



*Review*

## **The greening of municipal infrastructure investments: technical assistance, instruments, and city champions**

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**Abstract:** Cities in developing countries are faced with unique problems due to climate change, internal migration and general population growth. Urban population growth brings with it many benefits, but in cash-constrained municipalities this can be particularly problematic as the financial resources cannot keep pace with municipal infrastructure needs or environmentally-responsible decision-making. The confluence of these factors has widened the infrastructure finance gap in cities in developing countries and has made municipal leaders recognize the need to expand the variety of mechanisms available to help to close the infrastructure finance gap. However, in many cities, the commitment to green principles is driven by donors and external agencies, not from a deep appreciation of best practices for green principles or even the desire to make a city more climate resilient. This paper argues that the most effective way to institutionalise green practices within a city is not through a specially-dedicated environmental strategy but rather through a more well-established champion: the city's treasurer or chief financial officer.

**Keywords:** cities; green finance; municipal finance; municipal infrastructure; developing countries; economic development; green bonds

**JEL Codes:** H70, H74, H77, O11, O18, O19, Q58, R51

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## 1. Introduction

Increasing the flow of capital into climate-smart infrastructure would reap enormous economic, social and environmental benefits for cities and investors alike. In practice, however, there are multiple barriers that must be overcome first to allow this to happen, not least of which is the need for highly-specialised expertise in the preparation of bankable projects that effectively consider climate change in the design. This expertise is typically expensive and often not affordable for most cities in developing countries, despite growing interest from investors in urban infrastructure projects. Intermediary agencies, specifically technical assistance facilities, may provide the answer. Able to draw upon a pool of specialised knowledge, they can help advise municipalities and supporting agencies on how to develop projects in line with investor needs and expectations, while simultaneously ensuring projects take into account the challenges of climate change and wider social/environmental issues. They are not without their faults and limitations, however, but are increasingly playing a significant role in supporting municipalities in developing countries to access much needed finance for their projects. Moreover, these agencies tend to focus on creating new strategies or building up new departments that are often disconnected from the question of financial mobilisation itself. Accordingly, there is little hope of institutionalisation of green finance practices within municipalities when technical assistance is donor-driven and not well-aligned with city priorities and, most appropriately, the interests of well-placed city champions.

## 2. Municipal finance: the context

Municipalities in developing countries face extreme challenges in securing financing for new infrastructure. This is especially true of smaller secondary and tertiary cities that are growing rapidly but where capacity and available resources are far more limited than in the larger megacities. Aside from the obvious implications for the municipalities' collective and individual ability (or inability) to meet the basic needs of their citizens, their constrained capacity also prevents their ability to develop sustainably and tackle climate change. Cities are very much at the forefront of the efforts to tackle climate change due to both their role as major centres of emissions—cities consume over two thirds of the world's energy and produce 70% of global CO<sub>2</sub> emissions (C40 2019)—and as concentrated locus of human vulnerability to the impacts of climate change, such as flooding and heatwaves. Massive investments are needed to help cities rapidly decarbonise their infrastructure and industry while simultaneously building their resilience to an increasing frequency and severity of extreme weather conditions.

The scale of the infrastructure financing challenges facing cities is enormous. Current projections indicate that almost 2.5 billion people could be added to urban areas by 2050, with 95% of this growth taking place in Asia and Africa (UNDESA, 2014). USD 90 trillion is estimated to be needed for investment in sustainable infrastructure by 2030 to adequately cope with this rapid growth, most of which will be in urban areas and cities (New Climate Economy, 2016). A report by McKinsey on the global infrastructure gaps estimates that the world needs to invest about 3.8% of GDP, or an average of USD 3.3 trillion a year, in infrastructure just to meet the expected rate of growth—60% of this needs to be in emerging economies. They estimate, however, that the world will fall short by roughly 11% per year, or USD 350 billion and has actually been declining in 11 of the G20 economies as a result of the global financial crisis (Woetzel, 2016). The Global

Infrastructure Hub estimates that there will be a USD 16 trillion gap between projected investments and the amount needed to provide adequate infrastructure by 2040 (GI Hub, 2019).

### *2.1. Climate-proofing infrastructure investments*

Cities must also take into consideration climate change and wider environmental and social issues when designing their projects and how this may impact upon the project's financing. In order to achieve national and sub-national climate commitments as well as broader sustainable development ambitions, infrastructure needs to be designed to minimize its carbon footprint and be as resilient to current and future climate impacts as possible. This is not an additional "nice to have" ambition, however, as failure to do so is likely to substantially increase operating costs and potentially render the infrastructure unusable in the longer term.

Infrastructure is a long-term irreversible investment, often lasting many decades or more with limited options for later retrofitting or alternative use, so decisions made now will have major implications for current and future generations. Integrating climate considerations into infrastructure planning will help ensure the projects are resilient to future impacts and avoid locking in more polluting, carbon intensive designs. In the process, this may also provide a range of wider benefits, such as cleaner air and lower traffic congestion.

As previously mentioned, cities are major emitters of carbon emissions globally due to high energy consumption and carbon-intensive infrastructure, which also contributes to wider challenges such as high levels of air pollution and energy costs for the municipality and citizens alike. Ensuring that planned infrastructure has as small an emission profile as possible or encourages low-emission behaviours amongst citizens (such as prioritizing cycling or public transport over private car use) will have a significant impact on a city's emissions. It can also lead to significant cost savings over time, as low-emission infrastructure tends to be more energy-efficient, require less fossil fuels, reduced electricity needs and encourage more compact and efficient cities (New Climate Economy, 2015).

