Structuring International Financial Support to Support Domestic Climate Change Mitigation in Developing Countries

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September 2009

Climate Strategies aims to assist government in solving the collective action problem of climate change. A "not for profit" membership organisation, Companies House Number 05796323. Funders include governments and foundations. All our research is published in the public domain.

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ISDA Project

This paper is part of the project International Support for Domestic Action (ISDA). Case studies from five developing countries assess the barriers and drivers of actions that shift individual sectors onto low-carbon growth paths. Five cross-cutting papers then explore how international financial mechanisms, technology cooperation, intellectual property aspects, and suitable monitoring and reporting arrangements can enhance the scale, scope and speed of their implementation. The project is coordinated by Karsten Neuhoff, University of Cambridge; individual reports are available at http://climatestrategies.org/our-reports/category/43.html

Acknowledgements

The authors wish to thank the UK Research Councils (ESRC) for the financial support provided through a TSEC (Towards a Sustainable Energy Economy) programme grant.

Publisher

Climate Strategies 2009. For citation and reprints, please contact the publisher Climate Strategies

Executive Summary

Objectives of Financial Support Mechanisms

The shift to low-carbon development trajectories requires that private and public sector investment choices are shifted from energy inefficient and carbon intensive infrastructure and technologies towards low-carbon choices. This requires domestic governments to provide a robust policy framework to attract and shift the corresponding investment volumes. International financial support mechanisms can:

- support countries in the implementation of policy frameworks by contributing to incremental costs
- enhance regulatory stability by creating incentives to maintain effective policy frameworks
- facilitate access to finance to support private investors in the transition to low carbon investment

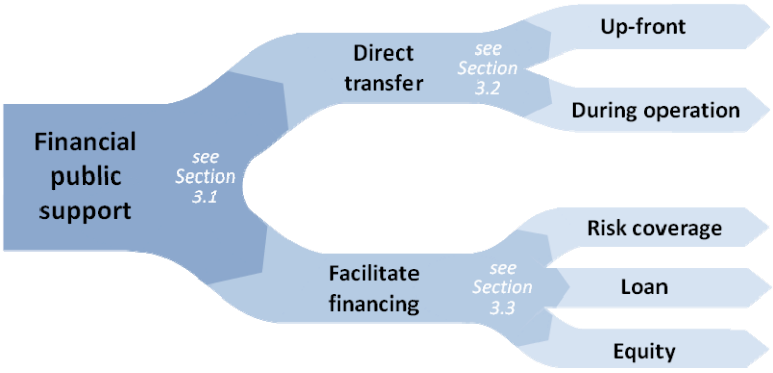
This represents a shift in the objective of financial support mechanisms from the purchasing of cheap tonnes of carbon to creating a long-term vision for facilitating the implementation of low-carbon development strategies, with the following implications.

Structure Support to Match Requirements for a Low-carbon Transition

Climate change support is not about aid, with donors and recipients. It is about taking joint responsibility for a global problem, with each party contributing according to their means and their common but differentiated responsibilities.

Support mechanisms are most effective where they can target the sector and country-specific needs of different actors, including project developers, investors and developing country governments. Thus they can target bottlenecks and contribute to the development of technologies, industries and business models for the large scale roll-out of low-carbon technologies and practices.

The figure below structures the different mechanisms that are available to provide financial support in bilateral settings or through multilateral institutions. Sector and country-specific analysis is required to identify the most suitable set of instruments in each instance.



Linking financial support to the implementation of specific Nationally Appropriate Mitigation Actions (NAMAs) allows for the selection of the suitable mechanism(s) in parallel with implementation of the necessary regulatory framework. Current and future financial support creates incentives for the implementation and continuation of the policy framework defined in a NAMA, thus enhancing regulatory stability and improving the low-carbon investment framework.

Enhance the Capacity of the International Community to Provide Support

The choice of mechanism is intrinsically linked to the institution that can provide the mechanism. For example

- Bilateral cooperation offers the flexibility to tailor a grant to the specific needs of a sector or country, and might therefore be the preferred option to facilitate transition strategies. Only where incremental costs are clearly defined, e.g., with technology demonstration projects, are multilateral organisations more able to use standardised methodologies to offer grant support.
- Multilateral organisations offer a stronger track record in the provision and management of loans, e.g. for infrastructure development.

