Contracts, Not Concrete: De-Risking Private Finance of Sustainable Infrastructure in Emerging Markets

By

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Submitted to MIT Sloan School of Management on May 6, 2016 in Partial fulfillment of the requirements for the Degree of Master of Science in Management Studies.

ABSTRACT

Matching long-term infrastructure demands in emerging markets with long-dated capital supply – from pension funds, insurers or sovereign wealth funds – has never been so high on the agenda of governments, climate funds and multilateral development banks. It has been argued that with the right policies and incentives in place, and with careful use of development capital and climate finance, private investors can make a profit financing emerging market infrastructure needs in a sustainable manner. However, this focus on policies and incentives constitutes a model of infrastructure investment risks comprised of country-level and sector-specific macro correlates. In fact there are significant contract-level micro correlates of infrastructure investment risks.

Despite the literature on private demand for sustainable infrastructure investments, few have considered the effects of supply constraints on the process. Infrastructure is not yet clearly an asset class and sustainable infrastructure presents greater uncertainty because technologies are new, funding models are uncertain, financing instruments are inadequate, and there is a paucity of cash-flow data with which to forecast risk-adjusted returns. Substantial private investment in infrastructure cannot take place without adequate measures of expected risk and performance – measures which the market has failed to supply.

If sustainable infrastructure is to become an asset class, relevant to the asset-allocation and liability-management of investors, then a change of focus is required from the governments, MDBs, sponsors and climate funds who provide institutional investors with access to sustainable infrastructure assets. The focus should be on collecting project cash-flow data to help answer open questions about cash-flow performance and risks, a task that requires large scale collaboration.

Better information on cash-flow performance by contract-level variables enables benchmarking of infrastructure investments in a manner which can add value to strategic asset-allocation decisions. This focus on contracts—not concrete – offers great potential both to de-risk infrastructure investments and to influence up-stream project preparation in emerging markets.

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List of Selected Acronyms

ADB – Asian Development Bank
AfDB – African Development Bank
AUM – Assets Under Management
CFI – Climate Finance Institution
DFI – Development Finance Institution
EBRD – European Bank for Reconstruction and Development
EMDEs – Emerging Markets and Developing Economies
GCF – The Green Climate Fund
GGGI – The Global Green Growth Institute
GHG – Greenhouse Gases
GIH – Global Infrastructure Hub
IFC – The International Financial Corporation
IRR – Internal Rate of Return
MDB – Multilateral Development Bank
MIGA – Multilateral Investment Guarantee Agency
NPV – Net Present Value
ODA – Overseas Development Assistance
PE Funds – Private Equity Funds
PIDG – Private Infrastructure Development Group
PPF – Project Preparation Facility
PPP – Public Private Partnership

REIPPP – Renewable Independent Power Producer Program

RFP – Request for Proposals

SEC – Securities and Exchange Commission

SDGs – Sustainable Development Goals

SPV – Special Purpose Vehicle

TCO – Total Cost of Ownership
1. Introduction

1.1 Thesis Questions & Hypotheses

Sustainable infrastructure, by definition, is socially inclusive and environmentally sound. Because infrastructure projects require large up-front capital expenditures and last for decades, choices tend to be irreversible. It follows that building sustainable infrastructure offers potential to help meet or exceed the Sustainable Development Goals (SDGs), which aim to eradicate poverty by 2030. As such, matching long-term infrastructure demands in emerging markets with long-dated capital supply – from pension funds, insurers or sovereign wealth funds – has never been so high on the policy agenda. With the right policies and incentives, so the argument goes, private investors can make a profit financing the infrastructure needed to make these goals a reality. Some argue sustainable infrastructure offers a “triple-win”: reduced emissions and climate risk, better quality economic development, and increased returns for investors. These arguments are now extremely popular, although they have also been made multiple times in the past without any significant progress taking place.

It is true that “policy makers need to focus on and strongly influence how decisions are made to invest in long-lived infrastructure if global climate change goals are to be achieved”. The literature is full of strongly-argued intervention ideas which target the sector-specific policies, institutions and capital markets that form the context in which private investors make their decisions.

However, most studies fail to focus on investment decisions themselves. How exactly are they made, who makes them, and on what basis? The “private sector” is sometimes referred to as though it were a monolith. Risk and return are routinely misunderstood. Multilateral Development

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1 McKinsey 2016, p.6
2 de Boer 2015
3 Valahu 2007
4 OECD 2015
5 WWF 2015, McKinsey 2013
6 de Boer 2015
7 McKinsey 2016
Banks (MDBs) and the Green Climate Fund (GCF) are both feted and vilified, and yet many commentators do not understand the constraints under which they operate. While infrastructure investment is ‘not about the money’, it is not clear that policy makers have the right focus to strongly influence investment decisions. On this basis, the hype about private investment therefore is not justified.

In order to look critically at policy ideas which aim to influence how decisions are made to invest in long-term infrastructure, it is important to ask: what constrains private capital allocations to infrastructure in general, and to sustainable infrastructure in EMDEs in particular? It is said that there are three main challenges to financing sustainable infrastructure at the scale required to meet or exceed the Sustainable Development Goals.

1) There is not enough private capital allocated to infrastructure in general, despite the fact that investor demand currently exceeds the supply of investable opportunities.

2) Significant amounts of private finance and expertise must flow cross-border to EMDEs, the location of both the majority of future demand for infrastructure and the majority of future greenhouse gas (GHG) emissions.

3) Increasing the supply of private capital allocated for infrastructure does not, in itself, increase the proportion which is sustainable.

In examining the three challenges above, in relation to how private investors make asset-allocation decisions, this thesis proposes two hypotheses:

1. Neither increased loan syndication, nor increased use of guarantees or sustainability premiums are likely to close the infrastructure finance gap, because they have no effect on ex-ante risk-adjusted returns, the primary driver of investment decisions.

2. An intense focus on sectoral policies and incentives obscures the importance of contracts and performance monitoring as determinants of private participation.
1.2 Overview of Thesis

This thesis first introduces the infrastructure finance gap in emerging markets and developing economies (EMDEs) to establish the context for a discussion of sustainable infrastructure. Second, it presents the challenges of EMDE infrastructure investments in general, explaining five common barriers to private investment. Third, it focuses on private sector incentives and the characteristics of infrastructure as it pertains to investor asset allocation decisions. Fourth, it considers the role that MDBs play in this effort, noting their capital structure constraints and their climate finance record. Fifth, it explores the dynamics of four policies aimed to increase private participation: investments in pipeline development, guarantees, loan syndication and sustainability premiums.

Based on an examination of supply constraints inherent in ideas to scale-up private finance for sustainable infrastructure, this thesis concludes that recent reports on infrastructure investment have reached a peak of hype which is not justified by the underlying constraints. Private finance, given the right policies and incentives, is unlikely to close the infrastructure gap over the next 15 years without significant new data on the performance of contracts and risk.

The risk is that over the next 15 years, the infrastructure gap will remain as large proportionately as it is today, which would dramatically shape the trajectory of efforts to deal with climate change in EMDEs.

1.3 Contributions to Knowledge

Intense focus on sustainable economic development culminated last December in Paris with a strengthened international consensus and broad global agreement to reduce the level of greenhouse gases. The Green Climate Fund (GCF) raised initial pledges of over $10 billion and each of the six major multilateral development banks committed to increasing their capital commitments to sustainable infrastructure by as much as two or three times the current level. They hope to mobilize 3 to 5 times as much capital through stimulating private participation.
This thesis — on de-risking private finance for infrastructure in sustainable development — examines a key element of progress: on whether current multilateral policies on scaling-up private infrastructure finance in EMDEs actually addresses the decision criteria which determine private participation. It pays particular attention to recent excitement about the potential of private investment to produce sustainable infrastructure. This excitement is unfounded and has produced a proliferation of important-sounding reports offering sweeping state-of-the-system conclusions\(^8\) which fail to engage with perhaps the most important determinant of infrastructure project cash flows: contracts.

By proposing some system dynamics models for further development, this thesis attempts to identify whether some popular multilateral intervention ideas are likely to increase flows of private finance to sustainable infrastructure in EMDEs, as well as to identify sources of foreseeable policy resistance.

1.4 A Note on Terminology

The term ‘infrastructure’ has no clear accepted definition among private investors and there is no agreement on the role it plays within portfolios. Sustainable Infrastructure is defined as infrastructure that is socially inclusive, low carbon, and climate resilient, but it also lacks a clear definition from an investment and financial regulatory standpoint.

It is important to note, at this point, that this thesis does not focus on public-private partnerships (PPPs). PPPs are a tool; they are not the end goal. Governments start with a problem in context, such as the need for energy assets, and then ask if PPPs fit. Not the other way around.

\(^8\) Rohde 2015, de Boer, Hulse and Kutner 2015, Mainelli and von Gunten 2015, Zuckerman, Frejova, Granoff, and Nelson 2016
2. The Infrastructure Investment Gap in EMDEs

2.1 Where is the Gap?

The infrastructure investment gap has been measured and documented elsewhere at global and regional levels, by academics, multilaterals, private investors, consultants, governments, and think-tanks; it is not the focus of this study. Regardless of methodology, all recent estimates of infrastructure requirements find that a significant gap exists.

EMDEs account for 37% of world infrastructure spending, despite their high growth rates and the fact that they represent 73% of world population. It is not surprising therefore, that between 2015 and 2030, the majority of the infrastructure gap — 65% according to McKinsey (2016, p.9) — is located in EMDEs.

![Figure 1: Infrastructure Demand by Type of Country and Type of Infrastructure 2015-2030 McKinsey 2016, p.25](image)

Taking the most conservative recent estimates which omit developed-world calculations, Ruiz-Nunez & Wei (2015 p.9) forecast total demand in EMDEs of $836 billion per year between 2014 and 2020, 49% of which is capital expenditure requirements and 51% of which is required for maintenance of current and future infrastructure. According to this analysis (below), EMDEs need
to spend around 6 percent of GDP through 2020 to satisfy individual and enterprise demand for infrastructure services.\(^9\)

Figure 2: Annual EMDE Demand Forecast 2014-2020, Source: Ruiz-Nunez and Wei (2015) p.10

