GAME-CHANGER OR COMPLEMENT?

THE POTENTIAL OF PUBLIC FINANCE INSTRUMENTS FOR COVERING RISKS AND FACILITATING LOW-CARBON INVESTMENTS IN DEVELOPING COUNTRIES

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Game-changer or complement?

The potential of public finance instruments for covering risks and facilitating low-carbon investments in developing countries

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Executive Summary

Annually, hundreds of billions will have to be invested in developing countries to allow a transition to low-carbon development. As public funding is limited, large amounts of private investments have to be mobilised. Among the different options for leveraging private funds, traditionally tools to cover incremental costs have dominated. In recent years the discussion has shifted towards public finance instruments facilitating access to private finance, mainly by reducing or covering risks. Such tools include public equity, public debt instruments and guarantees.

Reasons for using public finance-facilitating instruments (equity, debt and guarantees)

Policy makers are increasingly considering finance facilitating tools because they realised that - beyond the question of incremental costs - low-carbon technologies face a finance supply problem; even projects with considerable return expectation have problems to access finance because of high risks and limited liquidity of financial flows in developing countries. In such cases, public equity and debt have several functions. First, they can “signal” to private actors that risk-averse public institutions are investing in specific low-carbon technologies. Second, public finance instruments can cover risks that would otherwise impede private investments. Third, in cases of lending to financial intermediaries, such as banks, public finance can increase the capital flow in the case of less advanced financial markets. Through all these functions, public finance-facilitating instruments can leverage private capital, both debt and equity.

The just described benefits have yielded hope that finance-facilitating tools can leverage the hundreds of billions of private low-carbon investment needed in developing countries. However, such tools may also face severe challenges, such as the diversity of risks, insufficient low-carbon investment opportunities, substitutability of direct payment tools and free-riding. We have explored these challenges by reviewing the literature and conducting expert interviews.

Challenge 1: Diversity of risks

Low-carbon investors face several risks in developing countries, ranging from financial-economic and policy risks to technological and market risks. Fortunately, available risk-reducing tools can cover all types of risks and also risks at different stages of technology development. Still, risk coverage is only partial as public finance institutions are often risk-averse and try to avoid moral hazard.

Challenge 2: Insufficient amount of low-carbon investment opportunities

Can public finance institutions find enough investment opportunities? Currently, the “deal flow” – the amount of bankable low-carbon projects available to investors – is large enough, particularly in advanced developing countries. In less advanced economies, technical assistance and capacity building has to be carried out to increase the number of bankable investment opportunities. The deal flow problem will become even more severe if finance-facilitating tools are more widely employed. In the long-term, enough investment opportunities can only be secured with the right policy framework, which both means a generally improved investment environment and also ambitious climate policies.

Challenge 3: Substitutability of direct payment tools

Finance-facilitating tools may often be more efficient than direct payment tools (e.g. feed-in tariffs, carbon market payments) as they can leverage funds by using little or no public subsidies. However, finance-facilitating tools may face decreasing returns on the net present value of investments and their application is limited to cases where the return is already high enough to be potentially attractive for investors.

Challenge 4: Free riding and moral hazard

Finance-facilitating tools may, similar to tools covering incremental costs, face the problem to support investments that would have happened anyway, i.e. that are not additional to business-as-usual. While in the case of risk-reducing tools such free riding does not lead to windfall profits as in the case of direct payments, it means that risks already covered by the private sector are now taken over by the public, and private capital may be crowded out. Moreover, in case of guarantees, moral hazard may be a problem. Existing public finance instruments use several tools to minimise free riding and moral hazard: e.g. only

1 Such tools will henceforth be referred to as “finance-facilitating” or “risk-reducing” instruments.
partial risk coverage, exit strategies and thorough due diligence, which enables both to identify and to deter investors that do not really face a finance access problem.

During the expert interviews, we identified a fifth challenge: Public finance institutions using equity, debt and guarantees as tools, are often very risk-averse due to their need to preserve their high credit rating to raise capital on the financial market. Therefore, they often do not cover substantial risks even if they claim it. First examples of some advanced risk coverage exist, e.g. in case of the EU’s Global Energy Efficiency and Renewable Energy Fund (GEEREF) or the German Global Climate Partnership Fund, where public finance enables subordination of public investments. Expanding the use of such tools taking slightly more risks would increase the influence of finance-facilitating tools; it may in some cases also enable better use of public money as public funding can be re-invested.

**Reasonable expectations and some new ideas**

Summing up, finance-facilitating tools are an important part of a successful policy mix to drive low-carbon development because they can reduce risks, increase the capital flow and leverage substantial private capital. However, they are not a “game changer” enabling to move close to the 2 degrees target; ambitious climate policies (e.g. international emission targets, technology promotion or sustainable carbon pricing) are required to create the needed boost for low-carbon technologies.

While finance-facilitating tools cannot manage the transition to low-carbon development on their own, they are still an important complement to other tools that cannot address the “access to capital” barrier. This “finance problem” will probably persist, even under very high carbon prices. Therefore, the use of risk-reducing tools may be further expanded and new tools are to be explored. Apart from the further exploration of existing tools, such as public-private equity funds, we also see the shift of World Bank guarantees from fossil to renewable fuels as a promising policy option. Furthermore, in the interviews several new ideas came up, such as the creation of a liquidity pool for carbon price insurances or the issuance of Green Brady Bonds, where Northern countries back the issuance of bonds by emerging economies and the leveraged capital is used for low-carbon projects and funds.
Introduction

Leveraging private finance is essential as public finance alone will not be sufficient for embarking on low-emission development paths that limit global warming to 2°C (LSE, 2009; Neuhoff et al., 2009; UNEP, 2009). The World Bank estimates in its World Development Report 2010 (World Bank, 2009a) that by 2030 USD 264-563 billion of low-carbon investments are needed annually in developing countries; these investments will only happen if USD 63-175 billion of incremental costs are covered, either by public finance or carbon market payments. The IEA (2009) estimates USD 200bn of additional capital are to be invested in developing and emerging economies by 2020. As the OECD (2010) puts it: “Public finance can jump-start the motor, but private investment in low-carbon infrastructure and solutions will need to keep it running”2. While we have concluded in another working paper (Stadelmann et al., 2011) that the ratio between mobilised private investments per invested public funding is not necessarily a good indicator for efficiency in reducing greenhouse gases, we agree that substantial private sector investment has to be mobilised.

How can private sector funding be mobilised by the public sector?

The existing literature has for a long time mainly focused on policy tools to increase the relative returns of climate-friendly interventions. It is now common sense that a price on carbon, either through a tax or via establishing carbon markets is needed to trigger private sector investments in low-carbon technology. Most famously, the Stern Review on the economics of climate change called for a price on carbon (Stern, 2007). Apart from carbon taxes and emission trading, direct payments, e.g. in the form of feed-in tariffs, are widely discussed. In the context of climate policy in developing countries, international cooperation has not arrived at pricing carbon emissions but has relied on direct financial transfer for low-carbon technologies. Among direct international financial transfers, we may distinguish, following Neuhoff et al. (2009), between payments during operation, as in case of the Clean Development Mechanism (CDM), and up-front grants, e.g. those used by the Global Environmental Facility (GEF) (see Figure 1). Upfront direct payments are rarely used to directly subsidise projects and increase their return but rather to alleviate the many different barriers that low-carbon technologies face, e.g. related to an unfavourable enabling environment or lack of capacity. Real direct transfer is mainly applied in case of demonstration projects and research and development (R&D). In the context of the funding of Nationally Appropriate Mitigation Actions (NAMAs) in developing countries, the concept of “supported NAMAs“ is based on the assumption that industrialised countries will subsidise policy measures in developing countries, e.g. feed-in tariffs. Edkins et al. (2009) have developed a NAMA-based subsidy plan for the feed-in tariff for concentrating solar power in South Africa. Deutsche Bank Group (2010) has expanded it generally to all renewable energy technologies in developing countries. However, to date no industrialised country subsidies for feed-in tariffs in developing countries have been implemented in practice.