It will be essential to anchor the different support in an overarching framework, preferably a UNFCCC umbrella, to create synergies of the international cooperation rather than risk fragmentation of efforts.

To allow the mechanisms to provide support at sufficient scale, commitments for the gradual increase of the provision of public resources are necessary. Many options are discussed, including

- Reserving a share of auction revenue from national emission trading schemes
- Reserving revenues from carbon pricing on international aviation and shipping

Mechanisms can also be selected that provide effective support while being less demanding for balance sheets and current accounts. For example, if governments issue credit guarantees, this may not have direct implications for balance sheets and current accounts, but can still offer effective help. It allows pension funds and other private investors to offer low cost capital and learn about new technologies and regulatory frameworks so as to reduce the need for future public intervention

Match Demand Needs and Supply Capabilities

The need for tailored financial support to implement individual NAMAs in developing countries has to be aligned with the constraints on scale and institutional capacity for the provision of such support. Further analysis and ongoing reviews will be necessary to ensure effective use of scarce resources so as to facilitate rapid implementation of low-carbon development strategies across developing countries.

If the value of financial instruments like loans, equity and risk guarantees is reported in terms of grant equivalent contribution under the UNFCCC umbrella, then a fair comparison of contributions of different actors with their commitments will be possible. It also facilitates international learning about effective domestic policy and international support strategies.

The recent crisis in financial markets has demonstrated the risks associated with overly complex financial instruments. While international public support will have to use a set of instruments to unlock bottlenecks and target actors, it will be important to limit the number of mechanisms and ensure simple design.

The annual needs for public financial support for mitigation actions in developing countries will increase during the initial years of the low-carbon transition, as capacity and experience with the implementation of actions increases. If incremental costs are financed by newly issued dedicated bonds (at national or international level), then public finance needs will be increasingly stretched as this additional demand for public finance coincides with increasing costs of serving old bonds. Additional bonds or credit guarantees backed by governments in developed countries might however be a suitable approach to facilitate access to finance for low-carbon investments in developing countries. In this case the bonds will be served by revenues from low-carbon projects. This shows that a clear and consistent strategy will be important to enhance the credibility of low-carbon transition strategies.

1. Introduction

To avoid GHGs concentrations overshooting beyond a level at which climate dynamics could be out of control firstly necessitates that developed countries, given their past responsibility, drastically reduce their current emissions over the next half-century. It also requires action on the part of developing countries to avoid emitting the order of magnitude of GHGs emitted by industrialized countries in the past.

But developing countries will not cooperate so long as they perceive environmental issues as a new form of Malthusianism. Repeated references to sustainable development were made since Rio (1992) but climate negotiations have remained disengaged from the debates on development thus tying up a new Gordian Knot through a succession of misunderstandings (Hourcade et al. 2008)

Typically debates about International Climate Policy Architectures have been driven by the search for a world carbon price be it in the form of a cap and trade system or in the form of harmonized carbon taxes in order to minimize costs of climate policies by abating carbon emissions where it is cheaper to do so. But this perspective limits climate policy to a pure cost-minimisation exercise conducted regardless of the context of the developing countries with incomplete markets, weak policy regime and dual economy. In this context, the carbon price signal would be swamped by noises from many other signals, including the political markets in the private and public partnerships that fund the upfront investments in energy, transportation and building infrastructures. Second it would have a high adverse effect on the purchasing power of households and on the production costs of the industry; a 50$/tCO2 would double the price of cement in India, thus making far harder the access of low-middle families to decent housing.

In their accelerating pursuit of affluence, developing countries are going to build the bulk of their infrastructures (energy, transportation and buildings) in the next two to three decades, rendering a bifurcation towards high carbon development pathways irreversible in the near future. They will not slacken their pace in anticipation of a fully-fledged cap and trade system in which they would receive emissions allowances and direct transfers generous enough to compensate them for any significant carbon price[1]. This issue is then, during the maturing period of such a system, how can investments of $240 – 600 billion a year be triggered and targeted towards low carbon intensive infrastructures and efficient end-use equipments, which the recent WBDR estimates necessary to avoid a carbon intensive lock-in. This would seem to be sole path to align development and climate objectives.