<table>
<thead>
<tr>
<th>By income group</th>
<th>Capital US$Mn</th>
<th>%GDP</th>
<th>Maintenance US$Mn</th>
<th>%GDP</th>
<th>Total US$Mn</th>
<th>%GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Income</td>
<td>176,217</td>
<td>7.1%</td>
<td>172,089</td>
<td>6.9%</td>
<td>348,306</td>
<td>14.1%</td>
</tr>
<tr>
<td>Lower Middle Income</td>
<td>35,821</td>
<td>1.1%</td>
<td>72,063</td>
<td>2.3%</td>
<td>107,884</td>
<td>3.4%</td>
</tr>
<tr>
<td>Upper Middle Income</td>
<td>160,251</td>
<td>2.0%</td>
<td>203,047</td>
<td>2.6%</td>
<td>363,298</td>
<td>2.6%</td>
</tr>
<tr>
<td>Developing countries by region</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAR</td>
<td>159,074</td>
<td>7.8%</td>
<td>144,427</td>
<td>7.1%</td>
<td>303,501</td>
<td>14.9%</td>
</tr>
<tr>
<td>SSA</td>
<td>28,946</td>
<td>3.2%</td>
<td>27,108</td>
<td>3.0%</td>
<td>56,054</td>
<td>6.2%</td>
</tr>
<tr>
<td>EAP</td>
<td>115,897</td>
<td>2.0%</td>
<td>96,244</td>
<td>1.7%</td>
<td>212,140</td>
<td>3.7%</td>
</tr>
<tr>
<td>MENA</td>
<td>14,826</td>
<td>1.1%</td>
<td>32,244</td>
<td>2.5%</td>
<td>47,070</td>
<td>3.7%</td>
</tr>
<tr>
<td>LAC</td>
<td>65,828</td>
<td>1.7%</td>
<td>74,450</td>
<td>1.9%</td>
<td>140,277</td>
<td>3.6%</td>
</tr>
<tr>
<td>ECA</td>
<td>24,178</td>
<td>0.8%</td>
<td>36,267</td>
<td>1.1%</td>
<td>60,445</td>
<td>1.9%</td>
</tr>
<tr>
<td>Developing countries by sector</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>152,577</td>
<td>1.1%</td>
<td>167,754</td>
<td>1.2%</td>
<td>320,331</td>
<td>2.4%</td>
</tr>
<tr>
<td>Transport</td>
<td>76,201</td>
<td>0.6%</td>
<td>178,818</td>
<td>1.3%</td>
<td>255,019</td>
<td>1.9%</td>
</tr>
<tr>
<td>Telecoms</td>
<td>123,351</td>
<td>0.9%</td>
<td>63,755</td>
<td>0.5%</td>
<td>187,105</td>
<td>1.4%</td>
</tr>
<tr>
<td>W&amp;S+WW</td>
<td>20,160</td>
<td>0.1%</td>
<td>36,873</td>
<td>0.3%</td>
<td>57,033</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

| All developing countries | 819,488       | 6.0% |
| High Income countries    | 285,045       | 0.8% |
| World                    | 1,104,532     | 2.2% |

The same study\(^{10}\) estimates that $580 billion is spent in Emerging Markets and Developing Economies (EMDE) each year, although data is scarce. China’s infrastructure spending vastly outweighs its own projected needs, so it can be omitted from an analysis of the gap. Once Chinese data is removed actual spending in EMDEs is only $259 billion per year. This leaves an annual infrastructure investment gap in EMDEs (minus China) of $452 billion between 2014-2020.

The implication therefore, before we even consider sustainability, is that EMDEs need to almost double their current annual infrastructure investments in order to meet demand and pursue prosperity. When we consider sustainability, then the up-front costs of building sustainable infrastructure is 6% higher or more for individual projects\(^{11}\). According to McKinsey, it is possible

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\(^{9}\) Ruiz-Nunez and Wei 2015, p.9

\(^{10}\) Ruiz-Nunez and Wei 2015, p.2

\(^{11}\) McKinsey 2016, p.2
for the private sector to close around 1/3 of the gap worldwide through incremental spending\textsuperscript{17}, providing the right incentives are in place and there are enough bankable projects. However, "It is unlikely that private-sector money will be enough; development banks, multilateral institutions, and official development assistance will also need to get involved."	extsuperscript{13} According to the World Bank, for instance, in EMDEs "more than 70\% of the current infrastructure funds come from the public sector. The second largest source of financing comes from the private sector, roughly 20\% of the total funds. The remaining is covered by ODA"\textsuperscript{14}.

Figure 3: Annual EMDE\textsuperscript{15} Infrastructure Investment Requirements by Region in US$ billions 2014-2020, Source: Ruiz-Nunez and Wei (2015), p.15

<table>
<thead>
<tr>
<th>Region</th>
<th>EAP*</th>
<th>SAR</th>
<th>LAC</th>
<th>SSA</th>
<th>ECA</th>
<th>MENA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>87</td>
<td>309</td>
<td>141</td>
<td>58</td>
<td>62</td>
<td>53</td>
<td>711</td>
</tr>
<tr>
<td>Actual</td>
<td>35</td>
<td>68</td>
<td>41</td>
<td>28</td>
<td>35</td>
<td>52</td>
<td>259</td>
</tr>
<tr>
<td>Gap</td>
<td>52</td>
<td>241</td>
<td>100</td>
<td>30</td>
<td>27</td>
<td>1</td>
<td>452</td>
</tr>
</tbody>
</table>

\textsuperscript{12} McKinsey 2016, p.7
\textsuperscript{13} McKinsey 2016, p.25
\textsuperscript{14} Ruiz-Nunez and Wei 2015, p.2
\textsuperscript{15} China overspends so Chinese data is omitted from East-Asia Pacific (EPA*) region.
2.2 Private Flows in EMDE

Since the early 1990s, the amount of private investment in EMDE infrastructure has experienced some growth (Figure 4). In addition, since the 2008 financial crisis, governments face fiscal constraints which means they can no longer be expected to finance needed infrastructure. Optimism about the potential for EMDE governments to finance infrastructure through capital markets is not new\(^{16}\), "yet the volume of private participation in financing infrastructure projects in EMDEs remains modest"\(^{17}\).

Figure 4: Volume of Private Investment in Infrastructure in EMDEs, US$ billions adjusted by US CPI, Source: MIGA (2013) p.43

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\(^{16}\) Valahu 2007

\(^{17}\) Schwartz, Ruiz-Nuñez and Chelsky 2014, p.141
Infrastructure investors the world over tend to invest in their home region\textsuperscript{18}. Since around 65\% of demand for infrastructure between 2015-2030 is from emerging markets, this is noteworthy. When private and PPP infrastructure financing flows are combined, then 51\% of infrastructure investment flows are domestic\textsuperscript{19}, perhaps reflecting the fact that domestic investors are more familiar with the local context, face lower transaction costs and do not bear the same currency risks as a foreign investor.

Although PPP finance accounts for only 22\% of overall infrastructure flows in emerging markets\textsuperscript{20}, according to the World Bank’s PPP database, 60\% of PPP finance to “middle income” emerging markets between 2005 and 2014 came from other “middle income” emerging markets. In public-sector parlance this is “South-South” finance, and it is important to recognize its role, because it provides a rebuttal to those who believe climate finance is akin to charity from developed to developing countries\textsuperscript{21}.

That said, low-income countries do not exhibit the same promising domestic and regional private involvement. In those countries, according to McKinsey, only 8\% of private finance comes from domestic sources. Nonetheless, 53\% of private finance to low-income countries is from middle-income countries, with the balance coming from high-income countries\textsuperscript{22}, suggesting that closing the gap in low-income countries requires significantly different investments from sources such as the Green Climate Fund (GCF) until local capital markets improve through savings accumulation.

The bottom line is that private infrastructure investment tends to be sticky — that is, investors tend to remain in their home region — and the majority of private finance in emerging markets is from a domestic region. Worldwide the theoretical market is huge, but on a regional level the addressable one is much smaller\textsuperscript{23}.

\begin{flushleft}
\textsuperscript{18} McKinsey 2016,p.18  \\
\textsuperscript{19} McKinsey 2016,p.20-21  \\
\textsuperscript{20} McKinsey 2016,p.22  \\
\textsuperscript{21} Ha, Hale and Ogden 2016  \\
\textsuperscript{22} McKinsey 2016, p.22  \\
\textsuperscript{23} BlackRock 2015, p.3
\end{flushleft}
Figure 5: Private and PPP Infrastructure Financing Flows to Middle-Income Countries 2005-2014, Source: McKinsey (2016), p.22

- High-income countries: 39% of flows come from high-income countries
- Cross-border: 10% of flows are cross-border investments from other middle-income countries
- Domestic: 51% of flows are domestic investments
- Low-income countries: <1% of flows come from low-income countries
2.3 The Role of Government

Infrastructure has strong public-good characteristics, is highly visible, highly sensitive to local politics, requires large capital expenditure, and is often a natural monopoly. For these reasons, governments have played, and will always play, a leading role. In EMDEs government is the principal investor.

Problems plaguing public infrastructure in EMDEs are often obvious, but hard to resolve: tariffs are significantly below cost, bills are not collected, service quality is unreliable, losses and theft levels are high, labor productivity is poor and incentives for managers and workers are misaligned with social and productivity goals. There is a bias towards large capital projects rather than improving existing infrastructure or adopting reforms to manage demand. Some of these capital projects are white elephants, with negative social value and "the amount of innovation in the infrastructure area is "terrible" because the public sector has no incentive to innovate, there are below-cost tariffs, and there are subsidies to the owners of the existing system. When sustainability is added into the mix, governments assume that adding sustainability criteria to an infrastructure project will increase costs and construction time, while potentially excluding local suppliers who do not have the skills to meet the new criteria.

It is clear that governments may decide to enlist private sector finance and expertise. However, negotiating a PPP takes a lot of time and resources. Hence preparatory work prior to bidding or Requests For Proposals (RFPs) becomes important. If government wishes to pursue PPPs, it will need to establish the capacity to design them, identify and value the risks, and be able to ensure that a PPP provides value as compared with the traditional public provision of that service. As such, governments must make a serious assessment of the contract obligations they are entering into, because avoiding tough questions or issues in the hope that they will disappear has historically proven to be costly in the long run. Indeed, projects in emerging markets have significant political risks, usually calculated as a sovereign bond yield spread between host country yields and the risk-free US yield. Projects with strong economics that are also well structured in terms of risk can

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25 McKinsey 2016, p.51
26 Gómez-Ibáñez, J. 1997
achieve investment-grade ratings, but the ratings of debt issued will be constrained by the credit-rating of the sovereign.

2.4 It’s Not About the Money

The infrastructure investment gap is large. Perhaps the private sector cannot afford to close it. Is that true? At the recent Global Infrastructure Summit, World Bank President Jim Kim said: “It’s not about the money” a widely shared view among multilateral development banks. For the financial system, the challenge has little to do with the scale of the funds required. In addition, the number of private players offering debt increased after the financial crisis and the Basel III regulations, while more investors are looking to invest in infrastructure equity both directly and indirectly. Availability of debt and equity sources is no longer a significant concern.

2.5 The Paradox of Infrastructure

There is, in other words, a substantial investment opportunity for the private sector, and there is substantial capital available to be deployed. “The paradox of infrastructure is that there is huge interest, but it’s taking a long time to happen.” Why is that?

A detailed explanation can be found in the characteristics of specific projects, specific investor types, specific countries, specific sectors, decisions models, new technologies and empirical data. The interaction of these characteristics reveals barriers which inhibit investment in infrastructure in general, as well as for sustainable infrastructure in particular. The next section explains five common barriers.

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27 Fitch 2004, p. 12
28 World Bank 2016
29 Valahu interview
30 Preqin 2016
31 McKinsey 2016, p. 17-18
32 Authors 2015
3. Challenges in EMDE Infrastructure Investments

3.1 Inadequate Risk-Adjusted Returns

Risk-adjusted returns are a relative measure of return per unit of risk taken. They are the primary metric upon which portfolio managers are judged *ex-post* and they are the primary driver of strategic asset allocation decisions *ex-ante* among institutional investors. An investment with returns which are not likely to deviate much from the expected return is considered low-risk. An investment with volatile returns from year to year is risky. Risk-adjusted returns, therefore, discount expected returns by volatility of returns (Figure 6).