Figure 1: Use of public finance for low-carbon programmes in developing countries

From direct payments to finance-facilitating (risk-reducing) tools

In the last two to three years, the discussion on direct payment tools (i.e. those closing the incremental cost gap) has been complemented by ideas about how to facilitate finance, mainly by reducing the risks of low-

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2 An earlier UNFCCC (2008) study estimated that 85% of finance or investment to support climate change action will need to come from the private sector.
carbon investments. In short, the climate change community has realised that there is a "finance problem" over and above the incremental cost problem (Ward, 2010; Brown and Jacobs, 2011). Even when the incremental cost gap has been closed and net profits are available, liquidity of financial flows is often insufficient and the private sector is hesitant to invest because of perceived high risks of low-carbon investments in developing countries (e.g. country, financial or technology risks). Therefore, public finance instruments are needed to reduce these risks and ensure financial liquidity. Neuhoff et al. (2009) talk about tools to "facilitate finance", and classify the tools into public equity, debt and risk-covering tools (e.g. guarantees), see Figure 1. Such risk-reducing or finance-facilitating tools have been emphasised to such an extent in the last two years (see e.g. Ward et al., 2008; LSE, 2009; UNEP, 2009; Brown and Jacobs, 2011) that "leveraging private investments" in the current understanding means the use of finance-facilitating tools and not of other instruments.

Exploring four potential challenges of finance-facilitating tools in the climate policy architecture

The existing literature (Ward, 2010; Brown and Jacobs, 2011) has mainly shown the advantages of finance-facilitating tools; they address several investment risks and can leverage large amounts of private capital, potentially even very risk-averse pension funds. The focus on risk-reducing and finance-facilitating tools in the literature, and the emphasis on their advantages, has given the impression that such tools are somehow a "game-changer", meaning that enhanced focus on such tools enables the transition to low-carbon development and can leverage the hundreds of billions of private investment needed.

However, public finance-facilitating instruments may also face several serious challenges in leveraging the required funding. We have identified the following potential challenges;

1) Can such tools alleviate all types of risks related to low-carbon investments in developing countries?
2) Do enough investment opportunities exist where public finance instruments can be applied (deal flow problem)?
3) Can risk-reducing tools always substitute for direct payment instruments? Are they a sufficient condition for mobilisation of investment or only a necessary one which needs to be complemented by other instruments?
4) Can they overcome the problem of additionality ("free riding"), or in other words can they avoid spending public funding for projects and programmes that would take place anyway?

We are not aware of any literature that has looked at these potential challenges when applying finance-facilitating instruments for low-carbon development, apart from some discussions on the deal flow problem (UNEP, 2009). Given this research gap we will explore these challenges in this paper. We will start by outlining the major types of risks and available public financing instruments. Then, we will explore the four challenges (risks covered, deal flow, direct payment vs. finance-facilitating tools, free-riding issues) and conclude.

This paper will mainly rely on a literature review, especially in the first part when discussing existing finance-facilitating tools and the types of risks they can alleviate. For the second part, in which we discuss the other challenges, we will complement the literature review with data from seven semi-structured interviews we have conducted with experts from development banks, bilateral agencies and the private sector.

As we use quite specific terminology used in the investment world and climate change research, we included a glossary in the Annex.
Type of risks

Investors face several risks when investing in low-carbon technologies in developing countries. The following review of the most important risks included in risk-assessment frameworks is mainly based on experience with renewable energy. As other low-carbon technologies face similar investment risks, we can see this as a general overview. Many of these risks are not limited to low-carbon projects, but their combination with low-carbon technology and policy risks is particularly difficult to overcome. We will classify the risks in country and financial, policy-regulatory, technology and market risks, which are summarised in Table 1.

Country and financial risks
For developing countries, country risks play a major role as they are generally perceived as being higher than in industrialised ones (UNEP, 2009; Brown and Jacobs, 2011). Some country-related risks are connected to unfamiliarity with developing countries, including their economic, legal and political systems. Other risks persist even under profound knowledge of the countries: e.g. risks related to political stability, the legal system (rule of law, sanctity of contracts) and financial systems (interest rates, financial market). Furthermore, investors also assess economic risks (e.g. growth, inflation) and currency risk connected to fluctuating exchange rates. All these risks apply to any type of investment, e.g. standard “high-carbon” projects as well.

Policy and regulatory risks
As governments may change and budgets are constrained, all investors face the risk of changing policies and regulations. This risk, which again also exists for high-carbon projects, is exacerbated in the case of low-carbon investments, as due to their incremental costs these are in most cases only financially viable in the presence of public policy incentives, e.g. tax breaks, feed-in tariffs or standards (UNEP, 2009; Brown and Jacobs, 2011). Apart from climate-specific policies, the risks extend to other regulations, e.g. construction permits (Justice, 2009).

Table 1: Overview of low-carbon investment risks

<table>
<thead>
<tr>
<th>Risk category</th>
<th>Sub risk</th>
<th>Specific to low carbon projects</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country and financial risks</td>
<td>General country risk, unfamiliarity</td>
<td>No</td>
<td>UNEP (2009), Brown and Jacobs (2011)</td>
</tr>
<tr>
<td></td>
<td>Economic risks (e.g. inflation)</td>
<td>No</td>
<td>Justice (2009)</td>
</tr>
<tr>
<td></td>
<td>Financial market (e.g. interests)</td>
<td>No</td>
<td>Justice (2009)</td>
</tr>
<tr>
<td></td>
<td>Political risks, stability</td>
<td>No</td>
<td>Justice (2009)</td>
</tr>
<tr>
<td></td>
<td>Rule of law, security</td>
<td>No</td>
<td>Justice (2009), Brown and Jacobs (2011)</td>
</tr>
<tr>
<td></td>
<td>Currency risks</td>
<td>No</td>
<td>Justice (2009), Brown and Jacobs (2011)</td>
</tr>
<tr>
<td>Policy &amp; regulatory risks</td>
<td>Low-carbon policy</td>
<td>Yes</td>
<td>UNEP (2009), Brown and Jacobs (2011)</td>
</tr>
<tr>
<td></td>
<td>Further regulations</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Technology and project-specific risks</td>
<td>Construction risks</td>
<td>Yes, often higher</td>
<td>Justice (2009)</td>
</tr>
<tr>
<td></td>
<td>Operation risks</td>
<td>Yes, often higher</td>
<td>Justice (2009)</td>
</tr>
<tr>
<td></td>
<td>Unfamiliarity risk</td>
<td>Yes, often higher</td>
<td>Doornbosch and Knight (2008), Brown and Jacobs (2011)</td>
</tr>
<tr>
<td></td>
<td>Counter-party, execution risk</td>
<td>Yes, often higher</td>
<td>Brown and Jacobs (2011)</td>
</tr>
<tr>
<td>Market risks</td>
<td>Market prices, demand</td>
<td>No</td>
<td>Deutsche Bank Group (2010), Brown et al. (2011)</td>
</tr>
<tr>
<td></td>
<td>Carbon prices</td>
<td>Yes</td>
<td>Justice (2009)</td>
</tr>
</tbody>
</table>

Technology and project-specific risks
Most low-carbon technologies are less known than their fossil fuel counterparts. Therefore, various technology-specific risks exist. Apart from the uncertainty risks related to being unfamiliar with new technologies or projects (Doornbosch and Knight, 2008; Brown and Jacobs, 2011), there may be specific
risks related to construction or operation (Justice, 2009). Apart from the technology itself, low-carbon projects may also face counter-party risks (e.g. small and inexperienced companies in the case of new technologies). Brown and Jacobs (2011) refer to this as “execution risk”; the investors may be concerned that local counterparts are not experienced or skilled enough to implement the projects.

Market risks
Finally, as any standard project, low-carbon projects are embedded in markets with fluctuating prices, leading to market risks (Justice, 2009; Deutsche Bank Group, 2010). Market risks for a renewable electricity project include electricity demand (both general and low-carbon) as well as the development of existing and new competitors. Brown et al. (2011) also speak about “strategic risks” in this context. Carbon price fluctuation risk of course is specific to low-carbon investments that want to engage in carbon markets.

Figure 2 shows that the risks just described can significantly increase the required return of low-carbon energy investments in developing countries as compared to generic infrastructure investments in industrialised countries. This is an illustrative figure taken from a Deutsche Bank Group report; real required returns will depend on countries, technologies and counterparties.

Figure 2: Required return of low-carbon energy investments in developing countries due to added risks

Different finance-facilitating instruments
To address the risks described above and to ensure liquidity of low-carbon investment funding, several finance-facilitating tools are available: equity, debt and risk coverage, as classified by Neuhoff et al. (2009). We will only discuss these finance-facilitating instruments here but not direct payments increasing returns, such as carbon market payments or grants for research, development and demonstration.