Building the resilience of infrastructure to shocks and damage caused by climate impacts is also essential to avoid significant economic losses. In developing countries, where the impacts of climate change will be felt the hardest, infrastructure can be particularly vulnerable to extreme weather events such as flooding, erosion, storms and increasing temperatures. This can cause severe damage, loss of use and potentially make the infrastructure completely unusable, with major knock-on effects and costs for wider society and the economy. The United Nations Environment Program (UNEP) and the Bank for International Settlements (BIS) have found that natural catastrophes resulting in significant financial losses have become more frequent over the past 30 years, with rapidly rising losses (particularly uninsured losses) in developing countries as vulnerable cities expand as populations grow (Van Dahlen, 2012). Considering these changes early in the creation of project can help ensure potential climate risks are taken into account and effectively planned for, avoiding significant potential future losses for often a relatively small, incremental upfront cost that can be added on to the initial project design. For example, the Colombian port Muelles el Bosque in Cartagena is highly vulnerable to flooding from sea level rise, which would disrupt operations over extended periods of time and potentially cost around 2 million USD or 3–7% of its net income over the next decade. This could be easily avoided by the construction of a relatively cheap (380,000 USD) 20cm flood wall to counter the threat (PPIAF, 2016). In this particular case, early planning for potential climate threats can help prevent significant disruptions to operations in the future for a

negligible initial investment. Unfortunately, it is all too common for project developers and financiers to fail to take into account the risks of climate change until it is too late.

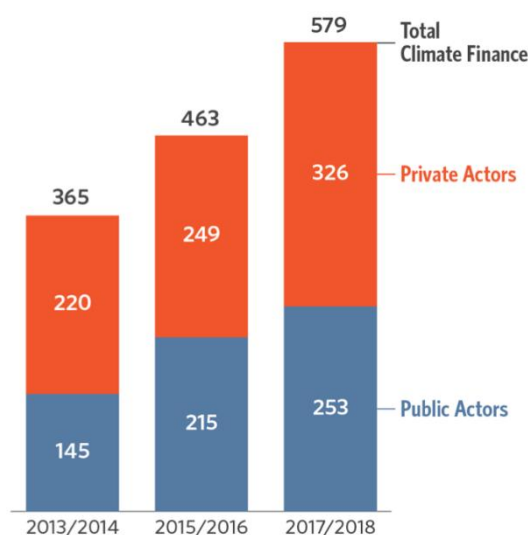
Public-private partnerships (PPPs) are a good example of where failure to consider climate proofing in infrastructure design can lead to project failure and significant losses to both parties. PPPs are increasingly popular for financing infrastructure projects in developing countries as they balance the financing and associated project risks between local government and the private sector, with responsibility for the different risks allocated to the partners best suited to handle them. While very effective in unlocking finance for projects, they can become costly for the municipalities and private sector partners if climate risks have not been taken into account in their design or in the allocation of risk. This is because that while PPPs are based upon the effective allocation of risk between the public and private sector partners, climate risks are typically not considered or allocated to a specific party to address. As a result, if an infrastructure asset fails due to a climate impact—such as a bridge damaged by excessive rain and flooding—this can prove very costly for the different parties, though it is often the municipality, as the “insurer of last resort”, that is left with majority of costs for repairs and lost revenues. As PPPs are typically long-lived (20 years+) and inflexible once created, failing to take into account these potential risks at the start can lock in serious long-term issues.

The incremental additional cost of ensuring infrastructure is designed to consider carbon emissions and potential future impacts from climate change is therefore substantially outweighed by avoided costs in terms of energy consumption and disruption/damage to future infrastructure. The cost implication for climate-smart infrastructure spending is not necessarily a huge one—often only an incremental increase in cost of a few percent. The OECD, for example, has estimated that \$6.9tn needs to be invested by 2030 to meet the Paris Agreement Goals, slightly more than the \$6.3tn needed to achieve the more modest Sustainable Development Goals (OECD, 2018). The challenge is, however, to ensure the costs and benefits are effectively distributed amongst the key stakeholders over time and that those paying for the infrastructure and bearing the risk are also the ones to realise the future benefits.

## *2.2. Financing approaches for municipalities*

This still leave the challenge of securing finance. In order for cities and municipalities to address the critical financing gaps in their infrastructure, many (particularly those in developing countries) have traditionally relied heavily on inter-governmental transfers to pay for critical projects, though this places considerable financial burden on the sovereign government and are usually insufficient for infrastructure financing. Ultimately, access to private finance will be critical, particularly as there is excess capital in global financial markets looking for suitable infrastructure projects, with a steadily growing interest from the private sector in city-level projects in developing countries.

Additionally, there has been a similar increase in the availability of climate-focused funds in the form of grants, traditional investments and blended finance, aimed at supporting the development of projects that aid long-term emissions reductions efforts and resilience building. These funds have historically been provided by donor governments and philanthropies, but over the past decade there has been a rapid growth in development banks and private companies providing financing for climate-focused projects (Figure 1).



**Figure 1.** Breakdown of global climate finance flows by public and private actors, 2013–2018 (two year average, USD billion). Source: Buchner et al. (2019) Global Landscape of Climate Finance 2019.

There is still a considerable gap, however, between the investment needs of cities in infrastructure projects and the amounts actually invested—McKinsey estimates that financing for SDG-aligned infrastructure falls short by approximately 33% each year, or just over 1 trillion USD (Woetzel, 2016). Generally, investors tend to struggle to provide financing for urban infrastructure projects in developing countries due to;

- A lack of bankable projects,
- Difficulties in managing political and macroeconomic risks,
- Poor alignment between their needs as institutional investors and the financing instruments being offered for projects.

As investors are often under considerable pressure to invest their capital with minimal risk and maximum return, they will tend to favour safer (if less attractive and impactful) projects in traditional markets they are comfortable with. In order to address these challenges, therefore, cities will need to work with investors to develop projects that both meet stringent investment criteria and the needs of the cities.

### 2.3. The development of climate-smart, bankable projects

The first step in the process is the preparation of *bankable, investment-ready* projects that are suitable for financing. This is essential for success, as poorly prepared projects will likely fail to secure investment, face significant delays and increased costs as issues are addressed and may ultimately be scrapped. Even if financing is secured, unless structured correctly it may be financially unsustainable and could leave the municipality (and its citizens) holding significant debts it may struggle to fund. A well-prepared and bankable project, on the other hand, will be much more likely to secure affordable financing and move rapidly into procurement and implementation. It will also build confidence amongst financiers in the municipality, increasing the likelihood they will invest in other projects and helping to close the infrastructure gap.