This paper starts from a two-sided diagnosis. Its pessimistic perspective is that the timing is inopportune; it is unlikely that OECD countries, which never enforced the claimed objective of allocating 0.7% of its GDP to overseas aid, will accept very large transfers in a period of financial crisis and f moving balances of power. Its optimist perspective is that we are not faced with a problem of capital shortage at the global level but with a problem of direction of savings in a period where emerging countries are capital exporters and some rich countries capital importers.

To put it in concrete terms, let us assume that the $15 billion transfers per year to non Annex 1 countries just proposed by the European Commission are endorsed by all EU member states and that all OECD countries accept the same transfers/GDP ratio (0.082%). The issue is how to maximize the leverage effect of these $31 billion on private and public finance in order to shift the $240 – 600 billion a year estimated by the WBDR.

[1] And all the more so as a dispassionate reading of the state of the art drawn up by the Harvard project (J.E. ALdy, R.N. Stavins 2008).about all the possible International Climate Policy Architectures suggests that none of them is likely to emerge in a near future

Achieving a leveraging effect of this magnitude is not only a matter of overseas assistance and concessionary funding. It requires a financial architecture which includes risk-management and risk-sharing dimensions, and can support mechanisms tailored to the many types of domestic development policies, from the project level to the program level and the support to economic reforms. This paper thus tries to delineate the elements of a financial architecture which would constitute a palatable deal with non-Annex 1 countries and accelerate their willingness to participate in a climate policy regime.

Such financial architecture restructuring is required because of what is at stake: a reorientation of capital flows has never been done before at this scale and ambition for any environmental policy. But precisely because the aim is not only climate but sustainable development, it is possible to envisage a scenario where the spread of the financial crisis to emerging markets makes a global rescue for developing countries an imperative part of the solution to the world crisis.

The remainder of the paper is structured as follows. Section 2 discusses the role finance can play in the overall framework of international cooperation on climate change mitigation, and argues that financial support can enhance scale, scope and speed of the low-carbon transition of individual sectors, if it is tailored to specific sectors and actors. Section 3 then structures the different needs, and provides criteria to identify suitable financial support mechanisms. These mechanisms are then discussed in more detail in section 4 with reference to experience in climate change and development cooperation. Moving from the demand side for financial support, section 5 shifts to the supply side of financial support mechanisms, and discusses the experience of different bilateral and multilateral institutions with the provision of such mechanisms. This offers the opportunity to map the needs for financial assistance through the mechanisms that are most suitable to address the needs, to the institutions that can provide the support in bilateral or multilateral setting. Section 6 puts this discussion into the broader context of ongoing global economic and financial developments, and section 7 concludes with a summary of immediate insights.

2. The Framework to Link Finance and Climate Change Mitigation

International financial support mechanisms for mitigation action in developing countries are anchored in a broader discussion on international cooperation on climate change mitigation. This has three major implications for the design of financial mechanisms:

Support Low Carbon Development Strategies rather than purchasing cheap tonnes of Carbon

The transition towards a low-carbon economy requires significant changes in a wide range of policies. The implementation of low-carbon development strategies necessitates profound reforms in energy policy (both from the supply and demand side), industrial policy, urban policy (tackling housing and transport issues in a comprehensive manner) and land use policy (dealing with conflicting land uses: agriculture and forests management and conservation).

Current UNFCCC discussions are exploring frameworks that allow these actions to be undertaken in a coherent manner. This is likely to involve a two stage process. Low carbon growth plans outline the overall development strategy and trajectory of a country. Thus interactions across sectors can be ensured and trigger points for actions required in individual sectors can be identified.

The set of actions that can shift a specific sector to a low-carbon technology choice, infrastructure or product can then be assessed in more detail, in interaction with domestic stakeholders and potential international supporters. The set of actions can comprise regulatory changes, infrastructure investment, and tailored financial support and training, and is often referred to as Nationally Appropriate Mitigation Action (NAMA).