Equity: Public-private investment funds
One means of reducing risks and facilitating access to finance is the provision of public equity, with public finance institutions (e.g. IFC, KfW) investing themselves in low-carbon companies and projects. While public investors do not buy equity shares at stock markets – such companies have reached a commercial stage where they can access capital from other sources – public equity has its merits for earlier stage companies and projects, where high technology or other risks prevent the sourcing of commercial equity and achieving favourable debt-to-equity ratios. We distinguish between investments in early-stage companies, similar to Venture Capital with very high risk and return expectations, and later-stage equity, more similar to Private Equity investment in more advanced technologies and companies.
Public equity can reduce risks in two ways. First of all, the provision of public equity has in general a “signalling” effect: if private actors see that public finance institutions with their rigorous due diligence processes invest in low-carbon technologies, they are more willing to invest as they perceive risks to be lower than before. This signalling effect not only relies on the sound due diligence process of public institutions but also on the fact that public investors have relations with developing countries’ governments, which may reduce some of the policy risks. Second, public equity can reduce risks when provided as subordinated equity, which has different terms than commercial equity. Subordinated equity will receive repayments later than ordinary equity (Brown and Jacobs, 2011), by which the senior equity provided by private investors faces lower risks.

Normally, public equity is not directly invested in companies or projects but indirectly via public-private equity funds. The idea is that public equity acts as an anchor investment triggering further private capital to be invested (Brown and Jacobs, 2011). Sometimes public equity is even injected in a fund-of-funds, which is similar to proposals for a cornerstone fund (LSE, 2009; UNEP, 2009). Such a high-level fund works by investing in lower-level funds, which themselves directly invest in projects$. It is expected that such a public-private fund-of-funds may even attract very risk-averse capital, such as institutional investors and pension funds, which are widely seen as the primary target when leveraging private finance (OECD 2010; UNEP 2009).

Public-private equity funds for low-carbon investments have already been set up by several public institutions. In all known cases the public does not take more than a 25% share of a fund, in order to limit risks5. For instance, the Asian Development Bank (ADB) invested in seven clean energy funds in 2007 and 2009. This year, the ADB also provided capital for two clean technology Venture Capital funds in India and China. As the investments are made at market terms, the leveraging impact of ADB’s investments will only emerge from its “signalling” effect. Another example is the plan of the British Department for International Development (DFID) and ADB to set up a Climate Change Public-Private Partnership (CP3) Fund, which is a high-level public-private-equity fund as proposed by many authors (LSE, 2009; UNEP, 2009; Ward, 2010). The idea is to use equity from multilateral and bilateral finance institutions to crowd-in private equity for the CP3, which would mainly invest directly in large-scale energy infrastructures and to a smaller extent also indirectly via private equity funds across Asia. Through this structure, public funding is able to leverage private funding at three levels: at the CP3 level, the investee fund level and the project level. While enough projects are in the pipeline in case of advanced developing countries (India and China), the sourcing is more difficult in smaller, less advanced economies. That is why a technical assistance facility is planned that will help to generate investment cases for a separate public-private equity fund, which will invest globally in private equity funds, also in less advanced economies.

While traditionally most public equity investments have been made at market terms, some newer examples take slightly more risks. One example is the EU’s Global Energy Efficiency and Renewable Energy Fund (GEEREF)6, which invests in clean energy equity funds with a focus on small- and medium-sized enterprises. As public equity within GEEREF has not the same priority on reflows than other investors, its investments have a risk-reducing impact beyond the signalling effect. Another example for subordination of public funds is Germany’s Global Climate Partnership Fund (GCPF), which we discuss under “loans”.

**Quasi equity**

Some public funding has similar risk features as equity, even when it does not involve the purchase of shares. The most common form of such quasi equity is subordinated debt as provided by the International Finance Corporation IFC (2011); we will discuss this below under loans. Furthermore, some public grants are also very similar to equity. For instance, Sustainable Development Technology Canada (SDTC) provides subsidies for early-stage (post R&D but pre-commercialisation) technology but the payments resemble equity as SDTC follows a very strict due diligence process and receives a share of any revenue during the funding period (SDTC, 2011). It has to be noted that SDTC is widely regarded as one of the most successful tools to mobilise private investments.

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5 Also referred to as having “skin in the game”.

6 They could also invest in climate policies, such as Nationally Appropriate Mitigation Actions (NAMAs). KPMG (2010) has proposed to build country-level public-private financial vehicles with international public capital injection to finance NAMAs.

7 This behaviour corresponds with the recommendations of Klein (1997) that the public sector should limit its capital investments (both in general and as share of equity in projects) in order to not expose tax payers to risks.

8 Sponsored by the EU, Norway and Germany and administered by the European Investment Bank.
Debt: three types of loans

In later technology stages, debt represents a larger share of the overall investments, up to 80%. However, in the case of high investment risks, local banks are often reluctant to provide loans and require a low debt-to-equity ratio. Moreover, many countries lack liquidity in long-term debt, even when technologies are rather mature. In such cases, public finance institutions can use debt tools, either by providing loans directly to projects/companies or by lending to local financial institutions for on-lending through credit lines, which is preferable in terms of building local capacity.

We distinguish three types of loans provided by public institutions (MacLean, 2008). The first one is senior debt, provided at market terms and having the same risk features as private debt. In this case, the main goal is to provide financial liquidity to the market without taking further risks. The second type is subordinated debt (also called ‘mezzanine’ debt or quasi-equity), which is provided at market terms but taking a first loss\(^7\) and therefore higher risks. One example of such subordinated debt funding is the IADB’s Renewable Energy and Cleaner Production Facility (UNECE, 2010). Finally, the third type is the one of concessional loans, provided below market rates (lower interest, longer maturity). Such loans are actually return-enhancing tools as they increase the return for other investors. Such concessional loans are the classic instrument of Multilateral Development Banks (LSE 2009), who normally provide them to governments but sometimes also to local banks. While primarily enhancing returns (or lowering costs) for other investors, concessional loans may also reduce risks due to the signalling effect.

An interesting example of lending tools is the Global Climate Partnership Fund (GCPF), a new public-private partnership fund where public investors take the highest and the second highest investment risks (B and C shares), while the most senior A-shares (and super-senior notes) are open for private investors\(^8\). While no private investors have been secured yet apart from the fund manager, many private companies are interested. The GCPF both lends senior and subordinate debt to local financial institutions while also providing loans (and in few cases equity) directly to projects (see Figure 3). The investments target countries where banks are not familiar with small-scale energy investments and liquidity for long-term loans is limited.

Figure 3: Investors and investment channels of the Global Climate Partnership Fund (GCPF)

Source: GCPF (2011), IFC and the Danish government added as investors

\(^7\) A creditor taking a “first loss” means that he is only paid after all other loan creditors are paid. Therefore, he has to cover the “first loss” in case of default.

\(^8\) The investment is a mix between equity and loans, as the investors receive a target return and the value papers have a maturity.
A new way to raise debt funding is the issuance of green bonds (see Box).

**Box: green bonds to raise debt**

Bonds are a traditional way to raise funds for governmental institutions and a standard fixed income asset for a range of investors, including pension funds. For such investors, bonds from Northern governments form a low-risk investment tool, as governments are thought to guarantee the returns, which may now be questionable due to the recently lowered credit rating of several industrialised countries.

Around Copenhagen, when the need for raising international climate funds became obvious, bonds were among the most discussed options. A range of bond types are theoretically available, including traditional government bonds, green bonds and energy efficiency bonds (LSE, 2009), with options for index-linking and no-coupons (Climate Bonds Initiative, 2011a). The most discussed type is the one of green bonds, which guarantees to investors that the borrowed funding is invested in environmentally friendly programmes. Such green bonds have the double benefit of raising funds for climate change programmes and limiting the risks for investors. Thus, low-risk funds otherwise not invested in climate change or development countries can be leveraged (Reichelt, 2010).

In 2008, the World Bank became the first public institution to issue green bonds for climate change projects in developing countries. Initially, some pension funds and governments purchased the bonds but later on also banks, e.g. Bank of America – Merrill Lynch invested. In the first two and half years, the World Bank has issued over USD 2 billion in Green Bonds (Point Carbon, 2011). Despite high attention, the OECD (2011) estimates that green bonds only have a share of 0.01% of the global USD 90 trillion bond market. Climate Bonds Initiative (2011b) gets to a similar number estimating that USD 12 billion of climate-related bonds have been issued, of which around one third are used for investments in developing countries.

