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INCENTIVIZING PRIVATE SECTOR INVESTMENT INTO SUSTAINABLE INFRASTRUCTURE IN EMERGING ECONOMIES

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Introduction

In order to provide the public goods and services that allow economic development, infrastructure has to be upgraded, replaced and newly built. In the energy sector alone, the IEA (2012) estimates that in the next 20 years, USD37tn are necessary to cover the increasing demand for energy and replace existing infrastructure that is going to be outdated.

As most sustainable infrastructure technologies bear higher upfront cost than their less sustainable alternatives (note that this does not automatically result in higher life-cycle cost), infrastructure investments that meet ambitious sustainability targets are even higher. In the energy sector, the IEA estimates an additional USD17tn by 2035 in order to provide the world economy with enough energy while not overstepping the 450ppm atmospheric concentration of CO_2 (IEA, 2012).

As only the private sector can realistically stem these amounts, it is essential to understand, how private investments into sustainable infrastructures can be incentivized. And, as public funds are limited, it is also instrumental, that policies are cost effective, i.e. they leverage private investments as much as possible.

In the following I will shortly highlight some peculiarities of infrastructure and infrastructure investments. I will then discuss, which investment criteria are relevant for the private sector and how they can be provided by the public sector. I will specifically focus on one of these criteria – investment risk – and argue why policies should always address investment risk and how this can be done in the case of infrastructure through different types of derisking. After discussing the potentials of derisking, finally, I will highlight some of the important research gaps regarding sustainable infrastructure investment derisking.

Peculiarities of infrastructure (that matter for investors)

While there are many more peculiarities about infrastructure technologies, e.g., the fact that they represent complex "open assembled systems" (Tushman & Rosenkopf, 1992), I regard the following six characteristics of infrastructure as most relevant for investors:

1) Infrastructures provide public goods, or commodity-type services which are foundation of many economic activities.
2) They are often characterized (to some extent) by natural monopolies.
3) There upfront costs are relatively large (explaining to large parts the existence of natural monopolies), especially in the case of more sustainable infrastructure designs (see above).
4) Total investment sums can be very high.
5) They have typically longer life times than non-infrastructure investments (e.g., in industry).
6) The revenues are typically stable (i.e., have a lower volatility than those in industry) but typically not very high (often regulated).

While the latter four characteristics have direct implications for investments and investors, the first two criteria have an indirect implication. The provision of public good and existence of natural monopolies imply a strong role for policy and regulation in infrastructure governance. The regulatory aspect is even more complex than for other strongly regulated non-infrastructure activities, as infrastructures often span various jurisdictions (Hooghe & Marks, 2003).

Private sector investment criteria

The three most important criteria of private investors can be easily summarized: scale, return, and risk (cf. Schmidt, 2015). Of course there are many other considerations, e.g., with respect to strategic investments, but the above three criteria will always be considered.

First, private investors typically dislike small project *scales*. This is due to the high efforts (and costs) in evaluating potential sources of return and risk for each project. Different project types often also require different legal arrangement, leading to additional costs. These evaluation and structuring costs typically occur long before an investment can generate returns and typically do not increase strongly with project size, which makes larger investment more attractive. On the other hand, financing very large investments (as often the case in infrastructure) requires either large balance sheets or building consortia with many partners. The former excludes a large share of medium-sized and smaller investors; the latter can result in high transaction costs, yet again.

Second, unlike most donors or the public sector, private investors demand a *return* on their investments above a certain threshold, also called hurdle rate. In other words, the revenues from a private sector-financed infrastructure project need to not only cover the depreciation on the equipment, the operational expenditures (such as wages), debt service and interest expenses to a bank, for example, but also provide an annual income for the equity sponsor above a certain hurdle rate. To increase revenues of sustainable infrastructure projects and help surpass the hurdle rate, several sources of value might be combined in a business model (e.g., national government payments based on performance, revenues from the global carbon markets, etc.).

Third, downside *risk* can be defined as the combination of (i) the probability of negative events that can affect an investment and (ii) the financial impact in case these events occur (compare ISO, 2009). Private investors – particularly those willing to invest into long-term infrastructure investments– are typically risk-averse (Shrimali et al., 2013; Waissbein et al. 2013; see also Figure 1). The minimum return an investor demands depends on the risks present in a project. Each additional risk adds to the hurdle rate. The presence of certain risks can even act as "show- stopper", making projects entirely unattractive for private sector investment. At the same time, many infrastructure projects are plagued by high risks stemming from different stakeholders at various governance levels.

