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04

BARRIERS TO EXPANDING CLIMATE-SMART URBAN INVESTMENT

04 | Barriers to Expanding Climate-Smart Urban Investment

Cities face unique challenges in accessing and attracting private capital. Urban climate projects can differ significantly from large-scale national projects; to be successful, all stakeholders must tailor their approach to the unique national context, local capacity, project characteristics, and implementation challenges that can limit the expansion of solutions and increase time and due diligence costs.

There are three things to consider when framing the challenges of mobilizing private investment in urban climate action.

The first is the role of cities as government authorities in mobilizing private investment in urban infrastructure. Many of the barriers cities face in attracting private investment are rooted in their limited control over broader enabling environmental conditions, such as national policies and regulations, and limited institutional capacity to plan and design climate-aligned investment opportunities for the private sector (C40 and ODI 2019).

The second is the role of cities as investors in urban infrastructure. Globally, cities vary widely in their ability to borrow money, with only 5 percent of the 500 largest cities in developing countries with a credit rating on international capital markets and only 20 percent with a credit rating in local markets (World Bank 2018). In addition, 56 percent of countries forbid any kind of borrowing by local governments, excluding them from issuing municipal bonds, and only 16 percent grant any taxation authority to local governments (Coalition for Urban Transitions 2019b, Ivanyna and Shah 2012). Both restrictions limit cities' ability to raise the capital needed to finance their climate plans.

Cities also have limited direct access to catalytic development finance that could be used to unlock

private investment. Multilateral and bilateral development finance institutions⁹ are traditionally oriented to work at the national rather than the municipal level, although they are still an important source of urban climate investment, and climate funds such as the Green Climate Fund, Adaptation Fund, and Global Environment Facility are not directly accessible to cities, which must go through national ministries, where there can be tensions and competing priorities (C40 and ODI 2019).

The third is how cities mobilize capital from private investors. Historically, private and institutional investors have had limited familiarity with financing sustainable infrastructure projects at the municipal level (Blended Finance Taskforce 2018). Some investors may also be subject to financial regulations that prohibit or restrict them from investing in developing countries or in infrastructure anywhere (Blended Finance Taskforce 2018). Although projects may take place at the municipal level, investors are also wary of the risks at the country level, including currency and exchange rate fluctuation, inflation, and political risk (C40 and ODI 2019). Private investors can also find it challenging and time consuming to access blended finance, which could be used to reduce the risks of some of these challenges.

Although urban climate investment projects in developing countries face all these challenges, these challenges are not exclusive to these types of projects. Two interconnected sets of barriers must be overcome to expand private urban climate investment in developing countries. The first set of barriers are traditional project finance challenges, and the second set of barriers is more unique to climate projects. Considering these risks together allows investors and other stakeholders to better understand the complex web of challenges

9 National and international development finance institutions (DFIs) are specialized development banks or subsidiaries set up to support private sector development in developing countries. They are usually majority-owned by national governments and source their capital from national or international development funds or benefit from government guarantees. This ensures their creditworthiness, which enables them to raise large amounts of money on international capital markets and provide financing on very competitive terms. See <https://www.oecd.org/development/development-finance-institutions-private-sector-development.htm>

Figure 1 Private Sector Investment Barriers



to expanding investment in urban climate projects and how they build on one another. Figure 1 provides a visual stacking of these two sets of investment barriers and their interlinkages.

This section will examine barriers to expanding urban climate investment. The first part of the section will examine traditional investment barriers and how they manifest in urban climate projects; the second part will examine a set of barriers specific to or strongly exacerbated in climate projects. Solutions to these barriers will then be explored in case studies.

Traditional Investment Barriers

This section reviews traditional barriers to private investment and how these barriers manifest in urban projects, summarized in figure 2. There is an additional focus on how these urban project finance barriers are exacerbated in climate-aligned investments as a result of the complexity of climate projects and intricacies of the climate finance architecture. Each barrier impacts the various stakeholders, including cities as both a government authority and as an investor, as well as private investors, involved in urban projects differently.