Financing needs are very different sector by sector, and even within a sector. If mitigation actions (NAMAs) are prioritised according to the least cost way of delivering immediate emission reductions, then many of the trigger points that can facilitate long-term transitions will be missed. The result could be a focus on marginal improvements, e.g. of efficiency improvements of coal power stations by a few percentage points. This could contribute to stranded investments in technologies that are not compatible with long-term mitigation objectives. Therefore it is important to assess emission reduction impacts of mitigation actions across the entire transition period.

Consequently, financial support provided by developed countries to support mitigation actions in developing countries will be more effective in addressing climate change, if it facilitates the transition towards low-carbon economies in developing countries, and is not purely focused on buying cheap tons of carbon.

Project Developers, Investors and Developing Countries Governments Require Tailored Financial Support

So far, financial support for mitigation actions undertaken by developing countries has mainly been project-based. The CDM might be the best example of such a project-based approach to climate finance. There are good reasons for this. Climate finance is still in its infancy. But given the urgency to tackle climate change, a scaled up approach to action and support is needed in developing countries. Hence, without neglecting project developers, who will still require direct support, the financial mechanism of the new climate regime needs to better engage with two key stakeholders: private investors and developing country governments. They both have a key role to play in the transition towards a low-carbon economy.

Investors can only provide finance to project developers within an appropriate policy framework drawn up by developing country governments.

Private finance will play a crucial role in financing the transition towards a low-carbon economy. In fact private finance will eventually provide the vast majority of financial flows. A number of financial institutions such as sovereign wealth funds, state and public pension funds, private and corporate pension funds, insurance companies, endowments, private banks, and investment management companies will all provide capital.

But as finance is only a tool, it needs an appropriate regulatory framework to function. Indeed, for the moment, climate finance is small compared to conventional finance. Investors advance many reasons to explain why they do not engage more in climate finance. The frequently mentioned reason is that the risk return ratio of climate project often does not compete with that of conventional projects. But there is also another, overarching, reason. With the current regulatory framework unable to sufficiently incentivize low-carbon project developers and thereby stimulate a strong low-carbon project pipeline, investors do not have enough projects, or sufficiently large projects, to which they can easily provide finance. Consequently, they are unable to realize the necessary economies of scale.

Strong, stable, transparent, and credible national policies incentivize low-carbon project developers and investors. Developed countries can provide such frameworks through a combination of commitments to absolute emission reduction targets, cap-and-trade

schemes and other policy instruments. Given uncertainties around growth projections, it is difficult for developing countries to use the same policy instrument mix, in particular where it is based on absolute emission targets. Hence they are left with (i) direct incentivizing of low-carbon development through financial support schemes or targeted regulatory requirements and (ii) energy and carbon pricing policies, initially likely to be focused on a progressive phase-out of fossil fuel subsidies.

Developing countries governments require financial support for the initial investments required to implement these frameworks. The implementation of a new regulatory framework, be it for climate or for other purposes, triggers transition costs. These transition costs are due to a change of relative prices, and among others to the short-term negative impacts of carbon price on incomes, the early scrapping of capital stocks, and the rigidities of the labour market. Government intervention is sometimes needed at an initial stage to facilitate this transition.

Financial Support can Contribute to Incremental Cost and Help to Shift Overall Investment to Low-carbon Technologies.

Figure 1 characterises the projected total annual investment costs in developed and developing countries for the year 2030. The total volumes of 12000 billion $ and 7000 billion $ respectively are vast. Relative to these numbers even the projected incremental investment costs for the mitigation scenario in the order of hundred billion $ are small.