How do infrastructure characteristics match with investor criteria?

Many different types of investors exist and only few of them are able to directly invest in infrastructure. In industrializing nations, we can assume project finance to attract most infrastructure finance. On the equity side, the large investment sums and long lifetimes of infrastructure generally match the criteria of institutional investors (such as pension funds, insurance companies etc.). On the debt side, large commercial banks are generally able to provide finance. Especially in emerging markets, many technology equipment manufacturers' (OEMs) finance branches are acting as direct (co-) investors in infrastructure providing equity and/or debt. It is again mostly OEM firms with large balance sheets that can provide co-finance. Apart from these direct investments, indirect investments, e.g., based on asset-backed securitization can include other investors. An example are "green infrastructure bonds", which can even be issued as retail bonds, allowing small scale investors (e.g., households) to invest into sustainable infrastructure. While securitized finance vehicles for sustainable infrastructure are flourishing in many industrialized countries (e.g., the US), only few green bonds have been issued in industrializing nations. This has to do with underdevelopment of financial markets, financial regulation, as well as risks.

All these investor types are typically risk averse. Figure 1 shows in a stylized way how higher risks result in higher cost of capital and how different types of investors are willing to take more risks, due to their different risk preference. Venture capital is arguably the investor type most willing to accept risk, based on the high potential gains expected from investing in new start-up firms. However, these types of investors have rather short investment horizons (up to 5 years, typically), which does not match with infrastructure finance requirements. This and their high return expectation excludes them from infrastructure investments. At the other end of the risk-preference spectrum, we find institutional investors, who are often willing to provide long-term finance and do not expect such high returns (as long as they are stable and come from a creditworthy counterparty). Figure 1 shows that with increasing risk, investors demand higher financial returns (cost of capital). The slope of this function depends on the risk preference of investors, which differs from type to type. It also shows that different types of investors have different asymptotes, meaning that they accept different maximal risk levels. This translates into more risks being perceived as "show-stoppers" by risk-averse investors than by risk-seeking investor types. In case a project does not lead to financial closure on the debt side, i.e. "bankability" is not given because the debt provider(s) are not comfortable with the risk levels, most infrastructure projects are not realized. Debt is essential as its costs are much lower.

In sum, attracting the private sector to invest in sustainable infrastructure, can work to some extent by increasing revenues and/or by reducing risk levels. As very risk-averse investors are the ones that can provide long-term large-scale finance, the role of addressing risk becomes even more obvious.

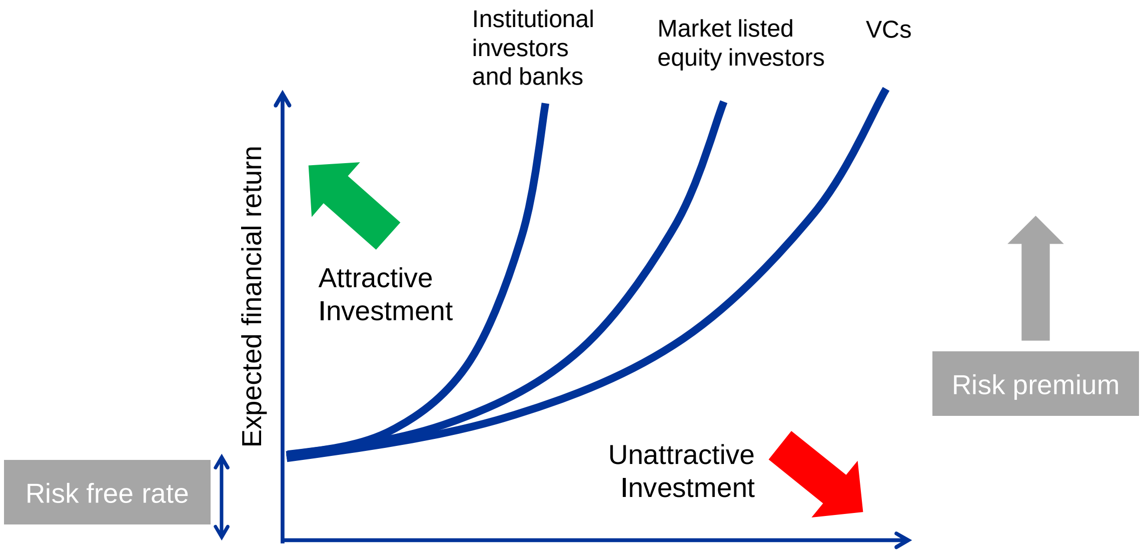

Figure 1: The role of risk for expected returns for different stylized types of investors

When it comes to sustainable infrastructure investment, the role of the cost of capital can become even more important. Sustainable infrastructure projects are often even more up-front capital intensive (as they often use more expensive technology, which results in savings during the operations phase).