Figure 2 Traditional Investment Barriers



Project Pipeline Barriers

Cities

As government authority

- Limited capacity to develop bankable⁶ climate-friendly projects and prepare projects of sufficient size and quality for commercial financing
- Limited capacity to manage diverse stakeholders
- Limited early-stage project preparation financing

Private Investors

- Unaccustomed to working with municipal governments; limited understanding of city projects
- Limited standardization of term sheets for portfolio aggregation to counter project ticket size

A major barrier to private investment in climate action is a limited supply of bankable projects of sufficient quality and size that offer fair risk allocation between public and private capital.

The lack of quality projects is frequently attributed to limited local government capacity for designing and structuring deals that are attractive to private investors, combined with weak project-related contractual frameworks, including international arbitration and currency convertibility provisions. This shortage of internal capacity is especially pronounced in developing country cities. To implement and fund their climate action plans, cities will need to

significantly increase their capacity to identify, prioritize, and prepare bankable projects and ensure their successful implementation. In addition, climate-related projects often require technical, feasibility, and impact studies which cities struggle to afford because public budgets are tight and cities have limited direct access to external project preparation finance and support.

Even in cases in which urban projects have been well structured, they are often too small for institutional investors¹¹ and come with a high cost of capital as a result of limited concessional finance (C40 2018). Investors, especially larger ones, struggle to justify the transaction costs for small projects, which are often equal to those of larger projects, even if the internal rate of return meets or exceeds their expectations. “Assets such as energy-efficiency investments in buildings and micro power generation are often impractical for traditional large investors to finance. Admittedly, many of these projects receive some form of concessionary capital that should improve risk-adjusted returns, but the complicated processes involved in securing funding from development banks and other investors can create bureaucratic hurdles that slow project preparation and push up transaction costs” (CCFLA 2015).

To help address the critical need for project preparation support and pipeline size, the Global Infrastructure Facility was established in 2014 as a G20 initiative¹² to support governments at the national and subnational levels—including cities—and multilateral development banks with funding and hands-on technical expertise to design and structure infrastructure investment opportunities that are attractive to private capital.¹³ It was designed to address pipeline size through

10 The term “bankable” means that a project has sufficient collateral, future cashflow and probability of success to be accepted for financing by a commercial bank or institutional financing.

11 C40 The Demand for Financing Climate Projects in Cities. Forty-five percent of projects surveyed for investment are less than \$10 million.

12 G20 is an international forum for governments and central bank governors of 19 countries and the European Union.

13 See <https://www.globalinfrastructure.org/sites/gif/files/GIFBrochure.pdf>

standardization, aggregation, and concerted private sector engagement to generate interest in projects.

However, even in cases in which cities have the capacity to prepare bankable projects, private and institutional investors often have limited understanding of cities and their financial conditions and consequently may be reluctant to invest in urban infrastructure, green or otherwise (C40 and ODI 2019). Private investors are also often wary of investing in some of the rapidly evolving climate technologies that cities need to meet their climate action plans. The combination of inexperience with municipal governments and the potential technological risks of new climate technologies can deter private investors from urban climate projects in spite of the multi-trillion-dollar opportunity (IFC 2017).

Case study 1 in the next section of the report describes a dedicated fund that supports cities to build a quality pipeline of projects and then mobilize institutional investment. The International Municipal Investment Fund, which the United Nations Capital Development Fund developed and Meridiam SARL manages, sources projects directly from municipalities. It uses concessional capital to support municipal

governments and developers with project development and preparation, including increasing the sustainability and resilience elements of projects and their financial bankability, and then mobilizing private investment from institutional investors.

Case Study 2 introduces The City Climate Finance Gap Fund, currently in development, that will provide financial and technical support upstream specifically to support pipeline identification and feasibility studies for low carbon resilient urban investments primarily in rapidly urbanizing cities in developing countries.