**Two challenges**

While green bonds are an interesting tool to raise large financial volumes for climate finance, they face two challenges. One major drawback is that raised funding has to be invested in very low risk projects. If multilateral development banks would invest bond funding in too risky programmes, they may lose their AAA rating. Therefore, it is questionable if green bonds really lead to additional climate benefits or if they just provide funding for baseline programmes. Another challenge is how to guarantee the greenness of bonds. Nowadays, the external credit rating focuses on investment risks but not on environmental benefits of bonds. Therefore, bond investors rely on information from the bond issuer regarding the climate-friendliness of the product.

“Brady bonds” for climate finance in developing countries?

A further option for climate finance in developing countries is to use traditional government bonds in emerging economies. In order to make those bonds more attractive for investors, richer countries could offer their balance sheets to support the repayment of bonds issued by developing countries, which could extend the tenor and lower the interest rate of these bonds substantially. Private sector entities investing in low carbon projects would have access to this pool of low cost debt. This system is similar to the “Brady bond” systems used in the 1980s and 1990s, which enabled heavily indebted developing countries to issue bonds backed by Northern governmental securities. In the case of “Climate Brady bonds”, industrialised governments could make backing of such bonds conditional on low-carbon policies (e.g. the removal of fossil fuel subsidies). A further step towards low-carbon policies would be to use such bonds to finance Nationally Appropriate Mitigation Actions (NAMAs), as proposed by Sullivan (forthcoming).

**Risk coverage: Guarantees and insurances**

Apart from directly providing debt or equity, public institutions also offer guarantees and insurance schemes for reducing risk for investors and banks. The following schemes are mostly not specific for climate change but applicable to all types of energy projects.

Among guarantees, we find comprehensive risk guarantees covering both political and commercial risks (Matsukawa and Habeck, 2007). The most common form of such comprehensive guarantees are credit guarantees for loans\(^9\), whereas we can distinguish between guarantees directed at individual

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\(^9\) According to Brown and Jacobs (2011), these are more suitable for early-stage, heavily dysfunctional markets.
projects/borrowers, then the ones directed at portfolios (e.g. utilities as applied in case of IFC’s China Utility-based Energy Efficiency Finance Programme, see also De'Serclaes (2010)) and the ones directed at primary lenders providing finance to wholesale lenders, e.g. microfinance institutions (Mostert et al., 2010). In climate finance discussions, the most discussed form are export credit guarantees (LSE, 2009; Neuhoff et al., 2009; OECD, 2010; UNEP, 2009), which are issued by various national and multilateral institutions and can cover some of the country and unfamiliarity risks. There are further types of comprehensive guarantees, different to credit guarantees, see Mostert et al. (2010) for an overview.

In contrast to comprehensive guarantees, political risk guarantees cover only political but not commercial risks (Matsukawa and Habeck, 2007). The best-known issuer of such political guarantees is the World Bank (2009b), with its close ties to Southern finance ministries and a particular focus on energy projects. While the World Bank also issues comprehensive guarantees, e.g. Partial Credit Guarantees (PCGs) covering all risks of lending to public sectors, many of its guarantees only cover political risks, e.g. the Partial Risk Guarantees (PRGs), which target for example currency risks, expropriation, and civil disturbance, and require a guarantee commitment of the host government. An even more prominent example of political risk coverage in the World Bank Group is the Multilateral Investment Guarantee Agency (MIGA), which offers export guarantees for both debt and equity.

Guarantees at the World Bank
We will have a closer look at the World Bank, as its guarantees have a disproportionate focus on the climate-relevant power sector. For instance, 58% of PCGs and even 76% of PRGs have been issued to power sector projects in the period 1990-2007 (World Bank, 2009b). The MIGA, while issuing only 19% of its export guarantees to projects in the power sector (World Bank, 2009b), has provided coverage to around USD 3.5 billion of electricity sector investment between 1994 and 2010, which is almost double the USD 2 billion of the World Bank’s PCGs and PRGs in the same period. The IFC is neglected here as it has only issued 1% of its guarantees in power sector projects between 1990 and 2007.

An internal evaluation of the World Bank (2010) has concluded that its guarantees have been not very successful in the case of energy efficiency, but they could become more and more important for renewable energy to insure investors against changes in favourable policies. Therefore, the World Bank is asked to expand its use of partial risk guarantees in the energy sector, especially in case of renewable energy and feed-in tariffs (World Bank, 2010).

However, from a climate policy perspective not only up-scaling of guarantees for clean energy is warranted but also the down-scaling of guarantees for fossil fuels, which becomes apparent when analysing the guarantees issued in the power sector in the last 15-20 years (see Figure 4). Of the USD 6 billion investments covered by World Bank guarantees, more than half focused on fossil fuels, while less than a quarter of guarantees benefited renewable energy. This is mainly related to a strong focus on guarantees for coal, oil and gas investments in the 1990s. However, even in the last 5 years more than double the amount of guarantees was used for fossil compared to renewable fuels. Interestingly, the MIGA has switched from a fossil portfolio in the 1990s to a more renewable-based portfolio in recent years, while the World Bank itself continues to cover more risks of fossil fuels (see Annex for details on MIGA and World Bank guarantees).

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10 Here, “World Bank” equals the International Bank for Reconstruction and Development (IBRD).
11 Policy-Based Guarantees are a sub-form of Partial Risk Guarantees used for policy-based borrowings.
12 After 2007, IFC has issued a USD 200 million guarantee for the China Utility-Based Energy Efficiency project (CHUEE), backed by a GEF grant (World Bank, 2010). Such a guarantee is similar to the whole annual guarantee portfolio of the IFC in the years before (World Bank, 2009b).
Apart from the more extensive use of generic guarantees, one may also consider more innovative insurance schemes tailored at specific risks. For example, Caperton (2010) suggested to create a foreign exchange liquidity facility, which would allow borrowers to lower their currency risks, as they could draw foreign currency from the facility in case of devaluation of their own currency (Brown and Jacobs, 2011).

**Carbon market insurance schemes**

Furthermore, insurance schemes may be used to reduce uncertainty about future carbon price, which has distressed the carbon market for a long time but is now even more prominent in the absence of any globally agreed emission targets for post 2012.

Rather than creating a regulatory price floor as often proposed, governments could also use financial market instruments to provide price security, e.g. by selling put options to private companies, which would give the buyer the right to sell the emission allowances for a fixed price at a certain time in the future, with the fixed price being similar to a guaranteed carbon price (Ismer and Neuhoff, 2009). While this instrument is only imaginable in industrialised countries, the put options would indirectly also guarantee some market value for credits from developing countries (e.g. from the Clean Development Mechanism).

Another, not yet implemented idea is to create a liquidity pool for leading re-insurance companies in order to lower the cost of insurance policies. Currently, private insurance companies ask for a fee of more than 10% of the covered sum if investors want to hedge against carbon price risks. Low-cost carbon insurances are especially important for investors paying their credits in advance as they face both commercial and carbon price risks. Incentivising advance payments would be an important step, given that the lack of such advance payments providing security for the investor is seen as major impediment for energy-related carbon-offset projects.

The only known public insurance against carbon market risks is the “insurance on breach of carbon credits” (introduced by the US Overseas Private Investment Corporation) protecting “US investors from the actions of a foreign government impacting the ability to realise carbon credit revenues” (Moran, 2011). This insurance is similar to a political guarantee but specifically focused on carbon credits.

Table 2 provides an overview of the discussed guarantees and insurance schemes.

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13 Such advance payments are also called “upfront” payments. They are very rare in the carbon market where credits are normally paid after the emission reductions have been verified and certified.

14 Price risks are less problematic for forward (payment on-delivery) buyers of CDM credits who can fix future prices.
### Table 2: Risk-covering guarantees and insurances

<table>
<thead>
<tr>
<th>Type</th>
<th>Tool</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traditional guarantees</strong></td>
<td>Comprehensive risk guarantees</td>
<td>Mostert et al. (2010), for export credit guarantees; LSE (2009), Neuhoff et al. (2009), OECD (2010); UNEP (2009), for other loan guarantees: Det'Serclaes (2010), Brown and Jacobs (2011)</td>
</tr>
<tr>
<td></td>
<td>a) Loan guarantees</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- (Export credit guarantees)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Individual guarantee</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Portfolio guarantee</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Wholesale guarantee</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Capital market guarantees</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Counter guarantees</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Political risk guarantees, e.g. World Bank's Partial Risk guarantees, MIGA</td>
<td>World Bank (2009b)</td>
</tr>
<tr>
<td></td>
<td>Counterparty risk guarantee</td>
<td>Deutsche Bank Group (2011)</td>
</tr>
<tr>
<td><strong>Climate-specific</strong></td>
<td>Foreign exchange liquidity facility</td>
<td>Brown and Jacobs (2011)</td>
</tr>
<tr>
<td><strong>insurance schemes</strong></td>
<td>Carbon credit insurance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- guaranteed carbon price (e.g. government put options, contracts for price differences)</td>
<td>Ismer and Neuhoff (2009), Neuhoff et al. (2009)</td>
</tr>
<tr>
<td></td>
<td>- Liquidity pool for reinsurers</td>
<td>New idea</td>
</tr>
<tr>
<td></td>
<td>- Insurance on breach of carbon credits</td>
<td>Moran (2011)</td>
</tr>
</tbody>
</table>

### Four potential challenges of finance-facilitating tools

Based on this overview on investment risks and available risk-reducing public finance instruments, we will now assess the four potential challenges of finance-facilitating tools as mentioned in the introduction: diversity of risk, lack of deal flow, substitutability of direct payment tools and deadweight effects.