The amount of work required in creating a bankable project can often be quite substantial in practice, as many municipalities lack the internal technical expertise to develop project ideas beyond an early stage concept and may not be able to undertake the necessary feasibility studies, project structuring reviews and approvals needed before it is ready for investment. Specialized technical expertise is often required from external organisations, such as consultancies and engineering firms, which can be very expensive. Alternatively, cities can recruit and/or train staff with the necessary expertise, but this can be equally expensive and there may not be enough projects to justify their cost.

As a result, the associated costs tend to be between 5–12% of the total investment needs of an infrastructure project, running into millions (or tens of millions) of dollars depending upon its scale and complexity (GI Hub, 2019). Where cities have funds available, these costs are usually be considered a justifiable expense, to later be recovered partly or fully through the project once financing has been secured. Unfortunately, the majority of cities and municipalities rarely have the funds available to pay for this support directly.

This situation is complicated further when climate considerations are integrated into infrastructure planning and financing. As stated previously, this is not a “nice to have” option; it is increasingly essential to ensure a project’s long term viability and avoid locking a city into a high-carbon pathway, justifying the marginal increased up-front costs through significant long-term savings and avoided damage/disruption. Despite this, project planners and financiers typically have limited familiarity and knowledge of how to effectively consider climate change effectively, requiring additional knowledge and skills. International development banks, larger engineering firms and some municipalities are increasingly providing guidelines and tools for staff to support climate-smart investment planning, but it is still not particularly widespread outside of this group and the approaches are sometimes inconsistent (New Climate Economy, 2015).

The skills and expertise needed will vary substantially from project to project but there are general principles that can be applied by project developers to ensure climate change is considered in practice. The New Climate Economy programme has identified two broad principles that are widely applicable to a range of projects:

- All infrastructure policies, plans and projects should build in resilience to the risks of climate changes projected during their lifetimes,
- All infrastructure policies, plans and projects should be consistent with countries’ adopted climate targets and policies and long-term ambitions, and able to be justified in the context of the global long-term goal of holding average global warming to under 2 °C.

Development banks and finance institutions have begun to collaborate to develop far more detailed and granular approaches for specific project types and climate risks. These approaches build on best practice and bring the technical knowledge out of specialised silos within their organisations and embed it in the broader decision-making processes for project and investment planning. There is an enormous amount of work still to do, however, as it is still a relatively new area for most organisations and current tools and practices are far from perfect.

The process of climate-proofing infrastructure projects actually begins long before individual projects are identified. A city’s overarching development strategy and capital investment planning, developed by the municipality and with the input of key stakeholders, tends to identify where new infrastructure is needed (or old infrastructure improved), how it should be developed to best meet the needs of citizens and wider development goals, as well as the options for financing. In reality, however, the quality of these plans can vary massively and may be lacking in detail and background

analysis—future climate risks, for example, may not be considered at all. National and city governments initially need to develop overarching policies, guidance and capital investment plans that take mainstream climate considerations into all decision-making processes and provide the necessary incentives for project developers. This will also ensure that projects that are not supportive of helping to achieve emissions reductions and/or are highly vulnerable to future climate impacts are de-prioritized, redesigned or even discarded altogether, while those that are receive greater support and prioritized. Importantly, it also signals to potential investors that these issues are being considered seriously and that there is a consistency of approach being applied in the development of projects, a major source of uncertainty for investors.

Once projects have been identified, they have to then be assessed from a climate perspective that considers both the potential emissions from the whole project lifecycle (construction, operation, decommissioning) and its vulnerability to a range of direct and indirect climate impacts. Depending upon the nature of the infrastructure project, this can potentially be a particularly complex process that requires significant data and technical expertise to complete, but general good practice guidelines and sources of affordable high-quality data are becoming increasingly widespread. Components of an assessment would include;

- Potential GHG impact over the project’s lifespan,
- Implications of climate for cost and revenue streams e.g. impact of future carbon pricing or fossil fuel subsidy changes on operating costs,
- Vulnerability to different climate impacts under different climate scenario conditions, including a cost-benefit analysis of different risk mitigation options.

This assessment can then be included with the economic assessment of the project, with recommendations for potential modifications and changes in design to achieve optimal results. Increasingly sophisticated frameworks have been developed by organisations such as the Green Investment Bank in the UK that provide highly tailored guidance and costing frameworks that incentivise and drive decision-making to support climate smart infrastructure designs and financing agreements. The re-insurance company Swiss Re has developed an Economics of Climate Adaptation (ECA) methodology to support decision making on climate risks in different regions and design adaptation strategies.

#### *2.4. The design and role of technical assistance/project preparation facilities*

Developing bankable, climate-smart infrastructure projects requires skills and expertise that are not immediately available within municipal administrations. The most practical solution therefore for most cities and potential financiers is to work with Project Preparation Facilities (PPFs) that can provide a range of support in preparing a suitable investment proposal for a project, both helping to advise on the shaping of the project to improve its suitability for financing and work with potential investors to ensure the appropriate financing mechanisms are created.

There are a wide range of different PPF models but generally they are intended to be centres of expertise in project structuring and financing, often based within a larger financial institution (such as a development bank) or operating independently on behalf of government agencies or groups of financial institutions. They employ, directly or indirectly, a range of specialists who have expertise in different types of project structuring and financing as well as technical experts in specific

infrastructure project types (such as public transport, sanitation, etc) where needed. They will typically be able to;

- Understand whether the enabling environment for a project exists, such as necessary regulatory frameworks and policies to support the project,
- Ensure a project is clearly defined, including partners, project champions, project outputs, etc,
- Assess the project feasibility, including the organisational and financial capacity to sponsor a project and whether the necessary modelling has been completed,
- Advise on how to structure the project appropriately, such as its legal status,
- Ensure that the transaction and closure procedures for the project are defined and in place,
- Help ensure the monitoring and evaluation of the project's implementation is in place.