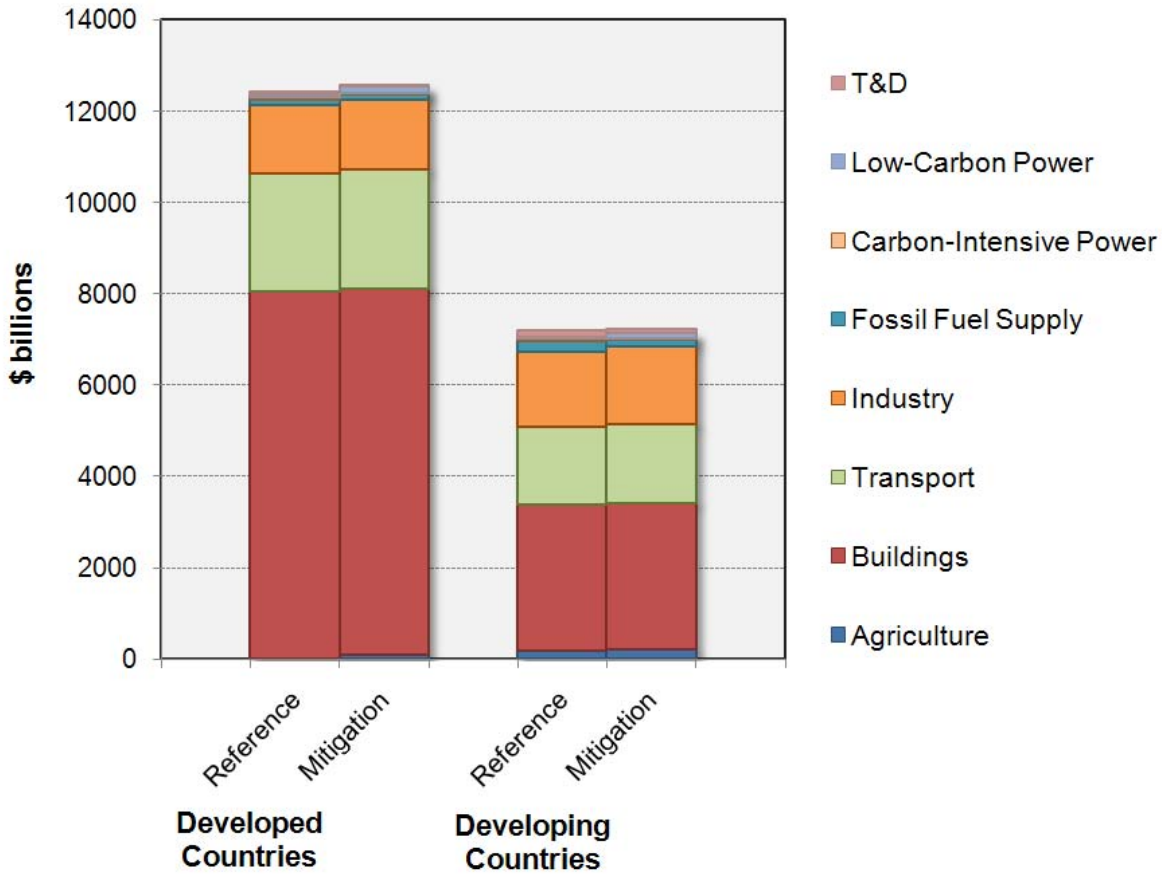


Figure 1. Developed and developing country investment volumes in reference and low-carbon scenario for 2030, as projected by International Energy Agency

This can be interpreted as an optimistic insight - with some political will it should be possible to raise the necessary finance. But at the same time it points to the bigger

challenge that climate change policy will genuinely face. After all, almost all of the investments relate to some technology or infrastructure development that is directly or indirectly linked to energy. Effective mitigation action therefore will have to target all these investments, to achieve a change to more energy and carbon efficient technologies, practices and infrastructure. In particular larger quantities will have to be invested in low-carbon technologies, and displaced from conventional technologies. This shift appears to be the main challenge.

At a disaggregated level, from a micro investment standpoint, low-carbon investments usually fall into one or the other of these two categories:

- A substitution from operational costs to capital expenditures, such as energy consumption of buildings or power plants, to investment costs for insulation or renewable energy plants.
- A shift of capital expenditures, such as the shift to low-carbon technologies in many industrial processes.

In both cases, it reinforces the case that low-carbon technologies predominantly require a shift of investment volumes.