Figure 6: Risk as Variability in Return, Source: Mullins (1993) p.2

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33 McKinsey 2016, p.33
In a series of over 50 interviews with private investors, McKinsey (2016, p.33-34) noted that inadequate risk-adjusted returns was the most-frequently cited reason for not investing in sustainable infrastructure. In particular, if the investment is related to a breakthrough technology, then private interest is likely to be lower, because investment decisions are made based on historic benchmark returns, which by definition are lacking for breakthrough technologies. Sustainability raises up-front costs for sustainable infrastructure, while future cash flows are more uncertain and there are significant risks in construction, operating and procurement. Investors can mitigate these through risk sharing or broader cost allocation within the project risk-allocation process, but when this doesn’t happen “private investors will likely find the projects unattractive”34. It follows that only investors with high risk appetites are willing to consider such investments in EMDEs without first seeing the technology proven over time in a less-volatile market.

It is important to note that private investors do not avoid sustainable infrastructure investments because the returns are not high enough. They avoid such investments because the risks are too high. The fundamental principle35 of sound project financing is that risks should be allocated to and borne by the party which is best able to manage or control them. Wherever there is a risk which can be controlled by a contractual party, therefore, it should be allocated accordingly. If it is a market-wide risk, then government should bear the risk (Figure 7), and it is a project-specific risk, then the private partner is best placed to mitigate. Other risks which cannot be controlled can be mitigated through contracts or they can be hedged. However when this does not happen, risks are retained by the special purpose vehicle (SPV) and its investors and for this reason, private investors in EMDEs often “avoid infrastructure like the plague”36.

34 McKinsey 2016, p.34
35 Deep 2001, p.219
36 Source: survey response.
3.2 Lack of Transparent and “Bankable” Pipelines:

As we have seen above, the theoretical market for infrastructure is huge, but the addressable one is much smaller. Many EMDE infrastructure projects under consideration are not “bankable,” in that they do not appear likely to deliver high enough risk-adjusted returns to attract private-sector equity or debt. Or “costs and risks may not appear to be allocated appropriately.”37 Asked about the infrastructure investment gap last year, Bertrand Badré of the World Bank told the Financial Times: “There are simply not enough viable projects out there”38. The onus is on governments to build pipelines because government, as noted above, takes the lead on infrastructure.

When governments fail to develop long-term plans, then the private sector has no reliable signal of expected needs and no justification to build expertise in new regions. Even when states do try to develop long-term plans, the credibility of such plans is often in question. For example, in East Asia, “Some national targets have been missed repeatedly (e.g., South Korea and Japan), some governments have been accused (mainly domestically) of lacking ambition in key sectors (Japan, South Korea, Taiwan, Singapore), and some long-term plans have been frequently revised (e.g., Thailand has launched three long-term “alternative energy” strategies in just six years)”39.

Given that few developed countries publish their project plan pipelines, it is not surprising that fewer still EMDEs either publish or communicate their own plans. Because certain risks, such as legal and political and currency risks, are more pronounced when foreign private investors are involved in emerging markets40, it is fundamental that in order to assess these risks, investors should have a clear understanding of the historical and social environment of the host market in which the project will be located41. If a private investor is not sure how many projects will take place in a specific region or a specific sector, there is no rationale to develop costly regional expertise in due diligence and credit-evaluation, because the investor cannot hope to recoup these large fixed costs on the basis of one or two publicly available projects. It follows that the incentive to invest in local staff and partnerships is absent, and capital remains “sticky” or tied to its home region.

37 McKinsey 2016, p.30
38 Authors 2015
39 REN21 2015, p.29
40 Deep 2001, p.222
41 Deep 2001, p.221
Governments, even in developed countries, are understaffed, lack incentives, are bad at IT, have other social concerns and exhibit fragmented accountability. Because bankable infrastructure investments require significant up-front investment in staff, money, and time, if a government wants to pursue private participation, it must be prepared, or somehow enabled, to make these investments. Above and beyond the challenges faced by developed nations, EMDEs lack project-development resources, are unable to afford funding commitments and often cannot offer credible and sufficient guarantees to offset perceived risks.42

Figure 7: Biggest Challenges Facing Unlisted Infrastructure Managers in 2016, Source: Preqin (2016) p.4

When one considers sustainability, the challenges become even more complicated. Specifically, a lack of defined standards, relating to resiliency and energy efficiency in particular, make project design awkward. Moreover, some types of sustainable infrastructure are distributed or being sold as “infrastructure-as-a-service” models, notably in the power sector. Traditionally dominated by large utilities, renewable power is increasingly off-grid and financed by smaller entities on the household and community-level. The IFC and other advisors have long tried to enjoin environmental concerns into project development at an early stage. Even if a government is committed to developing a long-term plan, there are technical obstacles to producing viable project design specifications, a major hurdle to bankability which delays pipelines.

42 McKinsey 2016, p.30
40 McKinsey 2016, p.32
44 McKinsey 2016, p.36
46 IFC 1999, p.53
3.3 High Development and Transaction Costs

Investing in physical infrastructure is a textbook case of the hold-up problem\textsuperscript{46}: most capital investment must be made at the beginning of a project and returns accrue gradually, while assets are immobile and lack alternative uses (in other words they are relationship specific). According to Gavin Wilson, head of the IFC’s Asset Management arm, “It’s a critical difference with other businesses and services, and not like health or education. All the money has to arrive before anything exists”\textsuperscript{47}.

The outset of a project, when returns are highly uncertain, is the riskiest part of the life-cycle, although relative to the capital required for a whole project, the financial demand is only 1%-5% of total project costs. However, the experience of the IFC in financing greenfield projects “demonstrates above all the importance of identifying risks at the outset of a project.”\textsuperscript{48} If the average infrastructure project is $200 million, then this cost amounts to between $2 million and $10 million, not counting the cost of discontinued projects. The effects of this hold-up problem are particularly important for investors because “the availability of sufficient economic potential is primarily determined by the project selection”\textsuperscript{49}. For a government, exploring different options rigorously to make an informed project selection is expensive and offers no direct return. The need to create unique financing structures for each project increases project preparation time and transaction costs, which are difficult to recoup since they are not capitalized\textsuperscript{50}.

Even if a government expends the necessary capital, and decides that there are benefits to working with the private sector, over and above public provision of a service, then the issue is complicated by the fact that there is no standard PPP template, and particularly if project finance is utilized, every project must be carefully judged and every risk must be carefully weighed and allocated based on who is best able to bear each risk.

\textsuperscript{46} Blanc-Brude 2016
\textsuperscript{47} FT 2015
\textsuperscript{48} IFC 1999, p.38
\textsuperscript{49} Weber and Alfen 2010, p.145
\textsuperscript{50} McKinsey 2016, p.32-33
The process of undertaking this painstaking analysis, therefore, depends upon the amount of funds available for early-stage project development. In this sense, this barrier is related to the above barrier: a lack of bankable projects.

Moreover, if the bidding or procurement process is inefficient, then this will discourage private investment because costs will be higher. Transactions must be tailored to the specific project.
context, and technical standards can be both diverse and inconsistent. "Investors with limited resources, time, and expertise, such as pensions and insurance companies, can find it difficult to assess projects when standards are so fragmented."\textsuperscript{51}

If a project is to be a sustainable one, then transaction and development costs are likely to be even higher due to the greater rigor required in writing the output specification for a sustainable asset. Data on the financial and risk-performance of such assets is lacking, in part because they are so new, and this fact makes deal evaluation much more complicated. A track-record of observed long-term investment returns for sustainable infrastructure assets would help. The problem is that such a track record does not exist\textsuperscript{52}. Investors are less familiar with sustainable infrastructure technologies, and research indicates that they have difficulty incorporating returns from speculative benefits such as climate resiliency, into their existing risk-return models\textsuperscript{53}. The fact that many sustainable assets are small scale and distributed assets complicates this matter as well.

\textsuperscript{51} McKinsey 2016, p.32-33  
\textsuperscript{52} Blanc-Brude 2013  
\textsuperscript{53} McKinsey 2016, p.33
3.4 A Lack of Viable Funding Models

While sustainable infrastructure projects may offer savings in total cost of ownership (TCO) for a project, allowing a private investor to recoup costs plus an investment return, there are currently few models designed to capture positive returns from speculative benefits, such as resilience, less carbon emitted, or lower costs as compared to traditional infrastructure. In addition, even when a sustainable project offers positive NPV over its lifetime, there may be a split incentives problem. For example, higher up-front costs will be paid by a constructor who makes an asset energy-efficient, while TCO savings from lower energy bills accrue to the operator or household owner. Attempting to re-allocate costs equitably between parties makes funding more complicated. The bottom line is: “Capital costs on low-carbon infrastructure projects are often higher than for alternative investments, while future cash flows are more uncertain”.

As a result many projects cannot deliver minimum 10-15% returns investors expect, in part because the public is unwilling or unable to pay high enough charges to allow for full cost-recovery plus a return, and government knows this. Governments face a fundamental dilemma about working with the private sector — “charging the public for something they had previously considered as free is unpopular”. As a result governments face substantial incentives to maintain tariffs below-cost, and regulators are least likely to raise tariffs when the economic imperative for doing so is greatest because for example, in times of high inflation, the economic value of the tariff deteriorates, yet it is these times when regulators are under most pressure not to raise tariffs. As the value of the tariff erodes, services decline, and the public become resistant to paying more for a declining service. When inflation happens, government can’t control some prices, such as food, but it can control the price of infrastructure.

While the private sector has one principal set of stakeholders (i.e. shareholders), the public sector has a diverse range of stakeholders. The public sector has a fear of giving up control and exposing itself to criticism from one or more of its many stakeholders. By retaining control, it

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54 McKinsey 2016, p.33
55 McKinsey 2016, p.33
56 World Bank 2013, p.23
57 McKinsey 2016, p.33
58 Authors 2015
59 Gómez-Ibáñez, 1997b
believes it reduces this vulnerability and can respond more quickly and with greater political sensitivity than the private sector to any stakeholder discontent. The private sector has a very intense focus: the bottom line. There is a broader range of concerns for government, who are better at dealing with problems in that range. While it may express an intent to pursue a privately-financed project, the public sector will be pulled towards designing a process that is closer to a traditional cost-plus procurement than a partnership.
3.5 Uncertain & Unfavorable Regulations and Policies

According to Infrastructure Investor (2016): “Regulatory instability perception is the largest barrier that prevents or limits investment into infrastructure and therefore hampers the maturity of the asset class.” Evidence from MIGA (2013) suggests that adverse regulatory changes and breach of contract are the leading causes of financial losses among foreign investors in emerging markets.

Figure 9: Financial Losses on Foreign Private EMDE Investments 2010-2013, Source: MIGA Political Risk Survey 2013

The lifetime of an infrastructure asset, at 20 to 50 years, will be much longer than that of the average democratic government. The capacity of an individual government to influence infrastructure investment decisions through policy is thus limited by the fact that any promised action is likely to expire or be supplanted when another government with other policies takes over. According to Amin Rajan⁶⁰, governments will make a “scout’s honor” soft undertaking, which fails to have the intended effect on the private sector. One of the main obstacles to turning demand into reality is thus the tendency of governments to “change goalposts all the time”. As a result many private institutional investors “are not prepared to take on the complex political risks involved... if they cannot get the necessary undertakings from governments”⁶⁰¹.