Ways of derisking sustainable infrastructure investments

Given the above, it is essential to address risks in order to attract private sector sustainable infrastructure investment. Generally, four levers to address risk exist:

1. Risk compensation or increased returns: Providing higher returns that compensate for high risk levels
2. Risk mitigation or policy derisking: addressing the root cause of risk
3. Risk transfer or financial derisking: transferring risks to third-parties (e.g., insurance companies)
4. Risk pooling or portfolio derisking: aggregation of projects in portfolios

Risk compensation can be very costly due to the slope of the function and often be insufficient to make a project "bankable", i.e. to attract debt sponsors, and the also typically risk-averse equity sponsors (see above). It also does not represent derisking in a strict sense. *Risk mitigation*, or policy derisking reduces the probability of a negative event happening. It acts by removing barriers in the investment environment. Typically it involves policy reform. *Risk transfer* or financial derisking works on the financial impact side of risk. While it does not affect the probability of a negative event happening, it mitigates the financial impact for the investor in case an event happens. The provision of insurance or guarantees are typical forms or risk transfer. The insurer or guarantor can take these risks at lower costs as she pools contracts. This is described by the forth derisking lever: *risk pooling* or portfolio derisking. Here, individual risks are pooled into portfolios, which results in lower combined risks as described in portfolio theory (Markowitz, 1952). While this derisking strategy is daily business for providers of insurances or guarantees, it is typically not applying to direct infrastructure investments as these are too large. An exemption are small scale infrastructures mostly in rural areas, such as village water systems or off-main grid micro-grids providing electricity to villages. For indirect finance, e.g., via bonds, portfolio derisking can be important. However, thus far there is very little research on portfolio derisking for sustainable infrastructure specifically in emerging economies.

Selecting derisking instruments for sustainable infrastructure projects in industrializing countries

Which of these different types of derisking to use and which underlying instruments (e.g., guarantees or insurance) to select depends on the specific risks present. These risks differ across infrastructure sectors, technologies, and countries. What is important for all infrastructure sectors is that they are typically regulated (see above). While regulation is necessary for infrastructure, it can pose risks. E.g., in the electricity sector, power market regulation that is not well set up can result in major risks. Another risk source that is commonly found in infrastructure stems from the existence of (natural) monopolies (see above). These are in many developing (but also industrialized) countries operated by state-owned enterprises. These enterprises often have activities which extend the natural monopoly share of the infrastructure service supply chain. This often results in high risks for new independent private sector players operating at the non-natural monopoly supply chain ends, as the state-owned monopolies have market power, operate the natural monopoly and thereby can exert their market power even beyond the affected supply chain stage, and have high political power (often more than their very regulator). An example are state-owned electricity providers which are fully integrated. New independent power producers (IPPs) often face tremendous resistance from these monopolies which fear independent operators. E.g., the fully integrated monopolist often poses very strict rules for grid access, denies access etc. This behaviour results in major investment risk for independent power producers.

Many other barriers resulting in investment risks exist. Many of them are sector- and country-specific.

It is thus essential to understand to which extent these different risks are present in the investment environment in order to select derisking measures. For the energy sector, the United Nations Development Programme (UNDP) together with ETH Zurich's Energy Politics Group developed a methodology that, based on structured investor surveys, allows rating different risks. The outcome of this methodology are "risk waterfall graphs", which show how different risk categories contribute to elevated cost of equity or debt (compared to best-in class investment environments). An example is given in Figure 2. This methodology was originally developed for large-scale renewable energy investments but is now further developed to also address other types of infrastructure investments.

One outcome of the UNDP/ETH Zurich work is that policy-derisking can come at very low cost and can have a high theoretical derisking effect. Typically infrastructure sector-specific regulation results in high risk levels in emerging economies. These risks can be addressed by policy reform. Other than in industry sectors, de-regulation is typically not an option in infrastructure sectors (due to peculiarities #1 and #2 listed above). Hence, *better* regulation that takes into account the *private sector investment perspective* is essential.