Macroeconomic Barriers

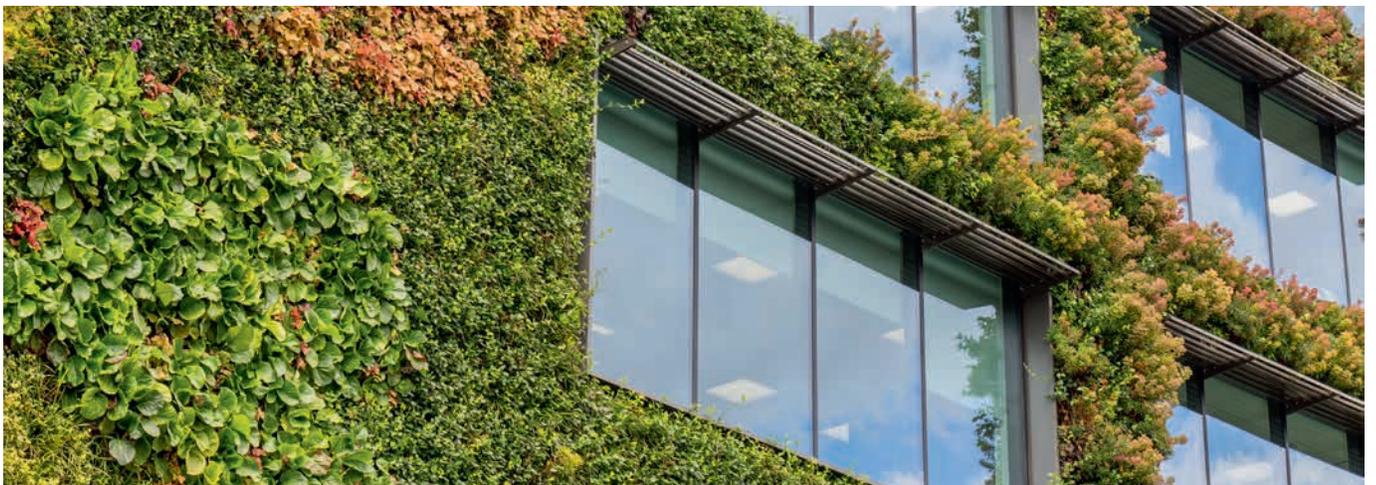
Cities

As government authority

- Lack of influence over monetary policy

Private Investors

- Foreign exchange risk
- Inflation
- Interest rates



Many of the greatest barriers to long-term private infrastructure investment in developing countries are macroeconomic risks that apply to all investments, including currency fluctuations, inflation, and interest rates (GCEC 2018).

For foreign investors, currency volatility is one of the most pervasive challenges to investing in developing countries over the long term. Foreign investors typically denominate their balance sheets in hard currencies such as dollars, euros, or pounds, and investments in local currencies, especially for long-term infrastructure projects. This creates an asset-liability mismatch which can expose them to significant foreign exchange risk (Blended Finance Task Force 2018). Denominating projects in hard currencies can be better for foreign investors but exposes the local off-taker to more foreign exchange risk, which presents its own challenges.

Some solutions to circumventing currency challenges include hedging instruments, local-currency financing for the private sector, and issuing developing country bonds on foreign exchanges. For example, The Currency Exchange Fund (TCX) pools foreign exchange risk into a global fund with a first-loss tranche that allows foreign lenders to provide local-currency loans while Guarantco offers local currency guarantees. To mitigate the risk of currency fluctuations and asset-liability mismatch in the private sector, international financial institutions such as the IFC can provide local currency financing, including loans, swaps, guarantees, and risk-sharing facilities.¹⁴ Another strategy for managing currency risk is to create pathways for developing countries and municipal governments to issue debt in their local currency on foreign exchanges, such as India's Masala bonds on the London Stock

Exchange, where investors rather than borrowers bear the currency risk.

However, at present, none of these options are sufficient to mitigate currency risk at scale and more-sustainable solutions will need to come from more-developed local capital markets and an expansion of local currency financing through local and international commercial banks (IISD 2015). Some of these macroeconomic challenges can also be mitigated by bringing more developing country institutional investors, who have more than \$5 trillion in assets under management, into deals (Blended Finance Taskforce 2018). Local institutional investors, whose balance sheets are usually denominated in local currency, are less exposed to currency risk and are often not bound by the same international financial regulations (see chart of institutional investor regulations in appendix 3) that international institutional investors must follow. These local investors also have a greater understanding of domestic markets and can be more comfortable pricing country and political risks.

Bringing local and international investors together in a deal can have powerful co-benefits. According to investors convened by the Climate Finance Leadership Initiative, “the willingness and ability of the host country and its population (pensions, entrepreneurs, sovereign wealth funds, development banks, etc.) to invest alongside international investors on pari passu or junior terms can also demonstrate local will and execution capacity, as well as local and non-local financial alignment (CFLI 2019).”¹⁵

Although these macroeconomic challenges influence the financial viability of municipal projects, as government authorities, cities have limited capacity to mitigate these risks for investors because

14 IFC has provided more than \$13 billion in local currency financing. See https://www.ifc.org/wps/wcm/connect/corp_ext_content/ifc_external_corporate_site/Solutions/Products+and+Services/Treasury-Client-Solutions.