The project preparation process is multi-disciplinary in nature, requiring a wide array of different skills and expertise to deliver. The advantage of PPFs are that they are able to provide the needed expertise and sophisticated approaches necessary for all phases of developing a strong, bankable project, covering the whole life-cycle of the process, from concept development to implementation. They can rapidly identify suitable projects for financing and provide the necessary support to help the project sponsor through the different steps in the process. As they will work on multiple projects across a range of cities/locations at the same time, they can justify maintaining a large team of specialists that can be deployed on different projects as needed. In addition, they also maintain the institutional knowledge to provide capacity building support to city administrations, helping train municipal staff in the different processes and reducing their reliance on external support for financing projects in the future. To ensure projects are climate-smart, PPFs are able to draw upon a larger pool of expertise globally, ranging from climate data scientists to specialised engineering expertise.

PPFs will generally not charge the city/financiers the costs of the process up-front, being either funded to deliver their services by a third party (such as a national government or international donor agency) or will be paid upon successful completion of the project out of the financing agreement, or a combination of the two. It will often be based within a suitable organisation that can draw upon a wider pool of expertise (and potentially financing) as required, such as a development bank, or within an agency that directly works with cities and other bodies as part of its mandate.

Many PPFs have been created over the years to support investment in sustainable infrastructure, though most have tended to focus on support national and regional in the development of projects. City-focused PPFs are less common, though several have been set up over the past few years, most in Africa, Asia and Latin America. Several have also been established in Europe and North America, as many smaller, secondary cities struggle to secure financing for infrastructure projects, facing similar challenges to their peers in developing countries. A few examples include:

- The European Bank for Reconstruction & Development (EBRD)'s Sustainable Energy Initiative (SEI), providing financing and capacity development to develop local infrastructure projects in Eastern Europe, the Mediterranean and neighbouring regions. Interestingly, the sustainability and climate impact/vulnerability of projects is considered within the context of the economic transition of the wider region.
- The Cities Development Initiative Asia (CDIA) established by the Asian Development Bank (ADB) and the Government of Germany to support medium-sized cities in Asia to bridge the gap between their development plans and the implementation of their infrastructure projects.



- The Global Infrastructure Facility (GIF) of the World Bank, established in 2015 to increase the number of “bankable” infrastructure projects with a focus on complex projects with strong potential for private sector financing.
- The New Partnership for Africa’s Development Infrastructure Project Preparation Facility (NEPAD-IPPF), a consortium led by the African Development Bank (AfDB) with financial donors and international construction firms.

Several similar institutions also exist in Europe, hosted by entities such as the European Investment Bank (EIB) to support investment in secondary cities in the region. The creation of these institutions has been driven by development banks that are seeking to drive greater investment into sustainable infrastructure projects in cities but are faced by a severe shortage of good quality projects that meet their necessary requirements for financing.

An alternative model is Project Development Funds (PDFs), financing vehicles often established by national governments to drive the necessary investments into critical infrastructure. PDFs are often connected to a revolving fund and focus on public-private partnership (PPPs) which tend to have higher project preparation costs. Generally, PDFs cover many of the same functions of PPFs, but are focused exclusively on delivering PPP projects in a specific country. For example, the Government of Indonesia established a PDF to support the establishment of PPP infrastructure projects across the country, focusing in particular on mid-stage activities (such as feasibility studies) that help the PPPs secure external financing.

#### 2.4.1. Strengths & weaknesses of PPFs

PPFs have seen a surge in popularity in recent years due to the value they provide in unlocking finance for much-needed projects, with most (80%) having been created since 2015. An estimated US\$ 600m has been dedicated to PPFs created by development banks since 2015, managing projects with an estimated value of US\$ 50bn in total (author calculation from aggregation of activities of PPFs).

PPFs clearly provide a number of advantages, hence their popularity, but they also have a few weaknesses that must be considered as well and are not a silver bullet to all the challenges that may hold up or prevent a project from proceeding. Generally, these disadvantages and limitations are outweighed by the value of the support PPFs are able to provide to cities in developing countries, particularly considering the desperate need for investment in infrastructure.

#### 2.4.2. PPF advantages

The main advantage of PPFs is that they help to rapidly accelerate the development and financing of infrastructure projects in cities and regions, many of which would struggle to progress otherwise. Their early involvement can help municipalities identify which projects are most likely to be successful in securing financing and more quickly prepare projects in line with investor needs. This can also help municipalities quickly redesign projects if needed and abandon those unlikely to succeed, saving considerable time and expense on the part of the cities. From a climate perspective, PPFs can maintain an internal pool of expertise in areas that are most relevant for helping to decarbonise a city, such as the financing of electric public transport systems, for example, or build its resilience by assessing the resilience of a project and the implications of changing climate conditions

on a projects long-term costs and financing. This expertise is generally rarely available for most municipalities and often in financial institutions as well.

At a broader level, PPFs are able to help support governments (national and local) to create a more supportive enabling environment by advising on policy and legislative measures to help unlock infrastructure financing. As a trusted intermediary, they have access to financial institutions that municipalities may struggle to engage with and can ensure that projects are developed in line with their expectations. This can help reassure investors of a project's viability and put in place any necessary measures to reduce project risk, increasing their willingness to work with municipalities they may traditionally be hesitant to work with.

PPFs can also address capacity gaps by building municipal expertise in the development and financing of infrastructure projects through the process, increasing a city's ability to rapidly develop bankable projects that also meet the needs of their citizens and take into account wider social, environmental and governance issues. This in turn can help improve a municipality's creditworthiness, increasing the availability of capital for future projects while reducing its cost.

#### 2.4.3. PPF disadvantages

PPFs are not without their faults and limitations, however. As such, they should not be considered to be a "silver bullet" to the financing challenges for cities in developing countries, though they could still provide considerable support.