What does it mean to get the necessary undertakings from governments? One fundamental misconception is that the private sector needs public financing in the form of incentives such as tax-

⁶⁰ Authors, 2015
⁶¹ Authors, 2015
incentives, feed-in tariffs, guarantees and ‘innovative policies’. However, analysis from the OECD (2014) indicates that public financial support is not a relevant factors in asset allocation to infrastructure decisions or country-allocation decisions. Far more important is a robust rule of law, the absence of political interference, clear institutional frameworks and consistent predictable regulation. In reality, “higher public intervention with financial support typically triggers a higher probability of political interference in project management and of contract renegotiation, something that private investors are not comfortable with.”

Figure 10: Theoretical Effects of Legal Protection on Required Returns for Private Investors in Infrastructure in EMDEs, Source: Irvin (2007) p.100

Investor confidence takes a long time to build-up, and can be very quickly knocked down because “poor contract enforcement reduces investor confidence in long-term returns no matter how attractive the economics appear”\textsuperscript{63}. The private sector is also very sensitive to where projects were successful in the past and as a result any first-of-type project in a new country is very hard to get private investment for.

\textsuperscript{62} OECD 2014, p.41
\textsuperscript{63} McKinsey 2016, p.30
4. Private Investors

4.1 Motivations and Incentives

Now that we have established characteristics of the infrastructure investment gap and the common barriers to private investment, it is pertinent to examine the incentives and motivations of private investors, both corporate and institutional.

Table 1: Private Investors by AUM and Investment Strategy, Source: from interviews and adapted from McKinsey 2016 p.7 and BlackRock 2015:p4

<table>
<thead>
<tr>
<th>Investor Type</th>
<th>AUM US$ trillions</th>
<th>% Of World AUM</th>
<th>Strategy</th>
<th>Typical Risk-Return Structuring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks</td>
<td>40.2</td>
<td>18%</td>
<td>Income</td>
<td>Senior Debt</td>
</tr>
<tr>
<td>Investment Companies</td>
<td>29.0</td>
<td>13.5%</td>
<td>Appreciation</td>
<td>Value Added Equity</td>
</tr>
<tr>
<td>Insurance Companies &amp; Private Pension Funds</td>
<td>26.5</td>
<td>12%</td>
<td>Income</td>
<td>Senior Debt</td>
</tr>
<tr>
<td>Public Pensions &amp; Superannuation Schemes⁴</td>
<td>10.9</td>
<td>5%</td>
<td>Income</td>
<td>Senior Debt</td>
</tr>
<tr>
<td>Sovereign Wealth Funds</td>
<td>6.3</td>
<td>3%</td>
<td>Appreciation</td>
<td>Value Added Equity</td>
</tr>
<tr>
<td>Infrastructure Operators and Developers</td>
<td>3.4</td>
<td>1.5%</td>
<td>Appreciation</td>
<td>Core Equity</td>
</tr>
<tr>
<td>Infrastructure &amp; PE Funds</td>
<td>2.7</td>
<td>1.2%</td>
<td>Appreciation</td>
<td>Opportunistic Equity</td>
</tr>
<tr>
<td>Endowments and Foundations</td>
<td>1.0</td>
<td>0.5%</td>
<td>Appreciation</td>
<td>Value Added Equity</td>
</tr>
</tbody>
</table>
Infrastructure investments in theory offer improved diversification, improved liability-hedging and lower volatility than capital market assets, based upon the following assumptions:

1. Predictable free cash flow
2. Attractive risk-adjusted yield over the long-term
3. Low price-elasticity of demand & low correlation with business cycles
4. Inflation linked cash flows, hence an inflation hedge
5. The opportunity to invest in unlisted assets

Different investors with heterogeneous risk-return preferences can offer different combinations of capital structure that might match with project types and across project life-cycles.\(^4\)

Boosting private participation in sustainable infrastructure finance in EMDEs will mean finding approaches tailored to each investor. Understanding how institutional investors differ along risk preferences, investment strategies, time horizons, regulatory status, and other incentives, is an important step in recognizing and setting expectations about their potential to close the gap.

Figure 11: Infrastructure Investment Strategies and Comparative Risk-Return Structuring, Source: BlackRock (2015) p.4

There are two basic types of strategy: income strategy or appreciation strategy. Since there are only two sources of returns for an investor, capital gains from asset appreciation or cash flow from dividends, there are two basic types of investment strategy: income strategy or appreciation strategy. The difference between the two comes down to whether and when the investor plans to

\(^4\) McKinsey 2016, p.14
exit the investment. Investors who buy-and-hold are engaged in income strategy. Because they no plans to exit their position, their only source of returns is cash flow from dividends (or debt repayments). Investors who plan to exit the investment, on the other hand, are looking to realize a capital gain, or an appreciation in the value of the asset.

4.2 Corporate Investors

Infrastructure owners and operators are traditionally the most heavily invested private players in EMDE infrastructure, providing scarce developer equity and often leading project consortia as general partner. They typically hold large portions of completion risk, demand risk and operational risk, and are the principal beneficiaries of lower operating costs. Their influence begins “up-stream” and often lasts, in changed forms, for the entire length of the project. Operators and developers tend to be, by definition, large construction companies which enjoy economies of scale from a strong regional presence, or from complementary business lines. Mining companies, for instance, have often built complementary infrastructure such as roads or rail tracks necessary to get their products to market. Developers typically have the largest influence on timing and structure of capital expenditures because they assume construction risk and thus higher up-front capital costs. They also face greater complexity since they are involved in projects from conception, which makes them well-placed to influence the sustainability of the asset.

While increasing corporate investment shares to sustainable infrastructure would be highly desirable, the problem is that corporate investors have similar perceptions about risks and returns that influence other investors, and they require risk-adjusted rates of return on invested capital (ROIC) of between 5% to 10% for new investments. Investment decisions rest on how well a project meets these requirements, as well as other company-specific strategic choices.

However, there are problems in estimating private rates of return, particularly among equity holders such as corporate investors, because “the required rate of return or discount rate for individual investors is fundamentally unobservable: it cannot be inferred from observable transaction prices because it is both a function of the characteristics of the asset (e.g. cash flow volatility) and individual investor preferences.” In addition, “using constant and deterministic

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65 McKinsey 2016, p.14
66 Blanc-Brude 2016c p.8
discount rates is defective if projects have multiple phases and project risk changes over time as real-options are exercised by asset owners\(^{67}\).

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\(^{67}\) Blanc-Brude 2016c p.8
4.3 Institutional Investors

Attracting new types of investors, who may be unfamiliar with infrastructure but who have significant assets is a necessity to close the infrastructure gap. Chief among these new types are institutional investors, which have had limited direct exposure to infrastructure finance, but which hold vast assets under management (AUM). Policy makers have made a priority of searching for new ways to finance sustainable long-term growth. Meanwhile, pensions funds and other institutional investors have recognized the need for long-term financial instruments to match their long-term commitments, in the form of pension or insurance payouts. Indirectly, institutional investors have invested in infrastructure as limited partners in unlisted private equity firms. However this role has left them with less leverage in shaping projects than corporations. They have been able to negotiate a price for their capital, but for operational and project-design decisions which shape sustainability, they have in the past been too late. They have not had significant exposure to infrastructure and as a result they are cautious.

Survey data (Figure 14) shows that despite having similar strategies, types institutional investor are heterogeneous in their asset-allocation preferences regarding infrastructure. However one thing they have in common is that they are unable to meet their target allocation. This gap between target and current allocations is, according to McKinsey, worth $120 billion per year between 2015 and 2030.

Banks hold by far the most AUM of all institutional investors, and they are the most important source of debt finance for infrastructure projects. In EMDEs, for instance, more than 80% of assets are owned by banks, pensions and insurance companies, suggesting that a tailored approach to these investors offers great potential to boost private participation. Banks can also take the lead on loan syndication, improving liquidity, or they can act as loan-takers for another arranging entity, such as an MDB. Domestic EMDE private sector banks play a hugely important role because they have the best local knowledge, are comfortable with 50-year long exposures to their domestic market, and they also offer the most astute understanding of local political risks, and they can lend in local currency – allowing projects to match revenue risks with debt service risks.

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68 McKinsey 2016, p.17
69 McKinsey 2016, p.15-16
70 McKinsey 2016, p.5
71 McKinsey 2016, p.14
In contrast to banks, investment companies, insurance companies and pension funds are all alike in risk preferences and tend to be subject to similar levels of regulation. Collectively, these three investor types represent 31% of world AUM. They are the classic "mid-stream" investors who in the past invested when assets were operating and able to provide steady cash flows that allow these investors to meet ongoing customer obligations.

A unique investor type is the sovereign wealth fund. With around 3% of world AUM, these investors are not large, but they can afford to take longer-term views and demand less liquidity as part of their investment strategy\footnote{McKinsey 2016, p.15}. Other investors include PE funds, which invest in unlisted equity (discussed below) and are among the most expensive sources of private capital\footnote{McKinsey 2016, p.16}, which take ‘opportunistic’ strategies with a focus on exit value instead of capturing the full tenor of infrastructure investments.
4.4 The Importance of De-Risking

It is often suggested\textsuperscript{74} that to influence the actions of private investors, one can simply offer increased returns. However, this is fundamentally a misunderstanding of risk-adjusted returns because a higher return alone has no impact on volatility. It may even raise the risk of expropriation.

The fundamental principle\textsuperscript{75} of sound project financing is that risks should be allocated to and borne by the party which is best able to manage or control them. Wherever there is a risk which can be controlled by a contractual party, therefore, it should be allocated accordingly. If it is a market-wide risk, then government should bear the risk (Figure 7), and it is a project-specific risk, then the private partner is best placed to mitigate. Other risks which cannot be controlled can be mitigated through contracts or they can be hedged. However when this does not happen, risks are retained by the SPV and its investors. By itself, therefore, a greater return does not provide a compelling reason to invest and for this reason, private investors in EMDEs often “avoid infrastructure like the plague”\textsuperscript{76}. To some extent project finance invites risk-taking which is sometimes “accepted with an aggressiveness towards a risk that is unsupported by the probabilities of the risk materializing”\textsuperscript{77}. Accepting risk in this manner can come with a high price to the project, such as when a government loses control of an inflation risk it was not well placed to mitigate. However, even if the price is not high, misallocation of risks creates a situation in which “the party shortchanged is a prime candidate to trigger a project disaster.”\textsuperscript{78}

Increasing a return thus equates to asking an investor to hold a risk in exchange for a risk-premium, instead of allocating the risk. It has no impact on the volatility of expected returns. An offer of increased returns alone is thus a red-flag representing a failure of project structuring. Such an approach is anathema to private infrastructure investors because “successful project finance structuring rests on the strength of the project itself. Identifying the project’s risks and then analyzing, allocating, and mitigating them are the essentials of project financing.”\textsuperscript{79}. Increasing a return is a risk transfer to the private sector, rather than a risk mitigation. When the risk transferred is something which the private partner cannot mitigate well, then the associated risk premium will be high, significantly increasing funding costs for the government or resulting in a total failure to attract an investor.