15 Investopedia defines Pari-passu as a Latin phrase meaning “equal footing” that describes situations where two or more assets, securities, creditors, or obligations are equally managed without preference. An example of pari-passu occurs during bankruptcy proceedings: When the court reaches a verdict, the court regards all creditors equally, and the trustee will repay them the same fractional amount as other creditors at the same time.

they lack direct influence and control over foreign exchange, inflation, and interest rates, which are usually under the purview of central banks.

On the international stage, two networks have formed to share best practices and experiences on macroeconomic, fiscal, and public finance management policies for low-carbon, climate-resilient growth which should have a positive ripple effect on cities ability to attract private investment. The Network of Central Banks and Supervisors for Greening the Financial System, launched in 2017, is a group of central banks and supervisors willing to share best practices, contribute to the development of environmental and climate risk management in the financial sector, and to mobilize mainstream finance to support the transition to a sustainable economy. Similarly, the Coalition of Finance Ministers for Climate Action, which the World Bank and the International Monetary Fund co-convened for the first time in 2018, recognizes the unique role of finance ministers in addressing climate challenges and developed the Helsinki Principles and the Santiago Action Plan (World Bank 2019; Coalition of Finance Ministers for Climate Action 2019).

The coalition brings together 50 finance ministries and institutional partners, including the United Nations Development Programme, the Organization for Economic Cooperation and Development, the United Nations Framework Convention for Climate Change Secretariat, the United Nations Environment Programme Finance Initiative, the European Commission, and the NDC Partnership. While cities are not explicitly or directly included in these international processes and coalitions, addressing the macroeconomic barriers that impede private investment at the national level will likely have positive impacts for cities who must also operate within the national context. However, as cities are key levers in the transition to a resilient low-carbon world, more efforts should be made to engage cities in these international processes and coalitions and include them as important climate stakeholders from the beginning.

Policy and Regulatory Barriers

Cities

As government authority

- Lack of vertical alignment between national and subnational governments
- Limited control over policies and regulations to encourage private investment, including well-designed concessions, well-regulated tariffs, and consistent technical standards for hardware, electricity quality, and grid expansion
- Lack of strong, efficient, impartial domestic dispute resolution systems

Private Investors

- Repudiation or breach of contract
- Currency convertibility, transferability, and funds expropriation risk
- Restrictions related to international financial regulations (e.g., capital requirements, treatment of guarantees)

Long-term private investment in infrastructure, green or otherwise, requires an effective enabling environment, including strong rule of law with clear rights and obligations of private investors, and an efficient, transparent, and impartial dispute resolution system. Low-carbon projects can be particularly sensitive to policy and regulatory risks, such as tariff fluctuations for renewable energy. The risks of policy reversals and renegotiations, which can be only partially covered through political risk insurance, is a major concern for developing country investors (CFLI 2019).

Cities often lack control over policies and regulations that shape strong enabling environments for private investment and are subject to policy directives of national governments. The fiscal constraints



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that national governments place on cities increase investor risk sensitivity, which can make it especially difficult to attract private investment to cities in developing countries where there is often uncertainty over the policies that impact the financial viability of investing in low-carbon and climate resilient infrastructure, such as tax subsidies.

In addition to concerns about local regulations and policy conditions, international financial regulations prevent foreign institutional investors, including banks, pension funds, and insurers (see appendix 3 for chart on institutional financial regulations according to investor segment) from investing in emerging markets and alternative assets¹⁶ such as infrastructure. Depending on where the investor is based, different regulations and requirements apply, including liquidity, leverage, and collateral requirements. As a result of these regulations, many foreign institutional investors avoid investing in emerging markets and infrastructure even when local enabling environment conditions are attractive (Blended Finance Taskforce 2018).

16 Alternative investments are assets other than stocks, bonds and cash such as hedge funds, private equity funds, commodities, infrastructure, and real estate.

Case study 3 explores the combination of policy and financial risk-reduction tools that the municipality of Yerevan in Armenia, along with UNDP and local financial institutions, is deploying to create targeted financial incentives to address market barriers to private investment in urban energy efficiency.