#### Diversity of risks

The first challenge related to finance-facilitating tools is the question whether all investments risks can be covered by at least one of the different tools available. Table 3 shows which investment risks the different public risk-reduction tools can cover.

Senior public equity and loans cover some unfamiliarity risks, both related to the country and the technology. Their leverage is mainly based on the fact that they provide a signal that investment in specific funds and projects is worthwhile. However, senior debt and equity cannot cover any other risk as they are treated equally to other equity and debt. For taking further risks, subordination of public funds is needed, by which all type of risks can potentially be covered. Normally, public funds do not actually cover too many risks, as they are also required to bring return without taking too many risks. Therefore, public institutions normally only subordinate their funds if they believe that they better assess risks than the private sector due to their advanced understanding of technologies, markets and countries. Whether they are in fact able to do so, remains open. So, in fact, they rather try to cover perceived than real risks. Furthermore, as risk mitigation policy, public equity will just take a minority stake. Thus, part of the risks will remain with the private investors.

Another form of public finance tool covering all types of risks is the one of comprehensive guarantees. However, as in the case of subordinated funds, public sector institutions only issue such comprehensive

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15 Or provision of finance below market returns but this is considered a subsidy, and is, therefore, not treated here.
guarantees if they believe risks to be relatively low. Furthermore, as in any other guarantee or insurance, the loss coverage is only partial to avoid moral hazard (see later).

Finally, political guarantees, foreign exchange facilities, counterparty risk insurances and carbon credit insurances cover specific risks, and are normally applied in case of advanced technologies with specific insurance requirements.

We can conclude that all types of risks can potentially be covered by public finance instruments but the coverage is only partial, as public finance institutions are risk-averse themselves and want to assure risk sharing with private investors.

**Table 3: Types of risk covered by public risk-reduction tools**

<table>
<thead>
<tr>
<th></th>
<th>Country-related risks</th>
<th>Policy risks</th>
<th>Technology, project risks</th>
<th>Market risks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unfamiliarity</td>
<td>Economic</td>
<td>Rule of law, financial</td>
<td>Low-carbon policies</td>
</tr>
<tr>
<td>Senior Equity</td>
<td>X</td>
<td>(X)</td>
<td>(X)</td>
<td>(X)</td>
</tr>
<tr>
<td>Subordinated equity</td>
<td>(X)</td>
<td>(X)</td>
<td>(X)</td>
<td>(X)</td>
</tr>
<tr>
<td>Senior Loans</td>
<td>X</td>
<td>(X)</td>
<td>(X)</td>
<td>(X)</td>
</tr>
<tr>
<td>Subordinated loans</td>
<td>(X)</td>
<td>(X)</td>
<td>(X)</td>
<td>(X)</td>
</tr>
<tr>
<td><strong>Guarantees</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Comprehensive</td>
<td>(X)</td>
<td>(X)</td>
<td>(X)</td>
<td>(X)</td>
</tr>
<tr>
<td>- Political</td>
<td>(X)</td>
<td>(X)</td>
<td>(X)</td>
<td>(X)</td>
</tr>
<tr>
<td>- Counterparty risks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign Exchange *</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon insurances</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Foreign Exchange liquidity facility

**Stage of technology development**

While we have seen that all risk types are potentially covered by risk-reducing tools, this may not be the case for **risks at all stages of technology development**. Looking at Figure 5, risk-reducing or finance-facilitating tools are primarily employed at the deployment and early diffusion stage of technologies, while both the very early stages (research & development, R&D) and very late stage (commercialisation) are covered by other tools. The reason is that risks at the R&D stage are so high that only outright research grants enable initiatives.

When the early research phase has been successful, then public risk-reducing tools (e.g. public Venture Capital) can be employed to leverage high-risk private funds. As technologies become more mature, other tools such as guarantees and loans become useful. In a very advanced stage of technologies, close to commercialisation, risks are so low that public finance is hardly needed anymore. Using public finance tools at this stage would often have no significant impact any more.

We, therefore, conclude that public finance tools may cover all types of risks is only doing this at the intermediate stage of technologies where a “valley of death” is to be crossed, as early stage technologies need public grants for research & development and investments in mature technologies do not need public risk coverage any more.
Ensuring a sufficient "deal flow"

The second challenge public finance instruments may face is the availability of sufficient investment opportunities. Some investors are ready to invest capital in low-carbon projects but the climate-targeted funds face the "deal flow" problem (UNEP, 2009), meaning that not enough well-designed projects are being offered to investors.\(^\text{16}\)

Is there really a "deal flow" problem? Interviewed public investors gave mixed answers on this question. Some claimed that this was always an issue, while others were more differentiated in saying that enough bankable projects are available in more advanced and larger countries like India and China, while the "deal flow" is insufficient in smaller, less advanced countries. One interviewee even claimed that there are sufficient investment opportunities everywhere but the problem was more related to investors being unfamiliar with new technologies, and low-carbon engineers not familiar with the requirements of the financial market.

Counteracting the deal flow problem

Most interviewees mentioned three ways of counteracting the deal flow problem; advanced risk-assessment, taking more risks, and capacity building/technical assistance.

First, several public finance institutions claimed that their advanced experience with countries and technologies helps them to detect some "perceived" risks. Therefore, their funds can accept a larger proportion of submitted deals.\(^\text{17}\)

Second, some public institutions accept a larger proportion of "deals" than the private sector even when the risk assessment is similar to the one from the private sector.\(^\text{18}\)

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\(^{16}\) This deal flow problem may, in the short term, also apply to tools covering incremental costs if they are rapidly stepped up. However, if sufficient incentives covering incremental costs are available, then deals will probably be developed very fast (see the case of solar energy in Germany), while "indefinite" risk-covering tools will not be sufficient for enabling a very large deal flow, if cost coverage is not given.

\(^{17}\) This could mean that public institutions may train private investors and banks in assessing risks of low-carbon technologies in developing countries but the interviewees have a biased view, related to their "advance" knowledge.

\(^{18}\) This risk-taking is often smoothed with the use of technical assistance programmes; when public institutions invest in new companies or funds with inexperienced managers, then often assistance for business or fund development is provided.
Third, and most importantly, the deal flow can be improved by provision of capacity building and technical assistance\(^1^9\), normally via bilateral and multilateral development agencies. Capacity building and technical assistance are targeted at three levels: the project level, the fund/bank level and the policy level. At the project level, enterprises or business plans are developed (UNEP, 2008b); UNEP (2009) even calls for the set-up of project development companies, in order to generate a larger investment pipeline. Apart from companies using low-carbon technologies, technical assistance can also target companies providing technologies according to one of the interviewees. At the funds and banks level, knowledge management can support the development of new products and improve risk-assessment in a way that funds or banks are more willing to invest in low-carbon business opportunities. Finally, at the policy level, capacity building may help to shape policies in a sense that they provide the right enabling environment for low-carbon investments (see below).

While all interviewees agreed that there was a need for capacity building and technical assistance, some were sceptical about its effectiveness. They call for capacity building to be demand-driven and closely related to the financing tools to have any impact. These views are similar to our findings (see Stadelmann and Michaelowa, 2011).

Existing capacity building and technical assistance activities show the need for such activities to complement public finance instruments. All known public-private equity and loan funds use capacity building and technical assistance besides the financing line.

Past experience also shows that only selected projects and funds are to be included in those programmes, either already accepted investments needing further support or projects and funds with a good chance of receiving finance. Therefore, capacity building should not be randomly spread\(^2^0\).