This massive shift of investments in the entire economy is a challenge. Indeed even if, at a project level, covering the additional costs might prove to be sufficient to reorient the overall investment (e.g. CDM) for some actions in some sectors, this is unlikely to suffice if the ambition is to support actions across several sectors in parallel.

Investors, despite the good will of some of them, are so far reluctant to engage in climate finance due to the large risks they face. First, they have to enter into new business relationships with new low-carbon project developers, with whom they do not have any track record and who are potentially business novices. Second, they face technology risk, due to uncertain performances of some low-carbon technologies. And third and above all, they face a huge policy risk because they do not trust governments to maintain the new investment framework for a sufficient period to ensure the profitability of low-carbon investment.

Indeed, this shift of investment necessitates a profound change in the portfolio of investors. All these risks need to be covered if the transition towards low-carbon economies is to occur. So equally important to the issue of direct money transfer to cover the incremental costs is the issue of providing guarantees to cover risk. Our paper will build upon this.

3. What are the Financing Needs?

For financial support mechanisms to contribute to the shift of investment towards low carbon technologies, it has to be tailored to investment needs. Therefore this section starts from a bottom-up needs assessment to inform the choice of suitable financial instruments required to support different types of projects. Firstly, following the structure outlined in Figure 2, the choice between provision of loans and credit guarantees versus direct financial transfers is explored. Then the relative merits of loans versus different types of credit guarantees are analysed, and finally the different options of providing direct financial support are discussed.

The needs also differ depending on the actors that are to be supported (governments, institutional investors, project developers). While this will be highlighted throughout the section, it will receive more structured attention in section 4.

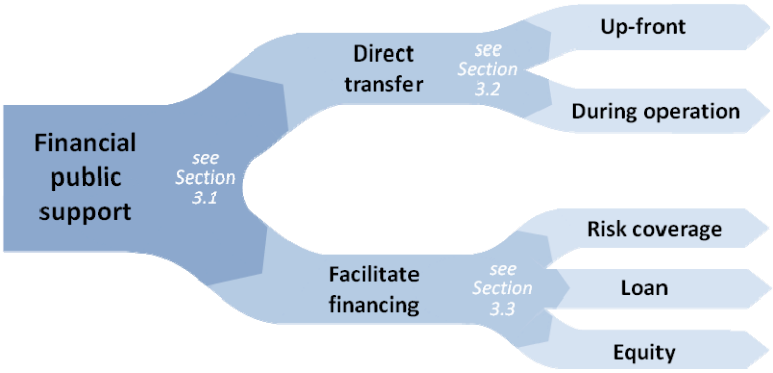


Figure 2. Financing instruments to match needs

3.1 Incremental Cost Support Versus Access to Finance

Private actors pursue projects if the rate of return is high enough to justify the risk involved. To shift investment to low-carbon options therefore requires

- Increasing the return of low-carbon investments relative to carbon intensive choices. This necessitates policies that reduce the costs of inputs of low-carbon options, increase costs of inputs or emissions for carbon-intensive options, or provide direct subsidies.
- Reducing the risk of low-carbon investment, either by enhancing the stability of low-carbon policy frameworks, or by offering some risk guarantees or facilitating access to capital.

International financial support mechanisms can support and complement actions of national governments to increase the return and reduce the risk of low-carbon investment:

- International mechanisms can provide direct grants to projects to cover incremental project costs, or create additional revenue streams e.g. through carbon credits. International mechanisms can also provide financial support to countries as a contribution to the incremental costs countries incur when implementing feed-in tariffs, supporting energy efficient buildings, or introducing carbon pricing.
- International support can reduce financing costs through the provision of preferential loans and equity or through public credit guarantees that reduce the costs of commercial loans by eliminating country, currency, policy, technology or even project risk.

For example a renewable energy investment of 1000 Euro, if pursued in an extremely safe environment, can be financed against net revenues of 100 Euro per year over 15 years. If country and currency risks increase investment risk, then return expectations might increase from 5% to 10%, and the project is only viable with an additional grant of 250 Euro. In the absence of the long-term revenue stability provided by feed-in tariffs, private sector investors concerned about policy and regulatory risk increase their rate of return expectations to 15%, and the project requires a grant of 425 Euro.