Financing Barriers

Cities

As government authority

- Limited direct access to climate funds and development finance that could reduce risk of private investment

As investor

- Lack of creditworthiness of cities, who are often constrained by the creditworthiness of their host country, which can be misaligned with the city's creditworthiness
- Limited ability to raise debt or taxes to finance projects
- Limited access to affordable, concessional co-financing, especially in local currency

Private Investors

- Underdeveloped capital markets (notably corporate bond markets)
- Limited access to risk-capital, first-loss financing, or junior tranche equity to reduce risk of commercial investment
- Lack of standardized term sheets, limiting portfolio financing

Many developing countries, and consequently the cities within them, face extreme barriers to accessing finance. Ninety-three percent of low- and

lower-middle-income countries are below investment grade or are unrated, which poses a significant challenge to raising debt financing (NCE 2018).

For debt investors, whether the counterparty is a government or private project developer, there are often serious concerns about whether off-takers have sufficient balance sheets, track records, and management and operations systems to meet their requirements. Even with credit enhancements and other tools such as guarantees and political risk insurance, credit rating agencies will rarely pierce the sovereign credit ceiling¹⁷ for a bond. For equity investments, commercial and institutional investors often consider the risks of infrastructure financing to be too high (NCE 2018).

The creditworthiness of host countries, which does not always align with cities' creditworthiness and limits their ability to borrow money, often constrains cities.¹⁸ Approximately 5 percent of the largest 500 cities in developing countries are deemed creditworthy in international capital markets, and only 20 percent can access local capital markets (World Bank 2018). Development finance institutions can enhance cities' creditworthiness through financial structuring, guarantee instruments, and anchor investments, and can support cities in issuing green bonds for climate projects. Johannesburg was the first city in a developing country to issue a green bond, in 2014 and other cities and subnational entities across Asia, Africa, and Latin America are considering issuing green bonds to finance their sustainable infrastructure needs (C40 and ODI 2019). Initiatives, such as World Bank City Credit Worthiness Initiative supports cities in budget management to

attain A or B level international or local credit ratings through capacity building and technical assistance.¹⁹

Even cities in developing countries that are deemed creditworthy in international capital markets can be downgraded because of factors beyond their control, including climate risks. For example, in 2017, Moody's downgraded Cape Town, South Africa, when a major drought threatened its water security.²⁰ Downgrading a city's creditworthiness directly affects its ability to benefit from private investment and to borrow capital, and the cost of that capital, which creates a vicious cycle when cities are looking to implement projects that would reduce their emissions and increase their resilience to climate-related hazards.²¹

In addition to challenges of creditworthiness, national regulations may limit cities' ability to raise capital and fund projects, climate or otherwise, themselves. "Fiscal constraints on sub-sovereign finance—including limited capacity to impose taxes or fines that could provide a revenue base, as well as the inability to borrow from national governments, or issue municipal bonds, remain a primary barrier to investment. This means that the funds directly held by city governments will only be able to supply a small proportion of the additional resources required to build low carbon climate-resilient infrastructure. These constraints are closely tied to creditworthiness and the ability to access local and international capital markets" (C40 and ODI 2019).

A global World Bank study found that only 16 percent of countries sampled granted significant taxation autonomy to local governments, which limits their ability to raise capital to fund climate

17 Rating agencies such as S&P and Moody's will rarely allow corporate or municipal issuers to be rated above the sovereign home country credit rating. See <https://www.cfainstitute.org/en/research/cfa-digest/2017/09/dig-v47-n9-3>

18 Cities can receive investment-grade credit ratings in local debt markets even in countries that are speculative grade on the international markets. This opens a possible channel to debt financing for well-managed cities in lower-income countries. For example, capital cities Dakar (Senegal) and Kampala (Uganda) have achieved an investment-grade rating in their local markets despite international sovereign ratings of Senegal and Kampala being below investment grade (NCE 2018).