Some interviewees were also optimistic that the provision of public equity and loans by itself is a signal that will drive the development and deal flow of low-carbon projects. However, this will depend on the certainty of public financing and its publicity.

**The importance of the right regulatory framework**

Some interviewees made clear that provision of capacity and technical assistance is only a limited, short-term reaction to deal flow problem. In the long-term, the only way of ensuring a sufficient deal flow is to have the right regulatory environment for low-carbon investments.

The reason for the importance of regulations and policies is twofold. First, the general regulatory environment (not climate-specific) may both reduce risks (e.g. inflation, political stability, established property rights) and reduce costs (e.g. low bureaucratic hurdles, taxes, and infrastructure). Second, policies specifically targeted at low-carbon investments reduce costs and most importantly generate the needed return for clean energy investments (see section on finance facilitation vs. direct payments).

All interviewees emphasised the need for the right regulatory environment (low political and economic risks, low bureaucratic hurdles), but respondents had different views on the need for climate-specific policy interventions. The common denominator was that policy interventions depend on the region and technology. While countries with a liberalised energy market may further ensure an enhanced deal flow by introducing a price on carbon, energy efficiency standards or a feed-in tariff for renewable energies, countries with state-controlled markets may enable low-carbon investments by removing subsidies on fossil fuels and enhancing access for private investors. On the technological side, most renewable energies (except large scale hydro, and in some cases wind, geothermal and biomass) and carbon capture and storage (CCS) need further support to bridge the cost gap, while some energy efficiency programmes in the private sector may not even need any direct governmental support or intervention to be implemented – in these cases, using public finance tools should be sufficient.

\(^{19}\) Technical assistance provides support for the technical and financial problems at hand, while capacity building is more targeted at longer term knowledge and know-how transfer. In practice, the two are often very similar. 

\(^{20}\) Sometimes technical assistance is provided by independent institutions, see e.g. the Seed Capital Assistance Facility (SCAF) providing enterprise development and seed capital support by taking over a share of development and transaction costs (Mostert et al., 2010)
In the long term, the sufficient deal flow for low-carbon investments leading to a 2°C target will only be generated if the right political goals (2 degree and emission reduction targets) and related measures (e.g. price on carbon, efficiency standards, promotion of low-carbon R&D) are in place. What investors are calling for, is in the end an “investment grade” policy framework with signals that are long (duration), loud (strength) and legal (Hamilton, 2010). This need for investment-friendly policy frameworks is also shown by the launch of the UK’s Capital Markets Climate Initiative, which tries to identify the right “investment grade” policies in leveraging private capital (Ballard, 2011). Another signal comes from a 2011 workshop of private sector and development finance institutions (Council of the European Union, 2011), which concluded that public finance interventions to change risk-return ratios are only a temporary measure and cannot substitute for the right policy framework in the long-term.

**Can the CDM help to ensure sufficient deal flow?**

Investors may be attracted to generate low-carbon deals if they are facing a short-term price on carbon. The only mechanism in developing countries that offers a real carbon price is the Clean Development Mechanism (CDM). Most interviewees, however, were quite sceptical about the potential of the CDM in its current state because the carbon price is uncertain, the rules are complex and the transaction costs high, particularly in the case of small-scale interventions. For ensuring a larger contribution to the deal flow, the CDM and other future carbon market mechanisms would need a more stable carbon price (linked to emission targets in the North) and lower transaction costs.

Summing up, finance-facilitating instruments indeed face a shortage in attractive projects. In the short term, this “deal flow” problem is limited to less advanced economies and can partly be overcome with technical assistance, capacity building and sound risk assessment but, in the mid- and long-term, substantial policy signals (long, loud and legal) are needed to create enough private interests in developing low-carbon investment projects.

**Finance-facilitating vs. direct payment tools**

A third challenge related to finance-facilitating tools is their ability to and their efficiency in replacing direct payment tools.

**Efficiency of finance-facilitating tools in replacing direct payment tools**

From a financial perspective, investment will only be undertaken if its Net Present Value (NPV) is positive. The NPV is dependent on future cash-in and cash-out-flows (or future revenues and costs) and the rate at which future flows are discounted to present value;

\[
Net\;present\;value = \text{discounted revenues} - \text{discounted operating costs} - \text{initial investment costs}
\]

With low-carbon projects, NPV is often below zero, as expected revenues (or returns) are low and discount rates are high because risky projects require high returns.\(^{21}\)

One option to arrive at a positive NPV is to increase revenues via direct payments (or a carbon price). Each USD of public finance via (discounted) direct payments increases the NPV by USD 1; in other words, direct payments have constant returns on the NPV. Tools for facilitating finance would be more efficient if they can increase the NPV by more than USD 1 per USD of public subsidy.\(^{22}\)

If we use tools for facilitating finance, we reduce the (perceived) risks of investment, which means that the debt-to-equity ratio may be increased (higher “gearing”). This may, on the one hand, reduce capital costs - which is, however, normally not the case\(^ {23}\) - or, more likely, increase risk-adjusted returns. Therefore, the NPV is also increased. As different tools for facilitating finance are used for different projects, we can

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\(^{21}\) high weighted average cost of capital

\(^{22}\) Neglecting transaction costs, additionality and leakage here.

\(^{23}\) Normally, higher gearing (debt-to-equity ratio) mainly affects riskiness of debt and equity, while the weighted cost of capital does not change much (Klein, 1997). In case of lower gearing, equity will just reduce its return expectations or, more often, exit from the project. Huizinga (1997) analyzed five World Bank guarantees and did not find any impact of the guarantee on the interest rates and tenor of non-guaranteed credits. However, using our reasoning, the guarantees may have lowered risks for non-guaranteed credits, by which lending was enabled.
assume that there are more and less adequate tools for reducing risks (facilitating finance). Assuming that policy makers know which tools are more efficient, we have decreasing returns of risk-reducing tools on increasing NPV.\footnote{While the first tools employed have a large return on NPV, the secondary tools have a smaller one.}

Figure 6 shows the efficiency of risk-reducing vs. direct payment tools in increasing the NPV under the assumptions described above (constant return of direct payments and decreasing return of risk-reducing tools). Direct payments can bring the NPV to a positive level for USD d of public finance. In case of efficient options for reducing risks, a positive NPV can be achieved for much lower costs (USD a), when using tools for facilitating finance only. In case of no efficient options for reducing risks, it is warranted to use direct payment tools only, as risk-reducing tools are both more expensive and cannot fully close the financing gap. In most cases, some efficient options for facilitating finance will be available. In this case, it is warranted to use finance-facilitating tools as long as they are more cost-effective than return-enhancing tools (b $). For the remainder of the financing, direct payments (USD c-b) are more efficient. Note that in this case, a part of the financing gap (USD x) can not be closed by using risk-reducing tools only.

Figure 6: Relative cost-effectiveness of risk-reducing and direct payment tools

![Figure 6: Relative cost-effectiveness of risk-reducing and direct payment tools](image)

Targeting different types of capital
The framework described above assumes that there are investors for each combination of reasonable risk-return ratios. However, the situation may in fact be more similar to the one depicted in Figure 7. Here, we have different types of investors (Venture Capital, Private Equity, infrastructure and pension funds), each with very different risk-return profiles. Therefore, for a given low-carbon investment opportunity (black dot), the tools to be used will depend on the type of equity to be targeted; for Venture Capital and Private Equity, return has to be enhanced, while for pension funds, risks have to be reduced.

Figure 7 also shows that for some projects with very low returns (the dark grey shaded area), some direct payment is required; with risk-reduction tools only, the financing gap cannot be closed. The dark-grey area actually represents many low-carbon technologies, e.g. solar PV or carbon-capture and storage, which have low or even negative returns under given market conditions. Unless substantial cost-reductions for such technologies are expected, direct payment tools will be needed to enable investments in such technologies. This failure of finance-facilitating (risk-reducing) tools to mobilise investments with negative NPV was recently emphasised by Edwards et al. (2011).
Summing up, risk-reducing tools cannot always substitute for direct payments as some technologies have too low profits to be even considered by investors. Furthermore, the efficiency of risk-reducing tools depends on the availability of tools. Assuming decreasing returns of risk-reducing tools on closing the financing gap, we can expect that in many cases a combination of direct payments and risk-reducing tools may be warranted from an efficiency perspective.

**Risks of crowding-out private finance and moral hazard**

The fourth challenge for finance facilitation are perverse incentives, particularly the problem of “free riding” (called the “additionality” problem in case of the CDM), i.e. can these tools avoid spending public funding for projects and programmes that would take place anyway, as is often the case for return-enhancing tools?