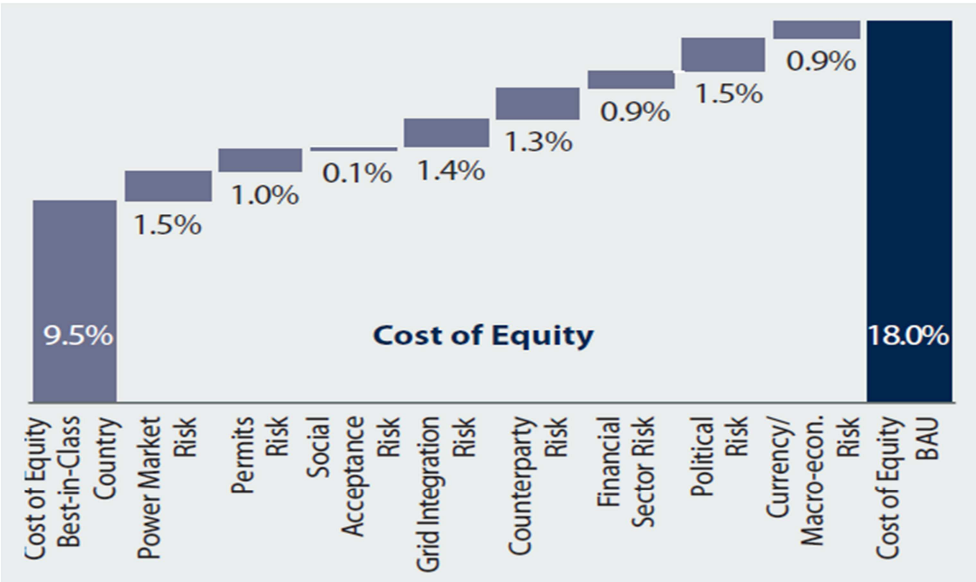

Figure 2: Example for "risk waterfall graph" – large-scale wind power – as output of UNDP DREI framework (Waissbein et al., 2013)

The work by UNDP/ETH also shows that risks which are not specific to the respective infrastructure sector but affect the entire country are more effectively addressed by financial derisking. For the example shown in Figure 2, this means that policy derisking can be effective in addressing the six left-most risks, whereas financial derisking is most appropriate for the two at the right hand side.

Generally, derisking instruments should be chosen according to the presence of risks, i.e. the more a risk category contributes to the "risk waterfall" the more important (and effective) it is to introduce derisking instruments addressing this risk. Such as the risk categories and their importance differs from sector to sector, the instruments available can be highly sector specific (especially in terms of their design) in case of policy derisking. Some instrument types are, however, applicable to all sectors (though their designs might differ). Examples are:

- Sector-specific realistic infrastructure investment targets (applies to all infrastructure sectors)
- Streamlined permitting processes (applies to all infrastructure sectors)
- Develop a grid code for IPPs – especially for intermittent renewable energy (applies to electricity provision)

The mix of derisking instruments is typically built around a cornerstone instruments that provides the main incentive for the private sector to invest in infrastructure. UNDP/ETH Zurich propose the policy mix example (using the example of large-scale renewable energy) shown in Figure 3.