19 See <https://www.worldbank.org/en/topic/urbandevelopment/brief/city-creditworthiness-initiative>

20 See https://www.moodys.com/research/Moodys-revises-the-outlook-of-the-City-of-Cape-Towns--PR_395926

21 See <https://insideclimatenews.org/news/04082019/climate-change-ratings-agencies-financial-risk-cities-companies>

projects (Ivanyna and Shah 2012). National governments also limit local borrowing: 89 of 160 of countries forbade any kind of borrowing by local governments, and only 22 allowed local governments to borrow without restrictions (Ivanyna and Shah 2012). As a result of restricted access to local and international finance, cities in developing countries are forced to make investments on a pay-as-you-go basis, meaning that capital expenditures for infrastructure and other urban projects are restricted to funds available in a given fiscal year. This makes it particularly difficult for these cities to engage in coherent infrastructure portfolio planning or to choose options that might cost more upfront but have a lower total cost of ownership.

Beyond regulatory restrictions on raising debt through bonds and revenue through taxes, cities face unique obstacles to financing projects, including limited access to development finance from climate funds and development finance institutions. It is difficult for cities to access financing from international climate funds such as the Green Climate Fund, Adaptation Fund, and Global Environment Facility because applications must be channeled through the national government focal point. Although development finance institutions are an important source of financing for cities, these institutions must generally work with national rather than with subnational entities. Although careful application of concessional capital can mitigate risks and improve the bankability of select eligible projects, it is not a panacea for the financing challenges that cities face.

Private investors face their own financing challenges with urban investments, such as project size, underdeveloped local capital markets, and difficulty accessing concessional risk capital. “Private investors lack incentives to incur the transaction costs associated with urban financing models, including the aggregation and standardization that may be required for smaller projects, while perceptions of country, currency and exchange rate

risk and uncertain development and transaction costs can deter investors whose asset allocation may limit their exposure to low-income countries” (ADB 2017).

Although concessional risk capital can increase risk-adjusted returns for municipal projects, investors can struggle to access this financing or find the process too lengthy and cumbersome (Blended Finance Taskforce 2018). In addition, underdeveloped or nonexistent capital markets in developing countries limit liquidity if an investor wants to exit, which reduces the attractiveness of investments in these markets.

Case studies 4 (Breathe Better Bond), 1 (International Municipal Investment Fund) and 5 (Shanghai Green Urban Financing) present examples of how municipal bonds, guarantees, technical assistance, and mezzanine risk-reduction facilities developed by the IFC, World Bank, and UNCDF can crowd-in urban climate investment.

Commercial Barriers

Cities

As investor

- Consumer demand, including stability and growth prospects for infrastructure services and competitive environment
- Local developer and contractor capabilities, particularly with regard to construction and operation
- Overall size of market (stability and growth prospects) limiting size of project or investment and ability to replicate or expand

Private Investors

As investor

- (Same as above)

Commercial risks—risks inherent to the project or the market in which it operates (commercial viability and revenue risk, construction risk, operating risk, input supply risk, and force majeure risk)—also present barriers to investment, particularly in developing countries. All these risks limit the ability to structure the project to provide a reasonable economic return to investors in any market and can be more pronounced in developing countries. Furthermore, commercial risks often result in high interest rates for cities. In a context where cities need to balance affordable service delivery with their own financial sustainability, this may impact whether a project is considered viable or not.

As per the discussion above, the bankability of climate investments will vary depending on whether the investment is in a mitigation-type project, in which there is more market experience in monetizing, creating revenue streams, and allocating risk efficiently, rather than an adaptation-type project, which the market typically perceives to be a public good with no or limited market-rate returns.

Designing projects well to reduce commercial risks and getting them to a bankable state is typically expensive and can be cost prohibitive for municipalities. The capacity of municipal governments to provide experts with the knowledge to navigate these challenges is also often limited. As such, initiatives to make standardized, project frameworks, such as

the Open Source Solar Contracts²² that the International Renewable Energy Agency (IRENA) recently released, the Terrawatt Initiative, and other programs such as the IFC Scaling Solar²³ program, readily accessible can help cities overcome these commercial barriers.

Case study 6 provides an example of innovative dedicated support from the City Resilience Program that is helping cities identify and build bankable transactions in resilience.

Climate Investment Barriers

This section highlights barriers specific to climate projects and how they compound and build upon traditional project finance risks, summarized in figure 3.