\textsuperscript{74} Zuckerman, Frejova, Granoff and Nelson 2016
\textsuperscript{75} Deep 2001, p.219
\textsuperscript{76} Source: survey response.
\textsuperscript{77} Hoffman 2007 p.51
\textsuperscript{78} Hoffman 2007 p.51
\textsuperscript{79} IFC 1999, p.38
PE firms with ‘opportunistic’ strategies or companies involved in the construction process are often the only investors willing to take on such risks as part of their equity stakes, but “High-risk exposure will prompt them to seek higher returns by charging higher construction or maintenance costs.”

Figure 13: Project Risk Transfers in PPPs, Source: Ehlers (2014) p.9

Indeed, increasing a return has no impact on the credit-rating of a project, which is a problem because projects in emerging markets have additional country risk, usually calculated as a sovereign bond yield spread between host country yields and the risk-free US yield. Projects with strong economics that are also well structured in terms of risk can achieve investment-grade ratings, but the ratings of debt issued will be constrained by the credit-rating of the sovereign.

The ideal situation for a government hoping to enlist private finance for infrastructure projects is this: multiple credible low-cost bids from investors who are looking to hold the asset for its lifetime. Increasing returns provides the opposite situation: very few if any bids which are likely to be high-cost and from investor types whose strategies are predicated upon an exit. Increasing returns is unviable to attract the level of private investment needed to close the sustainable infrastructure gap.

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Ehlers 2014, p.7
Fitch 2004, p. 12
De-risking is important for EMDE infrastructure projects, because in emerging markets, it is not so much the risk of war, strife, or outright appropriation which deters private investors, as much as the possibility “that governments will have second thoughts about long-term contracts and try to transfer extra risks to investors who are primarily interested in infrastructure solely on the basis that it is seen as low-risk” 82.

In an attractive fast-growing EMDE, such as Indonesia for example, where there might be a new port or highway project on the table, a project might appear to be “exciting” and might offer a high-return, but this is precisely the opposite of what most investors seek. Indeed, institutional investors tend to compare infrastructure to fixed-income, not to private equity. Gavin Wilson the head of the IFC’s asset management arm, said, speaking to the Financial Times: “People aren’t impressed by high returns because what they really want is lower risk” 83.

In addition, EMDE regulations often prohibit the use of standard risk-mitigation instruments, and risk-management is thus more constrained as a result. For instance in developed economies, which have deep and experienced capital markets and relatively stable economic fundamentals, many risks can be hedged through standard derivative instruments such as options, futures and swaps. These risk-mitigation instruments in EMDEs are often absent.

De-risking is both more desirable and harder to achieve than offering an increased return. Risk-management is highly uncertain in EMDEs, and risk-adjusted returns greatly penalize this uncertainty. However, this need not be the case if greater certainty about the performance (i.e. ex-post risk-adjusted returns) of EMDE infrastructure can be brought to bear. In the interests of de-risking, there is growing consensus around the limited role of infrastructure categories in explaining and predicting risk-adjusted returns, and new studies demonstrate that there is a much more significant role played by contracts, infrastructure business models, and utility regulations. This is encouraging, because it means that some elements of risk in EMDE infrastructure investments arise not from our knowledge and experience of the world, but from our ignorance. To de-risk asset allocation decisions in long-term infrastructure therefore requires two things 84:

(A) that investors know what risk and performance to expect over time and in different economic conditions

(B) that regulators understand what risks investors are taking.

82 Authers 2015
83 Authers 2015
84 Blanc-Brude 2014 p.4
5. Strategic Asset Allocation

"Investing long term in illiquid infrastructure assets is a strategic asset-allocation decision."85 Target asset allocation decisions to sustainable infrastructure depend upon three things: investor characteristics (including risk appetite, strategy and technical ability to engage in different types of investment); the mandates set forth in the governance structure of the investor; and the outcomes of the asset-liability matching and strategic asset-allocation process86. Having covered investor characteristics, we now turn to strategic asset-allocation decisions, including some governance considerations.

Capital market financing for EMDE infrastructure projects has been championed87 multiple times in the past. However, matching investment demand for new infrastructure and supply from institutional investors "remains elusive"88. The general challenges outlined in section three are well understood. However, on the investor-side, there is substantial confusion about what "investing in infrastructure" actually means.

5.1 What does "infrastructure investing" mean?

The term "infrastructure" is typically understood to refer to large structures of steel and concrete89 which are grouped by their economic function into sector-classifications, such as power or water. As a matter of public policy, this makes sense. For the purposes of asset allocation, however, this definition is totally inadequate. What does it mean to invest in transport, for example? A shadow toll-road is funded by regular contractual payments from government, whereas a real-toll road relies upon individual willingness-to-pay, collection efficiency and associated demand risk. When we say a toll road is a toll road, we commit the fallacy of composition. Private investors may thus be exposed to entirely different risks through investments in assets with similar labels which

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85 Blanc-Brude 2013 p.4  
86 OECD 2014 p.66  
87 Valahu 2007  
88 Blanc-Brude 2013 p.3  
89 Blanc-Brude 2014 p.2
perform identical economic functions. Thereby risk management can be led astray by taxonomies
that do not offer predictive power for the purpose of forecasting cash flow performance.

In other words, infrastructure assets are given similar labels when fundamentally different
forces drive their risk-adjusted returns. Lumping such assets into sectorial groups — such as energy,
power, water, sanitation, transport and telecoms — offers nothing to the institutional investor,
because these categories do not create predictive power on the variability of returns. As such we can
say with confidence that the sectoral definitions of infrastructure constitutes a poor model of
underlying cash-flow performance. It follows that they actually inhibit rather than facilitate the
strategic asset-allocation process.

This uncertainty about what it means to invest in infrastructure reinforces the view among
prudential regulators that infrastructure investment is risky and makes it difficult for investors to
examine long-term investment decisions at the most important level: strategic asset allocation.

It is possible to make a case that “Infrastructure is a young, promising asset class in flux”. But why is it so difficult to find long-term finance to match the long-term tenor of infrastructure
projects? And what does it mean to be an asset class in flux? For a group of assets to be considered
an asset class requires that they:

1. have a different enough profile compared to other existing asset classes, such as
corporate bonds or private equity. In other words that they are distinct enough to
not be part of an existing asset class.
2. exist in large enough quantities to be relevant for a typical investor, such that the
supply of investable assets is not a constraint.
3. can be placed into portfolios with enough diversification such that the portfolio
returns converge towards an average return which can be used as a benchmark.

90 Blanc Brude 2016
91 Blanc-Brude 2013, p.3
92 Infrastructure Investor 2016
5.2 Benchmarking Ex-Ante Risk-Adjusted Returns

In the absence of a clear infrastructure asset class, substantial private investment does take place, even among some institutional investors. How is that? When capital is first allocated in the investment process, ex-ante risk-adjusted measures are required. This is useful for control purposes because it allows comparison between investments and is instrumental in facilitating the investment selection process. Ex-ante returns are estimated on the basis of a robust benchmark for the cash flow performance of similar assets. The problem is that for infrastructure such a benchmark does not exist, because there is a paucity of publicly available trades with observable cash-flow data. If we assume that the average infrastructure project has a useful life of 30 years, then how many projects and their cash flows can we observe today that were financed in 1986? In reality, few projects existed at the time, those that did (e.g. telecoms or merchant coal-fired power projects) are different from today’s projects. Most important of all: cash flow records have not been kept.

Instead, investors must use a proxy. There are three existing proxies: two are for equity (PE fund performance and listed infrastructure performance) and one for debt (credit rating agency reports on project finance loans). Each of these benchmarks is problematic.

Figure 14: Research Findings on Infrastructure Equity Performance, Source: Blanc-Brude (2014), p.20

<table>
<thead>
<tr>
<th>Expected behavior</th>
<th>Listed infrastructure</th>
<th>Unlisted infrastructure private-equity funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Low correlation with business cycle</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Long term</td>
<td>No</td>
<td>Exits after 5–7 years</td>
</tr>
<tr>
<td>Excess returns</td>
<td>No</td>
<td>Yes, but fund-level leverage</td>
</tr>
<tr>
<td>Limited drawdown</td>
<td>No</td>
<td>No (credit cycle)</td>
</tr>
<tr>
<td>Inflation protection</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Blanc-Brude, 2014, p.12
Blanc-Brude 2014, p.26
First, infrastructure PE funds are “clones of leveraged-buyout funds with similar investment time frames, fee structures, and use of fund-level leverage”\textsuperscript{95}. Their performance does not differ significantly from other PE funds engaged in different industries. Moreover, the only benchmarks which PE funds widely report are mathematically unsound. Specifically, PE funds report internal rates of return (IRRs) as averages over a portfolio of projects, a practice which, given that the IRR is just the discount rate for which net present value (NPV) equals zero, is pointless, given the mathematical flaws of the IRR\textsuperscript{96}.

Second, listed infrastructure has not proven to be lower risk, nor lower correlated, nor long term, nor does it exhibit limited drawdown, inflation protection, or excess returns. Research from Australia (Figure 15 below), shows that listed infrastructure is considerably more volatile than unlisted infrastructure.

Figure 15: Listed and Unlisted Infrastructure, Rolling 12-month returns, Source: Australian Super (2013) p.3

Third, there is some data on the performance of infrastructure project finance debt, which is provided from time-to-time by credit ratings agencies. These studies do not distinguish between

\textsuperscript{95} Blanc-Brude 2013, p.6
\textsuperscript{96} See Appendix A for an explanation.
clear definitions of infrastructure, but they do offer some indication of risk on an aggregate level in EMDEs through the proxy of default rates. For example, global project finance loans are comparable to corporate bonds rated between Ba and Baa on the Moody's credit scale.

**Figure 16: Cumulative Default Rates for Global Project Finance Loans compared to Corporate Bonds**

![Cumulative Default Rates Chart](chart1)

However, EMDE project finance loans are riskier than OECD project finance loans:

**Figure 17: Cumulative Default Rates for Project Finance Loans in OECD and non-OECD countries, Source: Moody’s Investor Service, 2014 p.24**

![Cumulative Default Rates Chart](chart2)

Moody’s assign a cumulative default rate of 8.3% to EMDE project finance loans. One might think that this is an acceptable risk-premium. However, 80% of project finance loans experience a successful recovery and resumption of debt payments. This data however is still fundamentally inadequate as a benchmark for asset allocation purposes because it is aggregated and does not demonstrate that infrastructure project finance is a distinct asset-class. If infrastructure project finance is equivalent to a Baa-rated corporate bond, then infrastructure is indistinct.
While each of the above three benchmarks is inadequate, it would be wrong to assume that because the “infrastructure narrative” is not borne out by the available benchmarks, that infrastructure does not have the characteristics which it is speculated to have. This infrastructure narrative does in reality drive investor expectations and heuristics. However, without a robust benchmark, investors struggle to value infrastructure investments, as a survey (Figure 19 below) from Infrastructure Investor demonstrates.

Figure 18: Impact of the Lack of Infrastructure Benchmark on Limited Partner Participation Decisions, Source: Infrastructure Investor (2013) p.25

In the absence of acceptable benchmarks, there is substantial uncertainty about cash flow performance. Ultimately, “Infrastructure investing today is not yet a relevant asset-allocation question for institutional investors, and until it becomes one, the relative size of their investment in infrastructure will remain marginal”.