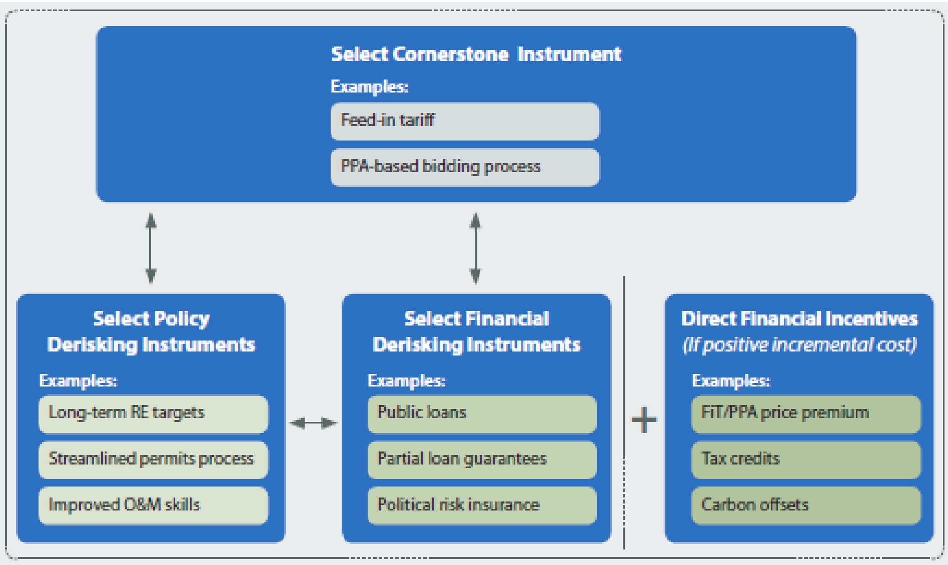

Figure 3: A policy mix that decreases risks while providing risk-adjusted returns (Waissbein et al., 2013)

The effects of derisking

In case derisking is effectively introduced and investors gain trust in the instruments, the effects can be large in terms of effectiveness and efficiency. Effectiveness refers to the question whether the policy mix can attract private sector finance at sufficient scale. Efficiency refers to the question at which public cost, private sector investment can be attracted.

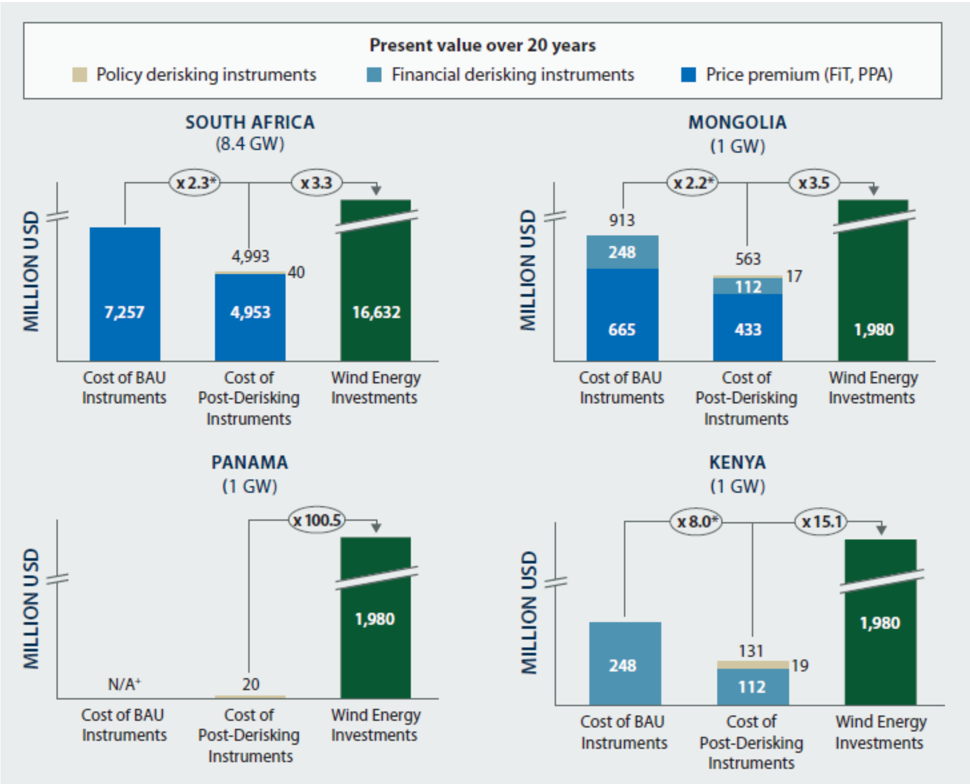

Figure 4: The potential effects of derisking in leveraging private sector investments into infrastructure – example of Wind power in four countries (Waissbein et al., 2013)

Future research on derisking

Despite the large potential of derisking for (sustainable) infrastructure investments there are many unanswered questions as academic research in finance mostly focuses on stock or bond markets due to data availability and historical path dependency in academia. I see need for future research in the following fields (cf. Schmidt, 2014):

- Collect and make accessible (anonymized) data on infrastructure investment, specifically the cost of capital
- Understand the drivers of risks and their interaction better
- Understand how policy derisking effects build up over time through trust building among investors
- Understand how different portfolio strategies result in different portfolio derisking effects
- Better understand the political economy of derisking in order to provide recommendations concerning the politics of derisking

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