Cost Structure (Higher Upfront Costs, Lower Operating Costs)

Many climate-mitigation projects, including renewable energy and electric transport, have higher upfront capital expenditures than conventional fossil fuel alternatives but lower operating and overall costs. The higher upfront costs of making a project low carbon and climate resilient, usually 5 percent to 10 percent (Bouton et al. 2015), can be difficult for investors (government and private) to justify given the time it can take for these projects to pay off, despite reducing the overall

Figure 3 Climate Investment Barriers



22 See <https://opensolarcontracts.org/>

23 See <https://www.scalingsolar.org/>

cost of ownership. It is difficult to pass these upfront costs on to consumers, and it is likely that a decision by government officials to do so would be politically unpopular. Large upfront urban investments that have long implementation timelines are also challenged by political and mayoral election cycles, where political officials wish to demonstrate quick wins and results within their terms in office.

Green bulk procurement is one approach to aggregating demand, providing a market launch pad that helps suppliers achieve economies of scale and reduce costs. Globally, public procurement accounts for 10 percent to 15 percent of GDP—much of which is from cities. This represents a huge degree of purchasing power (IFC 2017). Green procurement models should consider the total cost of ownership over the lifetime of the investment, rather than just the upfront cost (e.g., rooftop solar, e-buses). Green procurement models also need to include a mechanism to manage the risks and uncertainties of new technologies, such as financial leasing and operational leasing mechanisms instead of upfront purchase (WRI 2019).

Case study 7 describes an innovative approach to green procurement of e-buses in Santiago, Chile.

Higher Transaction and Due Diligence Costs
Low-emission and climate resilient urban infrastructure can incur high transaction and due diligence costs which reduce returns and increase projects costs, deterring critical investment by cities themselves and outside investors. “Transaction costs are already higher for infrastructure than many other asset classes and are then magnified by the real and perceived challenges of new green technology, the small scale of some projects, and the complexity of cities’ project development and financing systems” (CCFLA 2015). Other things that can increase transaction costs include a high-cost of capital, high due diligence costs and inefficient processes, all of which can create additional hurdles for financing small projects because transaction costs are often fixed.

One solution to financing smaller climate projects and reducing transaction and due diligence costs is to bundle projects together. Bundling smaller projects also has the advantages of improving liquidity, diversifying risks, enhancing underlying creditworthiness, and creating separate tranches of capital that appeal to different types of institutional investors. In addition to bundling projects, standardizing successful models once they have been proven could reduce transaction costs for funding climate projects in the \$1 million to \$5 million range that often struggle to access capital, although because blended finance transactions are often designed to meet the needs of specific investors and are often based on country and sector contexts, they can be difficult to replicate and expand.

Case study 1 outlines an innovative example of bundling climate projects into an urban climate fund structure to help lower transaction costs for pooled investment. Case study 7 features another approach where cities to act as aggregators of demand through green bulk procurement, enhancing economies of scale and reducing transaction costs of private sector developers and providers of resilient low-carbon solutions.

Green Technology Risk
A fundamental barrier to private investment in many climate projects is the underlying risk of newer technologies. Many of the green technologies that cities are looking to incorporate into their climate action plans, including battery storage, electric vehicles, and waste-to-energy projects, have not run through their projected lifespan, so there is insufficient data covering performance over the asset lifespan. This data gap introduces levels of risk and uncertainty that many investors, governments, and project developers may be unwilling to accept. “The lack of experience with and performance data for many sustainable technologies, such as anaerobic digestion for waste-to-energy projects, adds to the complexity and cost of investors’ due diligence” (CCFLA 2015).

Many green technologies are also evolving at such a rapid rate (e.g., rapid improvement and corresponding cost decline of solar photovoltaic in parallel with battery storage) that it is difficult to keep track of the latest improvements, and technologies quickly become obsolete or more expensive than future iterations. Introducing new green technologies can also require restructuring legacy systems and development of new laws and regulatory frameworks, which can delay adoption. However, as more green technologies become mainstreamed and run through their lifecycles this barrier may become less of a challenge over time.

Case study 8 features the case of urban vertical farming – a disruptive farming approach that is attractive to investors and has significant potential to help fight climate change and increase resilience in cities.

Monetizing Resilience Investments

As discussed in the previous section, one of the barriers to greater private investment in climate adaptation and resilience is the challenge of monetizing benefits and identifying clear revenue streams that would allow investors to recover their full costs over the lifetime of an asset. Adaptation and resilience projects are often focused on reducing losses from event-driven or acute effects (e.g. severe weather events) and long-term or chronic changes (e.g. drought) associated with climate change rather than generating revenue. Large infrastructure adaptation projects can incur high upfront costs and may not prove their value for decades, such as infrastructure built to withstand 50- or 100-year flood events (CCFLA 2015).

