhabitants live in cramped townships with poor infrastructure and buildings. In contrast to the hot coastal cities of Shanghai and Rio, Johannesburg needs a lot of energy in its often harsh winters. To make matters worse, 90% of Johannesburg's electricity comes from coal. Add the widespread burning of wood in the townships, and CO₂ emissions per person reach 1.5 tons – well above the 15-city average of 0.984 tons in the African Green City Index.⁸⁰ Despite this difficult starting point, and motivated by the 2010 World Cup, Johannesburg launched its 2040 Growth Development Strategy in 2011. This strategy aims gradually to replace fossil fuels with renewable energy, with a focus on solar energy for decentralized electricity production and warm water supply. Other components of the program are: energy saving initiatives; congestion reduction projects; enhancement of public transport (such as electric train network, bus rapid transit system); a prosecution and fine-based waste separation and recycling system; and innovative approaches to reducing urban sprawl by rehabilitating under-populated city areas and building new mixed-density housing developments with short access to municipal services and public transport. All these should substantially contribute to carbon emission reduction, although actual results are still to be published.

Table 3: Sustainable urban infrastructure projects in OECD cities

Project	City	Capital costs, USD million	Annual savings in CO ₂ , kilo tons
Transportation			
Bus rapid transit	Vancouver	39.2	1.8
Congestion charging	London	244	120
Bike sharing	Paris	132	18
Buildings			
Public building efficiency	Berlin	80	31.6
Thermal building refurbishment	Vienna	196	150
Energy			
Solar Center receiver station	Seville	41	110
Offshore wind power	Munich	652	598
Traffic signal lighting	Stockholm	3	1.54
Solid Waste			
Source separation/ methane production	Sydney	75	0.36
CHP district heating system	Copenhagen	562	720
Incineration-based CHP	Gothenburg	453	205
District heating & cooling	Helsinki	77 (2005-07)	2,700
Waste/ Wastewater			
Biogas from sewage	Stockholm	15	14
Landfill gas reuse	Christchurch	2.9	63.4

- 1 International Energy Agency (2009)
- 2 McKinsey (2012b)
- 3 IPCC (2014)
- 4 Munich Re (2013); IPCC (2012)
- 5 OECD (2012), p. 13
- 6 KPMG (2012)
- 7 LSE Cities (2013)
- 8 Siemens (2011b)
- 9 Siemens (2011a)
- 10 <http://www.c40.org/>
- 11 <http://eumayors.eu/>
- 12 After hurricane Sandy, both New York Governor Andrew Cuomo and Mayor Michael Bloomberg championed new storm protection infrastructure, which could cost the city more than USD 10 billion, Miller (2012)
- 13 The World Bank (2011)
- 14 European Commission (2013b)
- 15 The World Bank (2011)
- 16 Standard & Poor's (2014); Thomasson (2012)
- 17 Kuntze et al. (2013)
- 18 KPMG (2010)
- 19 Standard & Poor's (2014)
- 20 Boston Consulting Group (2013)
- 21 GVA (2010/2011)
- 22 The UN usually uses 1990 as base year for CO₂ trends. Sippel (2010)
- 23 Wagenvoort (2011)
- 24 Baietti et al. (2012)
- 25 The Sharpe ratio is the ratio of an investment or portfolio's excess return (risk premium) to its standard deviation
- 26 The average annual default rate for project finance debt has been 1.5% since 1998. Standard & Poor's (2014)
- 27 Inderst (2013)
- 28 A widely used subsidy scheme under which the producers of renewable energy receive a guaranteed, cost-based price
- 29 Swiss Re (2011)
- 30 Bloomberg New Energy Finance (2013)

- 31 OECD (2013a, c)
- 32 Bearing Point Institute (2013)
- 33 Estimate for 2011, OECD (2013c)
- 34 Under ideal circumstance, institutional investors could cover between one quarter and one half of renewable energy project debt and equity, respectively. Climate Policy Initiative (2013a)
- 35 Bearing Point Institute (2013)
- 36 Swiss Re (2012)
- 37 OECD (2013c).
- 38 “Axa Plans to Invest \$13.3 Billion in Infrastructure Debt”, Bloomberg, June 18th 2013.
- 39 Omers (2012).
- 40 AustralianSuper (2013).
- 41 OECD (2013b)
- 42 USS (2013)
- 43 OECD (2011a)
- 44 Institutional investors accounted for only USD 0.4 billion out of a total USD 224 billion in private climate finance in 2012. The biggest private investors were energy utilities and renewable energy companies as well as manufacturing companies and corporate users of energy. Climate Policy Initiative (2013b)
- 45 Dieter Helm in EIB (2010)
- 46 Edwards (2013)
- 47 Allen (2012). As part of a PFI overhaul, the government aims to restrict tendering to 18 months.
- 48 The Economist (2012b)
- 49 Prakash (2012)
- 50 2009 KPMG survey on “Bridging the Global Infrastructure Gap: Views from the Executive Suite”, cited in KPMG (2010)
- 51 Steinbeis Research Center (2013)
- 52 Climate Policy Initiative (2013a).
- 53 National Association of Pension Funds (2013).
- 54 Lin & Lu (2013)
- 55 Climate Policy Initiative (2013).
- 56 Preqin (2013)
- 57 Deutsche Bank Research (2010)
- 58 Siemens (2012b)
- 59 District heating distributes heat generated in a central location to local houses and businesses. Often the heat comes from a cogeneration or combined heat-and-power plant.

60 The European Energy Efficiency Fund was launched in 2011 with EUR 265 million in funds from the European Commission, EIB, Cassa Deposit e Prestiti and Deutsche Bank. The aim is to increase the fund to EUR 800 million by attracting more investors.

61 Schiellerup in Centre for European Reform (2011)

62 <http://www.dena.de/>

63 Tindale (2010)

64 OECD (2012) pp. 32-33

65 HM Treasury (2013)

66 McKinsey (2013) p. 64

67 Deutsche Bank Research (2012)

68 Through the ETS, the EU sets a limit for the total amount of CO₂ that industries are allowed to emit. Within this limit, companies are allocated or sold emission rights, which they can then trade with each other as needed. The overall CO₂ limit is reduced over time so that total emissions fall.

69 The Europe2020 Project Bonds – a joint project of the European Commission and the EIB – will use credit enhancement features to attract institutional investors to infrastructure finance in transport, energy and communications. A pilot phase started in 2012 and the full program was due to get under way in 2014. EIB (2013)

70 Directive 2012/27/EU, http://ec.europa.eu/energy/efficiency/eed/eed_en.htm

71 European Commission (2013a)

72 Among the first privately-run, pure energy efficiency funds in Europe were the SUSI Energy Efficiency Fund, launched in June 2013 in Switzerland, with € 300 million and CHF 100 million in capital to invest in energy efficiency retrofits of existing buildings; and the cooperative B.A.U.M. Zukunftsfonds in Germany which is investing in energy efficiency projects in private mid-size companies and public buildings

73 City of Copenhagen (2009)

74 City of Helsinki (2010)

75 City of Stockholm (2012)

76 <http://klimaschutz.de>

77 Stadtwerke München (2011)

78 Siemens (2011a)

79 Siemens (2010b)

80 Siemens (2011c)

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