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97 Blanc-Brude 2013, p.5
5.3 “Sustainable Infrastructure” as an Asset Class

The scale of demand for infrastructure in EMDEs over the coming decades is so great that private finance will become more important, with a greater potential to shape the sustainability of projects in systematically different way than it has done in the past. However, if infrastructure itself is not yet an established asset-class, then sustainable infrastructure has not established itself either as a distinct asset-class in its own right. Sustainability raises uncertainties of its own, because: “capital costs on low-carbon infrastructure projects are often higher than for alternative investments, while future cash flows are more uncertain.”

Consider sustainable energy for instance. It “is not a discrete asset class. Rather, sustainable energy investments can appear in many different asset classes.” As such, it’s hard to see how sustainable infrastructure can be part of strategic asset allocation decision, since in many ways, it is another sectoral grouping of assets which does not produce information or predictive value about the cash flow performance of the underlying assets. The conclusion we should take from this point is that, given the paucity of performance data for infrastructure in general, there is an opportunity for sustainable infrastructure to steal a march on other types of infrastructure by disrupting the problem of observable cash flows. If organizations such as the GCF can mandate the reporting of cash flows for all projects that they support, as a standard clause in loan documentation, grants and project preparation support, then sustainable infrastructure stands an excellent chance of satisfying the three criteria listed above as necessary for assets to add-value to strategic asset-allocation.

It is often speculated that sustainable infrastructure assets offer investors the same characteristics as other infrastructure, namely inflation hedging, predictable cash flows, fixed time horizons and diversification. However, what is distinct about sustainable infrastructure assets, although thus far this is only speculated, is that they also offer investors faster construction and lower operating costs, albeit with potentially higher capital expenditures up front. Establishing an evidence-base to validate these speculated benefits which are specific to sustainable infrastructure

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98 McKinsey 2016, p.3
99 World Bank 2013, p.23
100 OECD 2014 p.66
101 McKinsey 2016, p.30
102 McKinsey 2016, p.30
represents a huge opportunity to meet the third challenge outlined in the introduction to this thesis, namely that increasing investor asset allocations to infrastructure does not, in itself, increase the proportion of infrastructure which is sustainable. This opportunity also presents a threat to those focused purely on the idea of sustainable infrastructure as defined by economic function.
5.4 Contracts, not Concrete

Now that we have established that infrastructure, whether sustainable or otherwise, as defined by economic function offers little predictive power of future cash flow performance, and is thus not yet relevant for strategic asset allocation decisions, which definitions of infrastructure might offer predictive power, and thus relevance for strategic asset allocation decisions? The long-dated nature of infrastructure investments defines the need for long-term contracts. It follows therefore, that it is the specifics of long-term contracts which defines the investment characteristics of infrastructure, rather than the economic function of the asset.

A comprehensive contractual arrangement “forms the legal basis for a resilient project structure that adequately reflects the various interests of the project partners.” 103 As such, it is well-known that one must strive to write complete contracts, and that this entails systematically considering likely risks and disputes which might arise between stakeholders. It is necessary for project planners to think carefully about the design of the mechanisms, how they might be triggered, and the processes by which decisions will be arrived at. Because ensuring that each risk is borne by the party best able to manage it, and “this is achieved solely through structuring, the structure is the core element of project finance. The aim is to identify a resource-efficient, effective project structure that optimizes the total costs of the project and ensures that the actual occurrence of a risk does not result in the failure of the project as a whole.” 104

While it is well understood that risk is the focus of infrastructure project finance structuring, and that there are multiple contractual options which entail tradeoffs, it is less well known that according to recent research, “a number of characteristics associated with the structuring of projects constitute a much more powerful framework to understand, benchmark and predict long-term returns in infrastructure debt or equity” 105.

Intuitively, the idea that contracts, not concrete determine cash flow volatility makes sense, because private infrastructure investors typically do not tend to own the asset, which remains in the hands of government. What investors do own, however, is a claim on the cash flows of the project.

103 Weber and Alfen 2010, p.145
104 Weber and Alfen 2010, p.145
105 Blanc-Brude 2016a p.4
As such, the investment “is not conditioned by the tangible nature of the asset, but in a license to operate a natural but regulated monopoly”\textsuperscript{106}.

For example, one of the driving forces in the exponential growth of infrastructure investments during the 1990s was not a change in technology or construction methods. Instead, it was the adoption of US Rule 144A by the Securities and Exchange Commissions (SEC). This law allowed institutional investors to engage in a secondary market for trades of privately placed debt, without having to meet burdensome and time-consuming SEC regulations. This change “greatly widened the risk appetite, efficiency, and liquidity of the debt market for project finance, and thus made it attractive for international issuers to raise dollar debt”\textsuperscript{107}.

One potential predictor of long-term returns is found in the difference between infrastructure which is paid for by government (“contracted” infrastructure) versus infrastructure which is paid directly in user fees by the public (“merchant” infrastructure).
5.5 Hazard Analysis

While most of this thesis has so far focused on ex-ante risk-adjusted returns, it is important now to turn to some ex-post measures of returns. One of the best sources of statistical analysis on contract breaches is hazard analysis performed by the Multilateral Investment Guarantee Agency (MIGA). Hazard analysis is a regression which uses as its dependent variable the likelihood of a contract dispute in the next period, given that the project survived the past periods without dispute. Other factors are used as independent variables. To isolate the effects of contract structures, it is necessary to control for other confounding effects such as demographic, macroeconomic and sector factors. Contract-level variables included in the hazard analysis include project age, procurement type, share of private investment, and involvement of international financial institutions.

![Graph showing probability of contract breach by contract maturity. Source: MIGA (2013) p.46](image)

Over time, risk of contract breach increases with age of the contract, before reaching a plateau between the eighth and twelfth year of operation. Thereafter, risk of breach rises again. *"An awareness of all of these relationships is a valuable starting point to help investors and insurers best mitigate and manage their risks."* 108

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108 MIGA 2013, p.8
The suggestion of an “obsolescing bargain” is relevant because it is apparent that both contractual and country-level variables are significant. Important understanding would be lost if sector or country determinants of risk were looked at in isolation. “Applying a purely macro-variable approach evolving out of traditional expropriation models would be inadequate.” Further study in this area would be very useful.

It is important to note that neighboring countries with the same environmental issues may exhibit different regulatory standards, different enforcement and different compliance monitoring. Contract-level variables alone therefore, are not sufficient to forecast performance, because project finance needs to based on an understanding of context first, such that the right contractual mechanisms can be put in place and incorporated into the contractual arrangements.

On the macro, side, risk of breach is related to economic downturns, the quality of political institutions and dependence on primary commodities. Other non-contractual variables are also significant, including macro-variables such as income per capita. MIGA analysis shows some significant macro correlates and micro correlates which are triggers of contract breach. For example, even after controlling for other factors, “risk of contract breach is higher in middle-income countries than in low-income countries.” This suggests that as a country develops, risk of contract breach increases in-line with greater bargaining power of the public counter-parties. In a sense, the propensity of a government to enter disputes is more important than opportunism, “with middle-income governments being more demanding, or having more resources and opportunities to enforce changes or make demands on existing contractual arrangements.”

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109 MIGA 2013, p.46
110 IFC 1999, p.53
111 MIGA 2013, p.8
112 MIGA 2013, p.8
113 MIGA 2013, p.45
In addition, share of private ownership in a project is also correlated with contract breach. Broadly speaking, the more private ownership, the more likely a contract is to enter dispute.

Figure 20: Proportion of Disputed Contracts by Country Income Level 1984-2011, Source: MIGA (2013) p.20

Figure 21: Probability of Project Survival over Time by Share of Private Ownership, Source: MIGA (2013) p.47
Furthermore, the involvement of an international financial institution on a deal also results in lower risk of contract breach (measured here as probability of project survival in a year of contract, given that the project survived the past year). This is an important premise for arguments to expand the use of development bank financing, which is the focus of the next section.

Figure 22: Probability of Project Survival given International Financial Institution (IFI) Involvement, Source: MIGA (2013) p.47
6. Climate Finance

EMDE infrastructure investments have complex environmental and social impacts which spill out over the traditional project boundary and into a wider arena. In this context, risk allocation becomes a difficult task and some parties which are most able to bear certain risks, such as the government, are not necessarily part of the contract. If the focus should be on contracts, not concrete, therefore, MDBs are still as important as ever, because of their ability to draw-in parties from outside the project boundary. MDBs can broker and convene multiparty discussions and seek contractual risk-mitigation measures that are acceptable to all parties. Given MDBs' close relationships to host governments, they have the potential to deliver unique solutions to the complex environmental and social problems inherent in EMDE infrastructure investments.

MDBs have a crucial role in facilitating deals. Their resources have long been limited and as such they cannot be the main financiers of infrastructure projects. However, they are indispensable as facilitators, bringing vast expertise, insurance against political risks (also known as the MDB 'halo effect'), and they sometimes act as credible auditors of projects.

In terms of MDB allocations specifically earmarked for sustainability total financing was estimated to be $28.3 billion in 2014. However not all funds are allocated to infrastructure and there are limits to which MDBs can be exposed to specific types of investment. MDBs have mobilized climate finance through two types of pooled arrangements: targeted investment vehicles, and financial intermediary funds. The vast majority of MDB commitments to climate finance activities have been loans, with grants, guarantees and equity being far smaller commitments (Figure 23). MDBs are also accredited entities of the Green Climate Fund.

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114 IFC 1999 p.57
115 Ehlers 2014 p.16
117 World Bank 2011, p.17
6.1 MDB Capital Structure

One of the chief restrictions in MDB capacity to finance infrastructure is found in their founding charters. The charters of most MDBs limit outstanding development-related investments (both loans and equity) to an amount equal to paid-in capital plus reserves plus called-in capital. Unlike paid-in capital, callable capital has only been pledged by national governments, and there has never been a capital call.

Operationally, MDBs have capital adequacy policies which impose significantly tighter limits on both debt and equity investments and, in some regional MDBs, on debt issuance in particular. Specifically, these policies limit the amount of development investment to an amount backed by a minimum percentage of on-balance-sheet risk capital, which is defined as paid-in capital plus reserves only. Required percentages of risk capital vary among equity and debt investments, and also

World Bank 2011 p.2-3
upon whether the investment is related to sovereign or private entities, and among MDBs, these requirements vary based upon borrower risk profile and country or sector concentration levels.\textsuperscript{119} The availability of sufficient capital underpins AAA credit ratings, allowing MDBs to borrow very cheaply on the capital markets. It also allows them to play a stabilizing role during credit downturns as a reliable source of credit for EMDEs\textsuperscript{120}.

Figure 24: Capital Structure of Selected MDBs in 2014, Source: Humphrey (2015) p.15

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure24.png}
\caption{Capital Structure of Selected MDBs in 2014, Source: Humphrey (2015) p.15}
\end{figure}

In addition, MDBs are allowed to borrow against some of their callable capital, but only the amount of callable capital pledged by a government which is AAA rated\textsuperscript{121}. Therefore, most callable capital is not actually usable as equity-backing for MDB operations. These policies restrict the additional amounts of lending that MDBs can undertake. There have been multiple proposals for greater use of callable capital and increases to paid-in capital in the hope that this will allow more sustainable infrastructure to be built in EMDEs.