One challenge is their cost—PPFs can be expensive to operate due to the need to maintain a large pool of specialist experts and therefore need to ensure a good rate of success to justify their existence to their funders, whether grant-making bodies or financial institutions. This may deter them from focusing on projects that may be of significant importance to a municipality and its citizens but which would be unlikely to be particularly attractive to external investors or may require substantial time to develop, pushing up costs and reducing likelihood of success. PPFs may be forced to favour projects more likely to provide a good return on investment. They may also be deterred from working with cities in countries or regions with more difficult political or economic circumstances, as this can drive up project costs and reduce the likelihood of successful project completion—while this is completely understandable from a financial perspective, cities in the regions are often the most in need of financing support for their projects.

Another challenge is the ownership of the project. Ultimately, PPFs can only advise and support a municipality in the development and financing of their projects, they do ultimately own it and cannot make critical decisions without the permission of the project owner, such as the municipality itself. This is generally not a significant problem where there is good alignment between the objectives of the project owner and the PPF but can significantly delay or prevent a project's progress where there is a misalignment. This can be particularly challenging due to election cycles when Mayor's and their staff may feel under pressure to change their priorities and focus in order to cater to voter interests, potentially threatening longer-term infrastructure projects that require much greater policy stability. Projects that the city and the PPF may have been developing for several years can be abandoned or significantly changed to appeal to voter interests or biases. Even if not abandoned, investors can be deterred if they do not feel there is enough policy stability or commitment to the delivery of the project. There is only so much a PPF can do to mitigate this quite substantial risk.

Finally, it must be remembered that PPFs may have a particular set of projects and financing options/relationships they prioritize, often reflecting the interests of the organisations they are based in (such as development banks) or their areas of competency. They may, for example, only want to focus on projects and financing approaches that their sponsoring organisation may prefer—this could be a particular project type or financing solution that they can provide. Where the PPF’s sponsor is a bilateral donor agency, they may be encouraged to support projects that achieve a political goal (such as showing the donor agency’s support for particular project types, such as electrification of public transport, in the recipient country) rather than projects which may be more needed by the cities and their citizens. As a result, PPFs can promote a particular route which may not be in the best interests of the cities or discourage cities from pursuing projects and financing options where the PPF and their sponsors have less interest.

### *2.5. Conclusions: municipal finance and technical assistance*

In all of the above modalities for technical assistance, there is an overarching assumption that the city itself will have the ability to designate the right individuals to act as initiative champions or sponsors and that, within this set, there will be a fundamental appreciation of the need for climate-smart investments. This assumption has proven, thus far, to be unsuccessful and necessitates that intermediary agencies themselves work in tandem with the city to identify the most appropriate internal champions. As an example, take the presentation approach often embraced by externally-designated officials for championing climate change:

Climate-smart urban infrastructure will help the city to be more resilient to external shocks driven by global warming and increased scarcity of natural resources.<sup>1</sup>

Compare that with a finance-focused argument, given by a city treasurer, which might centre on:

Over the lifespan of a given asset, the operating costs for climate-smart urban infrastructure are demonstrated to be as low as half the cost of traditional urban infrastructure, which can dramatically save costs for the municipal budget.

Accordingly, grounding climate-smart infrastructure investments in financial departments, rather than environmental ones, can yield better long-term outcomes.

## **3. Instruments for financing climate-smart infrastructure: the context**

Technical assistance is critically important in preparing municipalities, particularly those in developing countries, for transactions that can raise needed finance for infrastructure. However, even when well-prepared, transactions do not always reach financial close due primarily to a mismatch between the needs and expectations of the seekers and sources of capital. Nonetheless, there are examples from across the developing world of successful transactions, as demonstrated in the following section. In the examples that follow, all of them were closed through the involvement of the planning, environmental and financial departments of the cities themselves; it is arguable that any approach that did not involve all three would have failed to achieve financial close.

Estimating the municipal infrastructure financing gap in developing countries as a percentage of the USD 16 trillion global gap can be difficult as projects that are not sponsored by municipalities can still

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<sup>1</sup> Presentation on climate change and infrastructure resilience from UCLG conference, November 2019.

count as urban infrastructure investments. For the purposes of this article, the financial instruments considered are those that municipalities themselves are directly involved in sponsoring or implementing. Whilst cities in developed countries regularly take advantage of a broad toolbox of mechanisms to raise capital, cities in developing countries often lag due to a mix of challenges, from political decentralisation to human capacity restraints to financial sophistication of potential lenders and investors.

### *3.1. Financial instruments: the basics*

When coupling responsible stewardship of the environment with economic development of urban areas, it is critical to remember the constraints many municipalities in developing countries are facing. The world's fastest-expanding urban agglomerations are now in developing countries. Rural to urban migration, combined with the effects of urban population growth, could add another 2.5 billion to the world's urban population by 2050. Close to 90 percent of this increase will be in Asia and Africa (UNDESA, 2014). The future development of emerging markets now depends significantly on how well urbanization is managed in cities and towns. The growth of cities and towns makes functional and fiscal decentralization more necessary, and in many countries local autonomy is growing. Cities in developing countries often have mandates to provide basic services and infrastructure and are increasingly held responsible for resilience building, and climate mitigation and adaptation. However, rarely is this increase in responsibilities and expenditure matched by increased municipal budgets.

Financial options available to cities in most developing countries have not kept pace with the growth and increasing complexity of the cities themselves. Cities are stuck in a vicious cycle of limited resources leading to a constrained response, while the population of the city and the demand for services continues to grow. Even when government transfers are predictable and generous (which is often the exception), they are rarely adequate to finance major infrastructure improvements in growing cities. The capital investment financing that is available to local governments is often provided by national agencies whose access to capital is highly constrained. Winning funding allocations from national budgets requires local governments to compete with line ministries and other priorities of the government in power. The need for co-financing with private capital is obvious and understood. However, the challenge is to bring borrowers and lenders together in a market relationship, and managing the risks inherent in this type of financing.

Following the first section's treatment of the types of technical assistance available for municipalities looking to develop green, financially-sustainable projects, this second section will review some of the most relevant instruments for meeting the financing needs for the delivery of green projects. Before considering these tools at the disposal of cities, though, it is important to pause to consider a sensitive question: the expectations of providers of technical assistance as a precursor to financial mobilisation, or so-called "tied aid".