Risk-reducing tools do not produce windfall profits as direct payment tools. However, they may still face the “free riding” problem and other unwanted side effects (see Table 4). For instance, finance-facilitating tools may take over risks that are carried anyway by the private sector. In such cases, public finance may crowd-out private finance, while guarantees have no leveraging impact on low-carbon investments. Honohan (2008) finds estimates in the literature that 25-65% of partial credit guarantees are benefiting projects that do not need the guarantee.

**Table 4: Efficiency risks of different direct payment and risk-reducing tools**

<table>
<thead>
<tr>
<th></th>
<th>Direct payment tools</th>
<th>Finance-facilitating/Risk-reducing tools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Debt instruments</td>
</tr>
<tr>
<td>Crowding-out private capital</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Free riding (non-additionality)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Increasing moral hazard</td>
<td></td>
<td>(X)**</td>
</tr>
</tbody>
</table>

* No windfall profits but free riding due to coverage of risks already covered by the private sector; ** If subordinated equity or loan

In case of guarantees and insurances, we face a further problem: moral hazard. With moral hazard\(^25\), economists mean that the insured person (here: the guarantee beneficiary) will change to a more risky...
behaviour because the insurer (here: the public guarantor) covers risks\textsuperscript{26}. Apart from guarantees, also debt and equity instruments may face moral hazard issues, if public equity or debt is subordinated and takes more risks (see Table 4).

A May 2011 EU staff document (European Commission, 2011) mentioned the same issues (free riding, crowding-out of private capital and moral hazard) as risks for efficient use of public funds.

**Ways of minimising the risks of crowding-out and moral hazards**

Interview partners were asked how they avoid free riding and crowding-out of private finance by employing public finance. First of all, some interviewees admitted that the risk can never fully be avoided. While one public investor believes that the “signalling” effect of public investments already leverages “additional” funding, most of the interviewed public institutions use several ways of avoiding crowding-out of private finance; they check if any investments have been taking place in similar projects and technologies, they use a very stringent due diligence process, which will only be undertaken by developers with real financing needs, and they gradually move their investments away from larger projects and countries with well working financial markets and increase their investment in smaller projects and countries with dysfunctional financial markets. This “exit-strategy” of public finance is similar to decreasing subsidies like feed-in tariffs over time to avoid windfall profits\textsuperscript{27}.

Crowding-out of private sector insurances can be reduced by charging fees for guarantees, usually around 1-2\% of the guarantee liability per annum in the case of the World Bank. However, the fee should also be low enough to provide enough incentives for buying the guarantees (Mostert et al., 2010).

For avoiding moral hazard, public finance institutions provide only partial guarantee. Therefore, the entity covered by the guarantee or insurance always has to pay part of the loss on its own, either pro rata, on a first or on a second loss basis\textsuperscript{28} (Mostert et al., 2010).

**Is free-riding a substantial problem for finance-facilitating tools?**

Interviewees claimed that, compared to subsidies, tools to facilitate finance face a lower risk of free riding because public equity and debt do not increase profits\textsuperscript{29}, and are therefore only attractive in cases that really face a finance supply problem. While this may be a true argument, it also supports our earlier argument that risk-reducing (or finance-facilitating) projects are only useful in cases with a certain level of returns. Therefore, risk-reducing tools cannot leverage a wide range of technologies that are not profitable yet needed for low-carbon development.

Even when the risk of free riding is low, it may form a severe challenge for some leverage claims. E.g. some of the public-private equity funds plan to leverage private funds at three levels: at the fund of funds level, the intermediate fund level and the project level. Even when the chances of avoiding free riding are 2/3 at each level, the probability of a true overall leverage claim is only 44\% with two levels, and 30\% with three levels\textsuperscript{30}.

**Taking more risks**

One problem that emerged from the interviews was the question whether the international community really takes on enough risks. While most public funds claim that they cover major risks and, thereby, leverage private capital, most of them are actually very risk averse; they invest at the same terms as private finance. This fact is connected to their funding source, which is mainly private funding raised by issuing bonds. For

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\textsuperscript{26} Apart from “moral hazard”, guarantees may also suffer from adverse selection (Klein, 1997), meaning that guarantees are disproportionally provided to high risk projects because guarantee providers are not able to fully adjust the guarantee fees to the risk profile of beneficiaries, mainly because of asymmetric information, which leads to a positive correlation between riskiness of projects and demand for insurances.

\textsuperscript{27} The reduction of public sector funds over time is also proposed by Reed and Gutman (2010) for programmes under the new Green Climate Fund.

\textsuperscript{28} For a definition of first and second loss, see the glossary in the Annex.

\textsuperscript{29} This is not true if loans are provided at concessional rates, which increases profits for other players. However, as discussed before, concessional loans are more similar to return-enhancement than to finance facilitation.

\textsuperscript{30} 44\% = 0.67\textsuperscript{2}; 30\% = 0.67\textsuperscript{3}
selling those bonds, development banks rely on their AAA rating, which signals trustworthiness and low risks to private investors. If development banks invest in too risky projects, they risk losing their high rating.

Some of the newer funds, e.g. GEEREF and the Green Climate Partnership Fund, cover more risks by subordinating or quasi-subordinating public finance. This subordination is made possible by backing with public grants or concessional finance. Using public grants in such a way (enabling subordinated equity but not requiring actual spending) has a comparative advantage to traditional grants as public finance can be invested several times to leverage more private capital. Therefore, some interviewees call for expanding the uses of public grants for creating subordinated equity, rather than keeping the worlds of grants and risk-averse public finance institutions separate.
Conclusions

This study has explored the potential of public finance-facilitating (mainly risk-reducing) tools to leverage low-carbon investments in developing countries. The hope of many policy makers is that such finance-facilitating instruments, including the provision of public equity, public debt instruments and guarantees, can leverage very large amounts of private investments.

Indeed, finance-facilitating tools are successfully applied today in cases where access to finance is difficult. The success is based on three effects: the “signalling effect” of public capital (the private sector sees that the public sector is investing), the coverage of risks and the increase in liquidity. Public finance institutions are also innovative in creating new finance-facilitating tools that even mobilise equity from pension funds, which are normally too risk-averse for investments in low-carbon technologies. Therefore, public finance instruments that reduce risks are certainly required as part of any future policy mix.

However, several doubts can be raised about whether finance-facilitating tools can really leverage the hundreds of billions of private investments required for limiting greenhouse gases in developing countries. We have set out the following four challenges at the beginning of this study;

1) Can such tools alleviate all types of investment risks in developing countries?
2) Do public finance instruments find enough investment opportunities (deal flow)?
3) Can risk-reducing tools always substitute for direct payments?
4) Can they circumvent the problem of “free riding”?

We explored them by reviewing the literature and conducting expert interviews. Rather than rigorously testing some pre-defined thesis, we applied an open approach of analysis and reached the following theses;

All types of risks can be covered but only partially

On the positive side, the wide range of available tools enables to cover all type of risks private investors face: unfamiliarity, country, financial, economic, policy, technological and market risks. Risk-coverage is, however, in all cases only partial as public investors are also risk-averse and want to prevent moral hazard in case of insurances. Due to the wide range of tools, risks can also be covered along different phases of technology development, from early deployment to diffusion. Only at really early technology stages (e.g. R&D), finance-facilitating tools have to be replaced by public grants.

The long-term deal flow problem can only be overcome with an ambitious policy framework

At the moment, public institutions find enough investment opportunities, particularly in larger and more advanced economies such as China and India. However, finance-facilitating tools will face a substantial deal flow problem if they are further expanded and aim to reach a larger range of countries and technologies. Technical assistance and capacity building may improve the deal flow in the short- and mid-term. However, for incentivising enough investment deals for a 2 degree target, the enabling environment has to be substantially improved in most developing countries, and ambitious low-carbon policies introducing a high carbon price (or equivalent measures) have to be introduced.

Finance-facilitating tools cannot always act as a substitute for direct payments

Some finance-facilitating tools are very cost-effective as they leverage private finance at low (or even zero) cost for the public. In these cases, they are certainly preferable to direct payments. However, finance-facilitating tools can only be applied to technologies that already have a substantial (expected) return attracting the attention of private investors. Thus, for a wide-ranging of technologies, providing public investments or risk coverage will not leverage private finance. In many cases, a combination of finance-facilitating and direct payment tools is warranted to maximise efficiency.