For every $10 billion increase in paid-in capital, for instance, MDBs expect to be able to make an additional $30 billion to $40 billion in loans to sustainable infrastructure projects\textsuperscript{122}.

\textsuperscript{119} World Bank 2011 p.3
\textsuperscript{120} World Bank 2011 p.2-3
\textsuperscript{121} Humphrey 2015a
\textsuperscript{122} World Bank 2011, p.5
A further challenge is how to incorporate paid-in capital increases into the existing shareholding structure of MDBs, with implications for voting rights. There can be a regular capital increase from all members or a selective capital increase from developed non-borrowing members. A third option would be a “donation” from some developed members without any change in shareholding. However, such ideas pre-date the formation of the GCF, and it is not clear why further paid-in-capital to MDBs will achieve since it will necessarily cannibalize some paid-in contributions to the GCF.

The critical assumption here, given MDB constraints on financing, is that the capital will come from other investors. “Rather than help with structuring financial products, [MDBs] can advise on creating a “pipeline” of priority projects, and make sure they are robust enough to win backing.”

Indeed, “Development banks are typically more familiar with political risk and macroeconomic conditions in developing countries and as such are well-placed to increase access to underwriting

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123 Authors 2015
facilities to scale up private-sector investment in these regions".

There are also other ways to increase MDB equity bases. For example, the Asian Development Bank is in the process of folding its concessional (sovereign) lending windows into its non-concessional window (sovereign and private). This will allow a one-time equity injection because around $31 billion of concessional loans will be backed by a slightly larger amount of equity than before, due to the fact that non-concessional loans are backed by greater equity. In effect, the ADB will enjoy more equity without the need for a paid-in capital increase. If successful, this has the potential to increase the ADB's lending capacity. However, this is not possible for some development banks, including the IBRD and African Development Bank for various legal reasons.

MDBs mark equity to loans at ratios of between 28% and 64% in order to protect their ability to borrow cheaply, an ability which rests upon AAA credit ratings. Meanwhile private financial institutions with similar AAA credit ratings mark loans with far less equity capital, typically at rates between 14% and 18% leading some to argue for lower restrictions at MDBs in particular with reference to guarantees. The problem with such an argument is that MDBs are exposed, by definition, to volatile EMDEs rather than stable developed markets. Unlike Barclays or HSBC, they cannot diversify so easily. Some regional MDBs are even less diversified.

Figure 26: Equity-to-Loan Ratios for Selected MDBs and Private Banks, Source: Humphrey and Prizzon (2015) p.9

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124 World Economic Forum 2013, p.22
125 Koretekaas 2015, p.10
7. Four Policies

MDBs have come under pressure to make better use of their balance sheets, partly as a result of equity-capital restrictions outlined above and partly as a result of the persistent infrastructure gap in EMDEs. McKinsey (2016) recommended MDB-led policies to scale-up private participation in sustainable infrastructure investments. In-line with Sterman, this analysis presents these policies in a feedback rich system, since: “The climate and economy are feedback rich systems. Understanding their dynamics and the likely impact of policies requires an ability to (1) recognize and (2) understand a diverse array of feedbacks, both positive and negative, and their (highly nonlinear) interactions.”

7.1 Investment in project preparation and pipeline development

The supply of well-structured “bankable” projects — those that are likely to deliver an acceptable financial return — is a major hurdle which needs to be overcome in order to channel more private finance to EMDE infrastructure. Overcoming such a hurdle is a challenge requiring substantial expertise, because: “Without a predictable pipeline of investable projects, the fixed costs of building up this expertise are often too high for potential investors.” The value of a project preparation facility is to bring such expertise — both technical and financial — to projects and to create standards that reduce transaction costs. According to McKinsey (2016, p.40-41), closing the gap between investor target allocations and actual allocations to infrastructure is worth $150 billion a year, suggesting that if there were more bankable projects, investors would immediately finance them.

According to Bertrand Badre, managing director of the World Bank, “The challenges are as much on the side of projects as on supply of capital. There are simply not enough viable projects out there.” According to McKinsey, many investors complain about the supply of bankable projects,

126 Sterman 2011, p.818
127 Sterman 2011, p.818
128 Bank for International Settlements 2014, p.3
129 McKinsey 2016, p.42
130 Speaking in Lima, FT 2015
and better project preparation in the form of facilities to take care of early stage project design and contract structuring can help make the case that a project does offer acceptable returns.\textsuperscript{131}

The problem of project preparation facilities is that they are costly and have no direct financial return, so it is incumbent upon such facilities to convince governments and multilateral agencies that this is a good way to spend money.\textsuperscript{132} The idea of project preparation as a public policy obstacle has gained momentum in recent years, based on the frequent investor observation that: “If there were a sustainable financial and fiscal framework, funds and debt would be there overnight.”\textsuperscript{133}

According to Philippe Valahu, who heads up the Private Infrastructure Development Group (PIDG), a $1.7 billion project preparation fund, new facilities have been funded at an astonishing rate since the G20 meeting in 2014 in Australia, when “the need for infrastructure investments resonated more.”\textsuperscript{134} The EBRD now have two PPP windows worth $45 million, the Global Infrastructure Hub is now operational in Australia with $50 million, the ADB has another new PPP unit worth $50-$60 million and these initiatives “all have the same intention.”\textsuperscript{135} “The real issue is scale”, says Valahu.

Project preparation facilities can be providers of an a-la-carte menu of mid-stream support options for governments who are hoping to develop a project that is already part of government plans. Such support is necessary to increase the supply of bankable projects, but it is not sufficient to influence their sustainability, because mid-stream interventions offer limited options to make a project more sustainable.\textsuperscript{136} Up-stream design and feasibility work can overcome the both investor uncertainty over new technologies and government misgivings about increased costs and construction times. Up-stream approaches offer the chance to ‘bake-in’ sustainability, an opportunity which is currently not widely available.

\textsuperscript{131} McKinsey 2016, p.40
\textsuperscript{132} McKinsey 2016, p.40
\textsuperscript{133} Authors 2015
\textsuperscript{134} Valahu, interview, 4/29/2016
\textsuperscript{135} Valahu, interview, 4/29/2016
\textsuperscript{136} McKinsey 2016, p.41
From a government perspective, banks can be a strategic bearer of project-development risk and an additional source of expensive "due-diligence" if incentives exist to offset these costs. In South Africa’s Renewable Energy Independent Power Producer Procurement Program (REIPPPP), for instance, government requires bidders to submit bank letters confirming that finance is in place before a bid will be considered. This has led to South African banks undertaking due-diligence earlier than would otherwise have been the case, and improving the viability of bids, allowing the government to avoid the problem of "lowball" offers which are not financially viable.\(^{137}\)

\(^{137}\) McKinsey 2016, p.15
7.2 Deploying Development Capital to finance Sustainability Premiums

A more direct proposal to use project-preparation funding for sustainability is to finance sustainability premiums. A sustainability premium is the incremental additional capital cost to make an infrastructure asset more sustainable. This is estimated through a proxy — in this case the incremental capital cost of Platinum LEED certification to make a building energy efficient, which is between 5%-8.5% of construction costs.

Figure 28: System Dynamics Model of Delays in Perceived Risk-Adjusted Returns from DFI Spending on Sustainability Premiums
There are two arguments for this use of development capital. First, sustainable infrastructure could offer lower total cost of ownership (TCO), and there are some total cost of ownership investment models which have worked well in developed countries. However, when modeling this intervention, it is pertinent to remember that “people routinely ignore or underestimate time delays”\footnote{Sterman 2000, 2011}, and that there is necessarily a delay between comparisons of ex-ante return expectations and ex-post observed performance. This is likely to cause oscillation in the system. In addition, “Middle-income countries have less experience, but considering that is where most demand will be, and that development banks have considerable experience in these markets, the potential is enormous”\footnote{McKinsey 2016, p.45}. The second argument for this use of capital is that it offers a high sustainability multiple for development financiers.

The problem with this model is that the really effective ex-post reinforcing loop is very slow to update – essentially it takes as long as the useful life of a piece of infrastructure – whereas in the meantime the balancing ex-ante loop dominates and private willingness to invest in sustainability premiums stays relatively flat. In addition, an improved model might account for the weakness of the ex-post signal based on the proportion of publicly observable cash flow data – which as we have seen is absent.

However, it is not clear how much infrastructure can be treated in this way, with a mid-stream intervention from development capital to cover a bolt-on sustainability feature-set. A nuclear power plant, for example, cannot become sustainable with an injection of 5% of its total construction costs. Nonetheless, other projects may be more amenable, and if this capital is offered to governments up-stream, then it has potential to shape their project selection and design choices and should be studied further.

The model as shown also does not consider potential learning effects on the size of the sustainability premium. These effects could wipe out the premium before ex-post returns are visible, given the length of the ex-post lag. However, in practice, this policy would be politically problematic to use any significant share (i.e. greater than 5%) of climate finance to top-up private projects with what essentially is a grant, unless otherwise specified.
7.3 Using Guarantees to Improve Capital Markets

Policy and regulatory risks are significant factors in sustainable infrastructure investments. Guarantees may be well-suited to EMDE infrastructure because they can be precisely targeted and adapted to be triggered in response to political risks. Guarantees do not involve direct disbursements of up-front cash, which leads some to some confusion because: “It may intuitively seem that an unfunded instrument (guarantee) would use up less MDB resources, and thus more resources can be put to use elsewhere, but that is not the case under current policies.”

There has been considerable excitement about guarantees in recent years. However, the use of guarantees remains limited and the reality has not lived up to the hype, for several reasons.

First, usage is discouraged by the manner in which guarantees are matched to equity, particularly in relation to loans. Guarantees are treated fully on the same basis as loans as if a guarantee were equal to a loan exposure of 100% of the same amount. In other words, MDBs book guarantees in exactly the same way as they book loans for the purposes of equity-capital restrictions. The reasoning behind this is that providing a loan or a guarantee does not in itself impact the operational reality of a project, and in other words the risk of default should be the same. Evidence suggests that guarantees have a much lower call-rate than loans have default rates although this has not had any impact on policy thus far.

Second, the impact of booking guarantees 1:1 with loans has important feedbacks through to the pricing of capital for a project and therefore to the private party’s choice of financing. MDBs charge exactly the same fees for guarantees as a loan-spread plus fees. They also undertake the same lengthy rounds of project design reviews. In addition, because the borrower under a guarantee borrows from the private sector, they will actually face a higher cost of borrowing with an MDB guarantee than a loan. Therefore a guarantee offers the same impact on an available lending envelope and the same cost structure from the MDB, but a higher cost-of-capital. There are also extra transaction costs from dealing with a third-party private lender rather than just an MDB alone.

140 MIGA 2013
141 Humphrey and Prizzon 2014 p.25
142 Humphrey and Prizzon 2014 p.24
143 Humphrey and Prizzon 2014 p.25
144 Humphrey and Prizzon 2014 p.25
The benefits of a guarantee may well be offset in most cases by the costs of the instrument, which is the main limit on usage. If guarantees can offer improved financial terms – say to borrow on the cusp of investment grade – or other benefits over and above a loan, then they may be selected, but it is hard to see this happening except on a limited scale.