These projects can also involve the complex challenge of quantifying the value of natural capital such as coral reefs and mangroves in mitigating the effects of hydrometeorological and other natural hazards exacerbated by the compounding effects of climate change. This challenge is complex for a combination of reasons, including the inherent difficulty of monetizing socioeconomic benefits;

the often large and diverse stakeholder groups, including vulnerable populations without the ability to pay for benefits from the interventions; and uncertainties related to climate effects and timing of benefits that depend on when an extreme climate event might occur (WBG 2019b).

In order to monetize investment, governments, cities, and the private sector need approaches to properly price risk and incorporate costs of externalities into economic analysis and financial planning. However, although insurance and catastrophic risk-transfer markets offer proxy markets to price risk, this is complex, because there is no single metric, such as a price on carbon for climate mitigation, that applies to all sectors and countries. Many climate risks are local, and risks and prices will differ according to location (GCA 2019). Much more international collaboration is needed to produce global data on hazards and exposures, calculations of probabilities, and knowledge of local conditions and vulnerabilities, and to create new risk management products and pool risk across countries. To help coordinate efforts across the private sector, the World Economic Forum, Willis Towers Watson, the Global Commission on Adaptation, the Government of the United Kingdom, and the Government of Jamaica are developing the Coalition for Climate Resilient Investment, a private sector-led coalition with assets of \$8 trillion that brings together companies all along the infrastructure investment value chain (IIGCC 2019).

In addition, establishing clear climate goals, including at the city level, is particularly important for many essential adaptation projects that may not be bankable in the traditional sense but could attract investment if prioritized. Resilience bonds are a tool that city governments can use to mobilize private investment. The dividend from a resilience bond can also theoretically be used to finance projects beyond infrastructure, such as awareness campaigns and community-building exercises. Cities can link insurance coverage, such as catastrophe bonds,

with capital investments in resilient projects and systems like flood barriers and green infrastructure to anticipate and reduce the impact and losses from potential climate-related events (IFC 2018).

Case study 9 presents a very innovative and promising approach to monetizing resilience investment in natural capital assets, such as coral reefs in the tourism sector, through parametric climate insurance products financed by the private sector.

Long-Term Planning Barriers

Climate-smart urban investments and planning need to account for the effect, and growing uncertainty, of long-term climate trends and build in flexibility to harness new clean technology innovations and promote cross-sectoral, systems-based approaches. The effect of climate change on the spatial distribution and intensity of natural hazards makes planning challenging and all assessments uncertain. For instance, climate change models show a wide range of possible futures for global sea level rise and change in timing and intensity of climate patterns. The effects of technology shifts, as mentioned above, also need to be accounted for. Methodologies and approaches to long-term investment and planning within the context of uncertainty constitute a new field and include robust decision-making, decision trees, and adaptive pathways. This new field also considers methodologies that favor robust solutions that perform well across a wide range of futures, preferences, and worldviews, although

it may not be optimal in any particular scenario. However, the complexity and lack of such robust long-term methodologies and policies present a barrier to private sector signaling and investment (WBG 2019b).

There are several initiatives focusing on long-term planning at the global, national, and municipal levels that need to be well coordinated, interlinked, and reinforcing at all levels, including the 2050 Pathways Platform,²⁴ which supports countries seeking to develop long-term net-zero-GHG emissions and climate-resilient sustainable-development pathways; Vision 2050 of the World Business Council for Sustainable Development, which convenes 200 forward-thinking global companies; and the C40 Climate Action Planning Program, which supports almost 100 cities in planning for net neutrality pathways by 2050.

Case study 10 features a software tool developed by the World Bank and IFC that helps cities improve their long-term strategies for climate investments, policies, and planning opportunities. The tool provides powerful data-driven scenario planning that helps cities make decisions about the future of their energy, transport and waste systems. Case study 2 features the City Climate Finance Gap Fund—a dedicated development climate finance fund designed to support cities on strategic spatial planning and design that support low carbon, resilient development pathways upstream, particularly in rapidly urbanizing cities in developing countries.

24 See <https://www.2050pathways.org/resources/>