This illustrates the basic options for international financial support – to provide grants towards the incremental costs or to provide credit guarantees and loans to reduce the financing costs. It is common practice to measure the value of such support by the amount it reduces the need for grants by, and to label it as grant equivalent support.

The example furthermore alludes to an indirect benefit that international financial support can provide. A significant share of the risk associated with low-carbon investments relates to the stability of the regulatory framework. If future international

financial support for low-carbon investment in a specific technology or sector is expected to increase with the effective implementation of a supportive domestic policy framework, then this further enhances domestic support and promotes continuity of the policy framework.

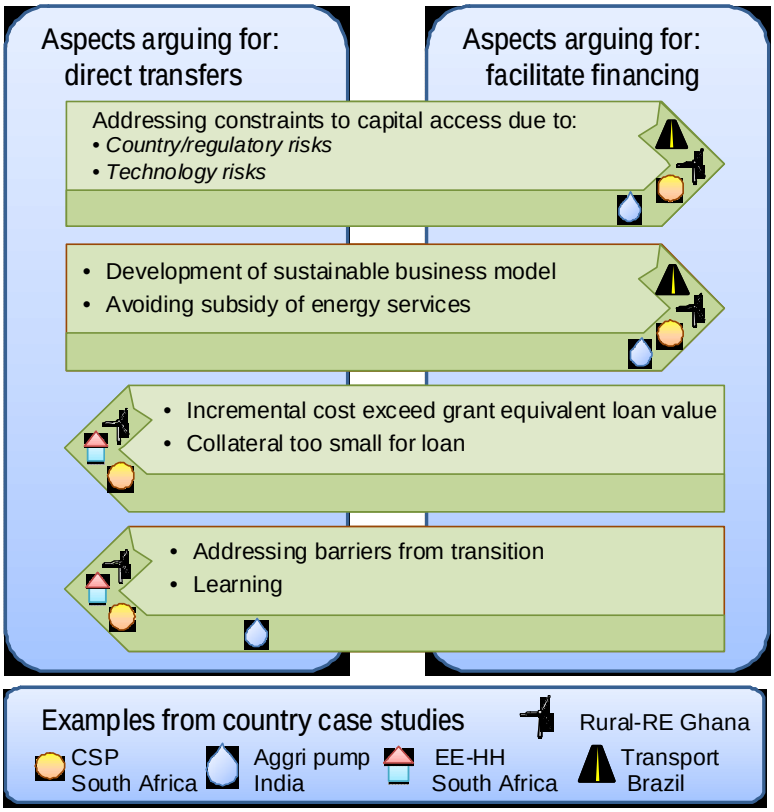


Figure 3. Four factors that determine whether a project/action is better supported with grants or loans/credit guarantees

Figure 3 illustrates two factors that argue in favour of the use of loans or credit guarantees, and two further factors in favour of direct support towards incremental costs. The small symbols, referring to insights from country policy case studies, illustrate how sector and country-specific aspects influence the optimal choice; these are discussed further in textboxes 1 and 2.

Factor 1: Addressing constraints in capital access. New technologies face enhanced policy risk as their success depends on evolving regulatory frameworks (RE projects in Ghana, EE agricultural pump sets in India, alternative transport infrastructure in Brazil). Limited historic experience with technologies creates uncertainties about reliability and future maintenance costs (CSP in South Africa). Together these factors prevent many institutional investors from providing large-scale finance for low-carbon projects in developing countries, and limit financing sources to those private actors and funds which are prepared to bear higher risks in exchange for higher rates of return on employed capital. Credit guarantees can selectively remove some of the risk (e.g. currency, country, policy risk) and thus allow access for funding from pension funds, insurance companies and sovereign wealth funds. Costs can therefore be reduced, and the necessary scale of low-carbon investment can be supported by institutions that are prepared to participate in financing. This process can be initiated or complemented by direct provisions of loans.

As argued in section 1, much low-carbon development hinges on the shift of large-scale investments in building, transport and industry towards low-carbon options. This shift

requires financing that is prepared to accompany the shift. Public provision of risk guarantees, or where necessary initial loans, can facilitate such a transition.