Finance-facilitating tools may crowd out private capital but this can be limited

In case of free-riding effects (investments would have happened without public intervention) public investments will not generate windfall profits but they cover “baseline” risks and thereby crowd out private capital. Free-riding effects can be lowered by applying sound due diligence processes, which deter investors not really in need of public investments. Guarantees and insurances will not crowd-out capital but they may face moral hazard as private investors covered by guarantees behave in a riskier way. Such moral hazard itself is limited by partial risk coverage and sound selection processes.
Taking more risks may help to increase the influence of finance-facilitating tools

Interestingly, most public finance institutions are very risk averse and invest capital at commercial terms even when they claim to cover risks. This is due to their financing source, which is mainly private capital leveraged through issuance of bonds. To enable the sourcing of this capital, development banks have to keep their AAA rating, which means that they are not allowed to invest in risky projects. This may be changed if the risks can be covered by public grants from other institutions, as already applied in case of some MDB projects supported by grants of the Global Environment Facility (GEF). This approach has the advantage compared to traditional development grants that grants are only spent in case of defaults in projects and funds; otherwise the funds can be invested again. Further expanding this innovative way of combining the leverage possibility of development banks and the risk-taking possibility of public grants may be warranted.

Finance-facilitating tools are important but not a game-changer on their own

We conclude that public finance instruments to facilitate financing are an important part of any climate regime, as they can leverage risk-averse capital and increase liquidity of low-carbon funding. The problem of access to finance will probably persist even when strong policy incentives are available. Therefore, risk-reducing tools will always have their place in a successful low-carbon policy mix.

However, if our theses are true, then finance-facilitating tools are not a “game changer” on their own; they will, by themselves, not be able to mobilise the billions of dollars needed for enabling low-carbon development. For achieving this huge leverage, far more ambitious climate policies are needed, enabling more low-carbon technologies to have similar or even higher returns than their fossil-fuel counterparts. Such ambitious policies will rely on political support, to which public finance instruments themselves may contribute; by attracting private sector investments, risk-reducing tools can help to create sustainable business interests in low-carbon technologies and, indirectly, make ambitious climate policies more acceptable.

Apart from pure climate policies, the success and potential of risk-reducing tools will also depend on the general investment environment (e.g. administrative hurdles, rule of law) and the available capacity on the project developer and finance sector side. Therefore, finance-facilitating tools and the creation of the right policy framework are to be complemented by technical assistance and capacity building (see also Council of the European Union, 2011). An interesting idea on how to successfully combine public policies, risk-reducing tools and technical assistance is the “feed-in-tariff-plus” concept of Deutsche Bank Group (2011).

The way forward: exploring new tools and shifting fossil fuel guarantees

While their long-term potential will depend on successful investment and low-carbon policy frameworks, the potential of risk-reducing policies at given climate policies is certainly not fully tapped. Particularly, newer finance-facilitating tools like public-private equity funds deserve wider application in order to explore their benefits. Furthermore, it is also warranted to look at existing instruments and rethink their application. An easy win, from a climate policy perspective, would be to shift existing World Bank guarantees away from fossil fuels towards renewable energies.
Glossary

2 degree target: Political goal to limit climate change to an extent that the average global temperature does not rise more than 2 degrees above pre-industrial levels; agreed in both the Copenhagen Accord and the Cancun Agreements.

AAA rating (or triple A): The highest credit rating a (government) bond can achieve according to the scale of most credit rating agencies. AAA marks very low credit risk for the lender and a very high capacity of the obligor to meet its financial commitments.

Bonds: Debt security, in which the issuing government, organisation or company owes the holders a debt and is, normally, obliged to pay interest (the coupon) and to repay the bond owner at a later date. A green bond incorporates that raised debt is used for environmentally friendly (often low-carbon) purposes.

Clean Development Mechanism (CDM): Mechanism under the Kyoto Protocol, through which industrial countries can (partly) meet their greenhouse gas emission targets by financing emission reduction projects in developing countries.

Concessional loans: Loans provided by development banks, at terms more favourable than available on the market (lower interest rates, longer maturity).

Crowding out: reduction of private investment due to government intervention (either government or regulatory measures).

Deal flow: the amount of (financially attractive) investment opportunities submitted to investors.

Debt: One of the two types of capital needed (equity being the other) for investment. Raising debt means that a project or company lends capital from a creditor (in most cases banks). We distinguish between senior debt, which’s creditor receives repayments and interest first in case of default, and subordinated debt, which receives repayments after senior debt but before equity.

Due Diligence: the care taken when entering into a transaction; in our case the process of assessing commercial and political risks of an investment.

Equity: One of the two types of investment capital needed (debt being the other), representing ownership of a company or project. Preferred equity has normally priority in dividends and assets in case of defaults but has less (or no) voting power in a company.

Feed-in tariff: Tariff at which electricity is remunerated when fed into an electricity grid. In case of renewable energy, feed-in tariff in most case equals a guaranteed feed-in tariff that ensures profitability of a project.

Finance-facilitating tools: Instruments to enable investments (by reducing risks or increasing the availability of capital) without increasing the return.

First and second loss: terms in insurance or investment cases to determine who covers the first losses of a project in case of a default. In investment cases, the creditor taking the first loss is only remunerated after all other investors have been remunerated. In insurance cases, the insured is normally covering the first loss, while the insurance covers the second loss, meaning any losses larger than the predefined amount of first loss to be covered by the insured. As alternative to first and second loss, “pro rata” terms (see below) can be applied.

Incremental costs: Cost of non-profitable projects after total revenues have been subtracted from total costs.

Investment grade: Risk level, at which a company or project becomes investable. BBB (Moody’s) or Baa (Standards & Poor’s) rating is at least needed for reaching investment grade; credits below this level are considered “junk credits” with low credit quality and substantial risks.
**Internal Rate of Return (IRR):** Rate of return to investment (in %) a project generates or is expected to generate. Technically, the IRR is the discount rate at which discounted revenues equal discounted expenditures, meaning that in this case, the Net Present Value (NPV) is zero. Internal refers to the fact that inflation or interests are not considered.

**Moral hazard:** Risk that the insured persons will change to a more risky behaviour if an insurance covers (part of) the risks.

**Nationally Appropriate Mitigation Actions (NAMAs):** Policies and measures developing countries are pledging to undertake under the Copenhagen Accord (and Cancun Agreements). NAMAs should be measurable, reportable and verifiable (MRV) and are supported by funding of industrialised countries’ governments. (According to the Cancun Agreements, NAMAs are also undertaken by industrialised countries but, still, the term NAMA is in most cases associated with developing countries).

**Net Present Value (NPV):** Value of an investment, calculated as discounted revenues minus discounted expenditures and initial investment. The discount rate is set at an IRR as expected by the capital market (or by the company).

**Partial Credit Guarantee (PCG):** traditional credit guarantee issued by Multilateral Development Banks (MDBs) covering (parts) of all type of risks when lending to the public sector.

**Partial Risk Guarantee (PRG):** traditional credit guarantee issued by Multilateral Development Banks (MDBs) covering specific political risks, e.g. currency risks, expropriation, and civil disturbance.

**Pro Rata:** Term in insurance contract meaning that parties share the risks according to a specific proportional ratio, e.g. the insured covers 20% of the loss, while the insurance covers 80% of the loss.

**Private Equity/ private equity:** a) [in our text written with capital letters] investments in not publicly traded stocks; normally riskier investments with high return expectations; b) [in our text written with non-capital letters]: equity owned by the private sector, as opposite to equity owned by the public sector.

**Public finance instruments:** Public investment instruments (debt or equity) and insurance / guarantee schemes. Grants and concessional loans are not included under public finance instruments.

**Put option:** security that gives the owner the right (but not the obligation) to sell a specified amount of a security (financial instrument, value paper) at a specified price within a specified time.

**“Signalling”**: Effect when a well-known (and repudiated) company, private person or governmental institution invests in a fund or company; other investors will see this as signal that there are investment opportunities, and the risk-return ratio is favourable because the “signalling” investor may have insider knowledge.

**Venture Capital:** capital invested in very early stage technologies or companies, with high risks but also very high (long-term) return potential.

**Windfall profits:** Unexpected profits a company can generate due to specific circumstances. Here, we limit windfall profits to cases where government interventions generate unexpected profits, e.g. because of (too) high subsidies.
Annexes

Guarantees in the power sector of World Bank sub-units

IBRD guarantees

Sources: Analysis using data from World Bank (2011c, 2011b, 2011a)

MIGA guarantees in the power sector

Sources: Analysis using data from MIGA (2011)
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