Figure 29: Non-Trade Guarantee Approval and Call Volume, Source: Humphrey and Prizzon (2014) p.23

<table>
<thead>
<tr>
<th></th>
<th>IBRD/IDA</th>
<th>IFC</th>
<th>MIGA</th>
<th>ADB</th>
<th>IADB</th>
<th>AfDB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guarantee</td>
<td>US$5.5</td>
<td>US$4.3</td>
<td>US$30</td>
<td>US$5.6</td>
<td>US$2.8</td>
<td>UA 484</td>
</tr>
<tr>
<td>volume (billion)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Called</td>
<td>US$250</td>
<td>n.a.</td>
<td>US$16</td>
<td>US$150,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>volume (million)</td>
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</tbody>
</table>

Some argue that due to lower climate risk, it is possible that guarantees for sustainable infrastructure could be priced lower than guarantees for ordinary infrastructure. However, this does not clearly outweigh the higher cost of the instrument compared to a loan. It is also stated that “As investors see that the real risk profile is actually lower than they believed, guarantees would no longer be required.” However, this process depends upon the quality of data being collected on projects, which as we have seen in the above sections is currently inadequate to produce usable benchmarks.

Given these limits, it is clear that guarantees will be attractive to a relatively small set of private borrowers with very specific goals such as using the MDB ‘halo effect’ to gain an investment grade they would not otherwise not be able to access. In this sense they are one important instrument for EMDEs, but it’s not clear given the above, that guarantees are a high-impact policy idea. The bottom line may be that lack of guarantees is “typically not seen as a barrier to investment in infrastructure by the private sector”.

Finally, MDB staff incentives are aligned to encourage lending, not the use of guarantees, and staff capabilities are heavily invested in loan issuance (Figure 30). If the size of the lending envelope is the same, and costs of the instrument are higher than loans, then borrower selection, on

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145 McKinsey 2016, p.46
146 McKinsey 2016, p.46
147 Gatti (2014) in Ehlers (2014)
aggregate, exhibits path dependence towards loan selection. However, the model below does not consider what would happen if guarantees were no longer marked 1:1 with loans.

However, the model does not consider what would happen if guarantees were no longer marked 1:1 with loans and it does not consider the credit rating of the borrower. Marking guarantees at lower equity coverage ratios than loans might introduce incentives at MDBs to accelerate the development of staff capabilities. The credit rating of the borrower, providing it is on the cusp of investment grade, might add to the attractiveness of guarantees. The model also assumes that most borrowers will have a choice whereas guarantees in some MDBs are not really on the table.
7.4 Increasing Loan Syndication

Another policy option which receives a lot of attention is increased loan syndication. When a development bank makes a loan on their own, this is an ‘A’ Loan, and when they package-up and sell portions of the loan to other debt-holders, this is a syndicated loan or a ‘B’ loan.

Figure 31: Relation between Borrower, B-Loan Participants & A-Loan Holder, Source: AfDB (2008) p.3

The idea behind increased loan-syndication is that MDBs will be able to recycle their balance sheet capital in order to make more loans than would otherwise have been the case. By holding a portion of the original ‘A’ loan, the MDB can continue to exert positive influence on a project’s risk while holding a significantly smaller stake and offering private capital an opportunity to gain exposure to EMDE infrastructure. This is therefore, to some extent, an argument about the better use of MDB credibility.

Figure 32: Loan Syndication Activity of Selected MDBs in 2012, Source: Humphrey 2015, p.12

<table>
<thead>
<tr>
<th></th>
<th>AsDB</th>
<th>EBRD</th>
<th>IFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syndications, US$</td>
<td>US$200 mln</td>
<td>US$1.6 bln</td>
<td>US$2.7 bln</td>
</tr>
<tr>
<td>% of non-sovereign loan commitments</td>
<td>2.2%</td>
<td>16.9%</td>
<td>31.8%</td>
</tr>
</tbody>
</table>

McKinsey\textsuperscript{146} suggests that if MDBs target their sustainability capital for syndication, then there will be more sustainable infrastructure projects in EMDEs than would otherwise have been the case, and there may be greater participation from local EMDE lenders who might not ordinarily

\textsuperscript{146} McKinsey 2016, p.52
invest in infrastructure. Syndication takes time however (Figure 34 below) and MDBs have historically syndicated relatively small proportions of their portfolios (Figure 32, above).

Figure 33: Syndication Time-Line of Typical Events that Precede a Loan Active Date, Source: Ivashina and Sun (2011) p.45

When considering infrastructure in particular, as the chart below demonstrates, syndication activity is very different by region. Outside Asian EMDEs, experience is very limited.

Figure 34: Infrastructure-Related Syndicated Project Loans (US$ billions), Source: Ehlers 2014, p.15

MDB lending is concentrated in EMDEs, so it is logical to assume that increased MDB loan syndication would have a disproportionate impact on the number of infrastructure projects financed in EMDEs. However, the important limit on this idea is that it has no direct effect on the number of bankable projects. “There may not be enough sustainable-infrastructure projects that meet the
MDBs' high standards. Also, there may not be enough willing investors\textsuperscript{149}. In addition, MDBs face a greater due-diligence burden if they are to satisfy private investors who take positions in the ‘B’ loan, and a substantial increase in syndications would pressure on MDBs to streamline the process. In addition, when an MDB sells down their position, the impact of their ‘halo effect’ on EMDE governments may be reduced.

\textsuperscript{149} McKinsey 2016, p.54
Pool of Portfolio - Smaller Loans

Diversification

Risk Diversification

Private Willingness to Invest

Portfolio Diversification

Transaction Costs

Private Confidence

Secondary Exposure for Financing

Number of Additional Projects Financed

Additional Exposure for Funding

Additional Exposure for Funding from Lower Threshold Technology

Viability of New Technologies

Viability of Additional Sustainable Infrastructure

MDB Overall Loan Syndication Rate

EMDE AseMDB Share of Investments to Sustainable Infrastructure Loans

MDB Balance Sheet Exposure to Sustainable Infrastructure

EMDE Loan Syndication

MDB Loan Syndication

Recycled MDB Capital

Bank-to-Bank Lending

Private Participation in MDB Loan Syndication

Sustainable Competition in Loan Markets

South-to-South Lending

Figure 35: System Dynamics Model of Theoretical Rebalancing Feedbacks in MDB Loan Syndication
8. Conclusion

World leaders have committed to ambitious climate goals and there is a case for greater use of private capital for sustainable energy, water, and transport systems, because these “will be a fundamental element of any realistic effort to reach these ambitious new goals.” It is also the case that there is a risk of becoming too starry-eyed about what certain policies might accomplish.

Building sustainable infrastructure probably does offer great potential to improve the quality of life for people around the world, to address climate change and in addition to provide commercial opportunities for smart businesses. However, infrastructure itself is not yet clearly an asset class, because it is not clear what investors can expect from investing in infrastructure. Sustainable infrastructure presents even greater uncertainty, because the technologies are new, the business models are uncertain, the financing instruments are inadequate, and there is an almost total lack of cash flow data with which to test hypotheses about risk-adjusted returns. With the right policies and incentives, it has been argued that investors can make a profit financing the infrastructure needed in a sustainable manner. While policies and incentives are important, however, these policies and incentives perpetuate a model of infrastructure investment and EMDE investment risks as being comprised of country-level and sector-specific macro correlates. When in fact, as demonstrated above, there are significant contract-level micro correlates of infrastructure risk.

It isn’t through error that many recent publications on private participation in infrastructure fail to focus on contracts. Instead, it is a matter of emphasis. The risk is that over the next 15 years, the infrastructure gap will remain as large proportionately as it is today, which would dramatically shape the trajectory of efforts to deal with climate change in EMDEs.

This thesis has presented the infrastructure investment gap, along with some of the challenges of building infrastructure in EMDEs, as well as the specific challenges as they pertain to sustainable infrastructure. It has taken a step further than many policy analyses by profiling the types of private investor who might participate in sustainable infrastructure investments, and focusing on their practical difficulties in calculating risk-adjusted returns. This thesis considered the role of contracts and MDBs, presenting theoretical models of four MDB policies which are put forth as candidates for creating “the right policies and incentives”. Each policy merits further scrutiny and it would be worthwhile to develop the models presented here.

150 Bielenberg, Kerlin, Oppenheim, & Roberts, 2016
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Appendix A: IRR, a Fundamentally Flawed Benchmark

The IRR is fundamentally flawed and therefore infrastructure PE fund IRRs are unsuitable as a benchmark for three reasons. First, it is possible that there is no unique IRR. Consider projects A and B for a given 10% discount rate.

<table>
<thead>
<tr>
<th>Project</th>
<th>CF1</th>
<th>CF2</th>
<th>CF3</th>
<th>NPV</th>
<th>IRR1</th>
<th>IRR2</th>
<th>Unique IRR?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-720</td>
<td>1710</td>
<td>-1000</td>
<td>$7.36</td>
<td>4%</td>
<td>33%</td>
<td>NO</td>
</tr>
<tr>
<td>B</td>
<td>90</td>
<td>-140</td>
<td>80</td>
<td>$26.22</td>
<td>-</td>
<td>-</td>
<td>NO</td>
</tr>
</tbody>
</table>

Project C has two IRR: one below and one above the opportunity cost of 10%. Which do investors prefer? At the start of the project, we pay out 720 cash in expectation of a positive cash flow in the second period, so investors would like the IRR to be higher than opportunity cost. But at the end of the project, we know our cash flow will be -1000, so investors would like the IRR to be lower. The NPV at 10% is positive, so we accept the project. But with the IRR method, it’s not clear.
Also, consider project B. It has no IRR with which to make a comparison to the opportunity cost. Both projects A and B have positive NPV but neither has a unique IRR. Does this mean investors don’t like these projects? No! Both NPVs are positive at a discount rate of 10%.

![No IRR](image)

Second, the IRR can make wrong decisions when comparing two mutually exclusive projects. Consider projects C and D.

<table>
<thead>
<tr>
<th>Project</th>
<th>CF1</th>
<th>CF2</th>
<th>CF3</th>
<th>CF4</th>
<th>CF5</th>
<th>NPV</th>
<th>IRR</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-700</td>
<td>100</td>
<td>200</td>
<td>400</td>
<td>400</td>
<td>$118.12</td>
<td>17%</td>
</tr>
<tr>
<td>D</td>
<td>-700</td>
<td>450</td>
<td>200</td>
<td>200</td>
<td>120</td>
<td>$96.91</td>
<td>19%</td>
</tr>
</tbody>
</table>

Project C has an NPV of $118.12, while Project D which has an NPV of $96.61, so we choose project C. However, Project D has an IRR of 19%, while Project C has an IRR of 17%, so we choose project D. Which do investors prefer? Project C of course! Because when we know the opportunity cost (in this case 10%), the NPV is always decisive. In contrast, the IRR is ambiguous. It follows that prudent investors do not use the IRR as a decision criteria, else they are imprudent.
Third, because the IRR is simply the discount rate for which NPV equal zero, the average IRR for a group of projects has no useful meaning.

For these three reasons, the IRR is a fundamentally flawed measure which is wholly inadequate for benchmarking infrastructure assets.