The theory of "tied aid" can lead to a mis-alignment of expectations between recipients and providers of free technical assistance. The OECD encourages the untying of aid, explaining that "tied aid describes official grants or loans that limit procurement to companies in the donor country or in a small group of countries. Tied aid therefore often prevents recipient countries from receiving good value for money for services, goods, or works". Untying aid—removing the legal and regulatory barriers to open competition for aid funded procurement—generally increases aid effectiveness by reducing transaction costs and improving the ability of recipient countries to set their own course. It

also allows donors to take greater care in aligning their aid programmes with the objectives and financial management systems of recipient countries (OECD Untied Aid). In effect, municipalities have taken decisions on support from foundations and donors based not on need but based on concerns that acceptance of support is an implicit recognition of a future expectation to borrow from a development finance institution linked to the provider of technical assistance. This phenomenon significantly distorts the market, driving decisions that are not in the best interest of the recipient of support, but instead in the interest of creating a pipeline for subsequent transactions. There are, of course, exceptions to this blanket assertion, particularly when the donor countries coordinate their aid policies with the recipient countries to ensure mutual benefit from both sides (Kim, 2016), but this tends to not hold for sub-national governments as they often suffer from mis-alignment with their own national governments.

Putting aside the question of “tied aid”, the sources of funds for cities in developing countries can be grouped into categories according to the provenance of the money and the need for repayment. Table 1 presents these financial flows from the perspective of their origin, not their use. The first two rows, taken together as representative of regularly-available finance; which is largely uni-directional, meaning that the funds flow from the source into projects and do not need to generate revenue sufficient for repayment of the capital investment or interest associated with the funding. Conversely, the lower half of the table contains instruments that are almost exclusively repayable in nature; for sources of repayable finance to feel confident of the repayment of their loans, municipalities need to be able to demonstrate, either formally or informally, their willingness and ability to repay (collectively known as their creditworthiness). In addition to these flows, innovations to raise funds for specific projects have led to a new category of project finance. This new category allows municipalities to generate money for projects without needing to directly contribute the full amount (as in the case of partnerships between the city as the public party to a private sector counterparty).

**Table 1.** Sources of finance for municipal investment.

	Non-repayable	Repayable
Citizen Payments	Taxes User Fees/Tariffs Land Value Capture	
Exclusively Public	Transfers from National Government	Municipal Development Funds
May be Public or Private	Grants	Local Government Funding Agency Concessionary Loans from Development Finance Institutions Municipal Bonds
Exclusively Private		Market-rate Loans from Commercial Banks

Before looking to raise capital from external sources, cities can look to maximise their own-source revenues. Beyond looking at the traditional options of increasing their billing and collection efficiency, cities can also benefit from innovations, such as those in land value capture, as a mechanism for increased financial flows. In all cases, and with reference to this paper’s main theme, the inclusion of advances in technology (through the incorporation, for example, of e-billing and payment systems) can dramatically reduce greenhouse gas emissions. An innovative case study can

be found in reviewing the Ugandan capital, Kampala, in demonstrating how improved billing and collection efficiency can reduce GHG emission through the modernisation of collection using cadastral mapping, geolocation, automated bill-pay (Gorelick, 2018).

### *3.2. Debt financing instruments*

Taxes, tariffs and transfers do not generate sufficient finance for cities to meet their long-term investment needs. As a result, cities have developed creative instruments that can cover the cost of their financial needs by borrowing from a number of different sources of capital: financial institutions, civic-minded citizens, and others.

Public sector financing is usually 100% debt financing (i.e., fully leveraged with no equity capital at risk). The cost of this debt financing is significantly lower relative to the private sector due largely to taxes and other public assets that effectively serve as collateral on the debt. Taxpayers are thus de facto equity holders of government investments, and any risks associated with these investments are ultimately borne by the taxpayers. These risks, however, are not reflected in the debt financing costs per se because they are considered relatively risk-free, implying that taxpayers are obligated to make the debt holders whole in one way or another. Traditionally, this borrowing has taken the form of loans or bonds. Loans are typically bilateral instruments between a sole borrower and a sole lender through a negotiated transaction between both parties. Bonds are typically instruments with a sole borrower and multiple sources of capital through a public transaction, refereed by a financial regulator and an advocate for the prospective bondholders, or a trustee.

Within this context, it is critically important to recognise the relatively weak financial stature of municipalities. A 2013 World Bank report demonstrated that less than 20% of cities in developing countries have access to local capital markets, through, for example, issuing bonds to investors. Only 4% of cities deemed creditworthy enough to access international capital markets (World Bank, 2013).

One of the most straightforward instruments, domestic municipal development funds, allows for financial flows which are managed, typically, through oversight from the national government whereby the funds themselves are capitalised by a diversified pool of development finance institutions and the national government itself. For example, Canada's Green Municipal Fund has incorporated a green window into its municipal development funds, with a goal of ultimately phasing this out with mandate that all projects incorporate green elements. To date, the Fund has supported 1,310 municipal sustainability initiatives, which has led to a reduction in GHG emission by 2.6 million tons and created 10,738 person-years of employment across the country. Requests for financing flow through the same channel as any other prospective municipal investment, with cities submitting a comprehensive application including details on project financial sustainability, engineering specifications, borrower creditworthiness, and other key information, all of which is reviewed by an investment review committee (Green Municipal Fund). This approach could work particularly well in developing countries that already have municipal development funds; the fund's existing architecture could absorb an expanded mandate and borrowers could work within an already-familiar system.

As the needs of cities grow, the lending capacity of municipal development funds is often to help cities to deliver against their capital investment plans. Development finance institutions, which have the capacity to offer longer maturities and lower interest rates when compared with other financiers, can help cities to achieve their financing goals.

However, despite their mandate to encourage growth, city leaders occasionally are frustrated by the pace with which development finance institutions approve transactions; commercial banks play an important role in financing cities with urgent projects. As these banks, whether domestic or international, have prioritised the origination of loans for urban infrastructure projects with green components, cities can negotiate for better terms, and often see better results, after incorporating climate-smart elements. Examples can be found around the world of commercial banks that have adopted green strategies in recognition of the overall health and economic benefits. A Greek bank, Piraeus, based its decisions partially on research-based evidence that demonstrated that air pollution yields a gain of 17,850 working days based on a reduction in absences from work due to illness stemming directly from particulates in the air (Piraeus Bank).

Those cities that are no longer eligible for funding from development finance institutions and have demonstrated strong creditworthiness have recognised that financing for long-term investments can be more affordably achieved through the use of municipal bonds. Recently, cities in developing countries have begun to experiment with the use of green municipal bonds, where the proceeds from capital raises are targeted on infrastructure projects with green elements. Therefore, driven by the increased demand for financial resources to cover the cost of ever-larger projects coupled with the demonstration of creditworthiness to the investment community, metropolises in developing countries have had varying degrees of success in looking beyond commercial loans to municipal bond issuance in local capital markets.

### 3.2.1. Green bonds: understanding the green bond market

The Green Bond market faces the usual challenges of a nascent market. An often-cited hurdle is the lack of a universally accepted definition and auditing standard for Green Bonds. The total market for “climate-aligned bonds”, which are regular bonds that have a climate component, is \$694 billion; only 20% of this amount is officially labelled as Green Bonds (\$118 billion).

Institutional investors that are buying “green bonds” regularly state as a common fear that the lack of a definition and globally accepted measurement standards could open the door to “green washing”, which occurs when a project is marketed as environmentally friendly but turns out to be less beneficial than investors are led to believe, or when proceeds could be used for other non-green projects. There are no quantitative statistics that show how likely it is that greenwashing will occur, or under what circumstances it is more likely. In 2017’s Green Finance Summit organized by the City of London’s Green Finance Initiative, Philip Brown from Citi Group has cited the fact that over half of corporate green bonds issued have been used to re-finance current bonds and are not ‘fresh’ issuance indicating that the innovation and green credibility might be lacking. Accordingly, greenwashing would most likely undermine investor confidence in the market and the green bond movement itself.

There are various initiatives underway to improve standards and definitions. The International Capital Markets Association (ICMA), for example, issued a set of Green Bond Principles covering: 1) use of proceeds, 2) process for project evaluation and selection, 3) management of proceeds and 4) reporting. Another standard has been advocated by the Climate Bonds Initiative (CBI), an investor-focused not-for-profit organization. It aims to go a step beyond the ICMA’s principles with the creation of a certification system. Importantly, with respect to market standardization and guidelines,

it is important to note that green bonds serve the dual purposes of first, an investment instrument and, second, as a sustainable development instrument.

When considering green municipal bonds in the context of developing countries, there are very few successful examples, largely driven by the fact cities themselves struggle to issue any type of bond (Gorelick, 2018). Yet, while most cities in sub-Saharan Africa have been unsuccessful in launching municipal bonds for many of the reasons cited above, two South African cities—Johannesburg and Cape Town—have issued green municipal bonds that have been readily absorbed by the market.

South Africa, and Johannesburg in particular, has traditionally been a pioneer in Africa's capital markets. Alone in sub-Saharan Africa, South Africa explicitly and constitutionally enshrines the right of municipalities to borrow, through the Municipal Finance Management Act (MFMA, Act No. 56 of 2003). The MFMA, implemented in 2004, ensures that borrowed capital is used only for infrastructure investments, as long-term debt can only be raised to finance capital expenditures and not to fund current expenses. Thus, a bond issuance cannot be used to balance the budget due to a shortfall in any given year. Therefore, unlike what happens in most of sub-Saharan Africa, local governments across South Africa were given significant latitude to creatively pursue municipal debt through capital market transactions, while simultaneously understanding that there would be no safety net in the case of an inability to meet the debt service requirements stipulated in the transaction documents (Bloch, 2000).

### 3.2.2. Johannesburg: a case study

The City of Johannesburg, with its April 2004 issuance, marked the beginning of the post-apartheid municipal bond era in South Africa. The locally denominated, six-year transaction of ZAR 1 billion (approximately USD 159 million) was viewed as highly attractive for investors, particularly because it was offered at a rate that was 230 basis points over the government benchmark bond, or at a nominal interest rate of 11.95%. This relatively high price, coupled with a sense of national pride at pioneering Africa's first municipal bond, generated overwhelming demand, and the bond was oversubscribed threefold at primary issuance (Coetzee, 2013; Mantso & Blaauw, 2009). The minimum increment size was ZAR 1,000,000 (or USD 159,000), signaling an intention on the part of the City to have investors that were either institutions or high net worth individuals. Only two months later, the City issued a second bond, seeking to raise a total of ZAR 1 billion. To reassure investors that Johannesburg was not taking on an unsustainable amount of debt, and to extend the maturity to 12 years, the municipality solicited an aggregate guarantee of 40% (with two matching guarantees of 20% each from the International Finance Corporation and the Development Bank of Southern Africa). Due to the credit enhancement, and despite a doubling in the bond's length, the premium paid by the City over the benchmark treasury curve was reduced to 164 basis points, with a nominal interest rate of 11.9%, again based on prevailing interest rates at the time.

The City of Johannesburg has successfully transitioned away from exclusive reliance on loans from development finance institutions and commercial banks to source its long-term debt. Since the issuance of the first municipal bond in 2004 by Johannesburg, other large cities in South Africa have been relying on capital markets investors to provide financing for infrastructure as part of a larger suite of financial tools. South Africa's success has inspired other countries across sub-Saharan Africa to look more closely at their experience and the potential for its replicability. Unfortunately, many



opportunities for replication are thwarted in inception due to the lack of corollary commitment to a more complete devolution of financial decision-making power from the national government to sub-national government (ideally enshrined in the Constitution).

The city of Johannesburg launched Africa's first green bond in June 2014; the proceeds from this 10-year 1.46 billion rand issuance have been used to improve and expedite the implementation of its climate change mitigation strategy and move the City towards a low carbon infrastructure, minimal resource reliance and increased preservation of natural resources (JSE, 2014).

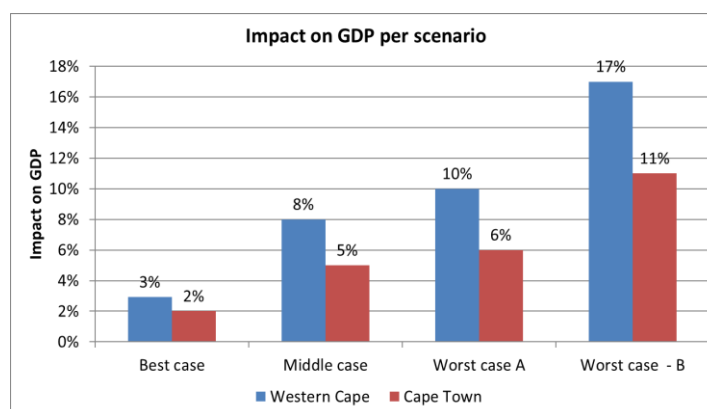
Executive Mayor Parks Tau was quoted as noting that this transaction was 1.5 times oversubscribed, which, according to the Mayor, clearly demonstrates investor confidence in City of Johannesburg and commitment to environmental stewardship and climate change, while receiving a market related financial return. The bulk of the buyers of the city's green bond issuance were the traditional buyers of Johannesburg's debt—institutional investors with an appetite for long-term exposure to the city—although the green designation helped the city to be more attractive to investors with a green mandate.

### 3.2.3. Capetown: a case study

In Cape Town, the 1 billion rand (USD 76 million) transaction was successfully closed on July 12, 2017, with a significant amount of oversubscription; within two hours of bidding, 29 investors made offers totaling R4.3 billion in response to the R1 billion being sought (Fin24 2017). Proceeds from the transaction have been targeted at:

- Procurement of electric busses
- Energy efficiency in buildings
- Water management initiatives
- Water meter installations and replacements
- Water pressure management
- Upgrades to reservoirs
- Sewage effluent treatment
- Rehabilitation and protection of coastal structures

Unfortunately, this transaction was insufficient to stop the pending drought. A study commissioned by South Africa's Western Cape Department of Economic Development and Tourism during the height of the drought that hit Cape Town and the surrounding areas highlighted the devastating potential impact of maintaining status quo—a dramatic drop in GDP (as shown below).



**Figure 2.** Projected Range of impact on GDP from prolonged water drought in Western Cape and City of Cape Town, South Africa.

Only with an appreciation of the information in the above graphic did Cape Town undertake a number of simultaneous steps that effectively arrested the approach of the anticipated “Day Zero”.

Despite a strong appreciation for both the types of technical assistance required to develop financially-sustainable, environmentally-sensitive projects as well as the types of instruments that are best suited for their delivery, cities in developing countries are challenged in the execution of these objectives. Shortfalls include:

- Challenges in defining, and subsequently maintaining green status. As elaborated above, the international financial community has not yet agreed upon a universally-applicable and acknowledged definition for the term green, which poses complications in the labelling of green investments and the subsequent maintenance of green accreditation.
- Prioritisation of green projects in the face of other more immediate needs. While city leaders around the world recognise that green investments are both climate-friendly and demonstrably less expensive in the long-run, municipal councils and other decision-makers are often forced to subordinate their desire to introduce green projects, and access green finance, in favour of delivery using more traditional, less green methods.
- Limited ability to operate and maintain green investments. In line with the preceding point, municipalities often anticipate challenges in the operation and maintenance of green investments, which typically require non-traditional skills, ultimately increasing the reliance on external advisory services to ensure that capital investments reach their expected useful life.
- Limited understanding of green finance in local markets. As many sub-national governments are exclusively limited to borrowing in local currency, cities seeking finance need to rely on the sophistication of local investors and in their appreciation of green projects as the beneficiaries of climate-smart financing tools. The relatively weak performance of sovereign governments in developing countries only serves to underscore this point, limiting the total number of non-domestic lenders willing to consider cities as borrowers.

Yet, the numbers of cities in developing countries exploring ways to better finance their green projects increases every year. These cities, like Cape Town in the above example, are understanding the negative impact of a failure to act, and that decisive actions are required to meet their goals for urban sustainability. Accordingly, there is undoubtedly a growing interest, and a growing need for a

diversification of technical assistance and financial instruments to help cities to realise their collective goals.

#### 4. Discussion

The evidence presented has shown that cities in developing countries not only have access to international best practices in raising funds for climate-smart infrastructure, and yet there are limited examples of successful implementation. This is predominantly due to the inability to introduce these ideas, in most instances, within a constrained environment where financial viability outshines environmental concerns and, more important, there are few internal municipal officials with the seniority to effectively serve as champions. The theory of change associated with this argument, introduced here by the authors, postulates that:

If each city's chief financial officer or treasurer embraces best practices in green finance and if that same individual can objectively demonstrate the financial benefits to the city of pursuing a more green strategy in its infrastructure investment and capital investment plan, then more cities around the world would adopt policies that encourage green investment. However, if the status quo is maintained where green policies are encouraged by external bodies that do not ultimately have seniority within city frameworks to promote green practices and if those policies are separated from financial concerns, then the frequency of green transactions will not significantly increase.

This theory is grounded in case studies of cities that have received support for green or resilient strategies from charitable foundations and aid agencies only to ultimately not be successful in institutionalizing this approach.

#### 5. Conclusion

The hypothesis of this paper, that cities in developing countries can best achieve long-term success in financing climate-smart infrastructure as part of a long-term capital investment plan, is driven by the fact that sub-national governments in developing countries have largely failed to make green investments without the aid of external agencies. Sufficient support through the process, coupled with the existence of appropriate tools, should facilitate financial flows; yet, without the appropriate champions in the form of city treasurers and chief financial officers, as argued in this paper, there is limited chance of meaningful progress.

#### Conflict of interest

All authors declare no conflict of interest in this paper.

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