Factor 2: Development of sustainable business models. Publicly initiated and financed projects can only constitute a small share of the total volume of projects necessary to deliver low-carbon growth. Thus it will be important to develop sustainable business models to deliver low-carbon and energy efficient technologies (same examples as above). Provision of loans and credit guarantees to private actors can contribute to the development of business models and companies. This option also argues in favour of using risk guarantees and loans as instruments to provide financial support for low-carbon development in developing countries.

Factor 3: Providing support beyond grant equivalent value of loans. For some new technologies, like concentrated solar power, incremental costs can exceed the grant equivalent value that facilitating access to finance provides. In this case additional grants are necessary. In other cases, for example low-income housing, or rural renewable energy provision, local communities do not have the resources to provide sufficient collateral or income streams to use loans to cover incremental investment cost. Grants can allow for local ownership, which is often seen to be essential for project success.

Factor 4: Simple institutional design for transition policies Initial learning and transaction costs create barriers that can be overcome with regulatory design, technology cooperation and some additional costs for initial projects. In this case direct grants can be simple and create low transaction costs. They also provide support, where benefits are difficult to appropriate by individual actors, e.g. from technology improvements through learning by doing.

The different financing needs across the illustrative case studies show that support packages have to be tailored to the specific technology or sector.

3.2 Up-front Support versus Support during Operation

Direct support in the form of grants can be provided through up-front investment support or as support throughout the duration of the project.

Up-front support is easy to implement and typically reduces transaction costs as no further interaction is required. Costs are potentially further reduced, as it decreases the need for private actors to raise capital to cover investment costs.

However, these savings can come at significant risks for performance of projects. Wind support schemes that provided the most support through up-front tax credits initially in California and later in India, resulted in the underperformance of many projects due to inappropriate locations, quality of turbines and maintenance. Spreading support over the life time of projects allows for the linkage of support to project performance and thus increases incentives for effective implementation, installation and operation of low-carbon technologies.

Provision of support during the operation of low-carbon projects can take several shapes. Feed-in tariffs have become established in several developed countries as an option to provide long-term guarantees to buy renewable energy from producers, often above market prices. Thus additional revenues are provided to investors and incentives for project delivery are strengthened. The guaranteed price also reduces investment risk, thus reducing financing costs. International support could provide grants to contribute towards these incremental costs.

Energy policy and carbon pricing provide three further options to support low-carbon technologies:

First, the CDM mechanism allows low-carbon projects in developing countries to create off-set credits that can be sold in cap-and-trade schemes of developed countries, creating additional revenue during operation of accredited projects. Administrative complexity has however limited the regional and sectoral scope of its application, particularly for smaller scale or complex projects, and the uncertainty in demand for offsets has resulted in significant discounting of the value of offsets in financing decisions.

Second, domestic efforts to reduce energy subsidies increase the value of energy savings and thus enhance the profitability of energy efficiency measures. International support can help to address some of the political economy barriers to achieving this and facilitate the transition by supporting adoption and diffusion of energy efficient technologies, thereby reducing the impact on energy bills of consumers and industry.

Third, domestic carbon pricing schemes like carbon taxes or cap-and-trade schemes with auctions increase the costs of carbon intensive processes, products and services. This creates market opportunities and enhances the profitability of low-carbon projects. International support can facilitate the implementation of carbon pricing and contribute to policy stability by increasing low-carbon opportunities through financial support, technical cooperation, technical assistance and capacity building to facilitate the transition of the regulatory framework, manufacturing base and workforce.

Technical assistance grants can also focus on removal of some of the constraints in the wider investment environment that may limit investment e.g. grants to improve the capacity of regulatory authorities or improve the ability of commercial financial institutions to assess applications for finance for low-carbon projects.

3.3 Equity, Loan or Risk Coverage

First, a distinction can be drawn between mechanisms that transfer risk to the public sector and mechanisms where the public sector shares in risk through the provision of capital. The most common example of mechanisms that transfer risks to the public sector is insurance or guarantee products. These are agreements where the guarantor (or insurance provider) agrees to compensate the guarantee (insurance product) holder in the event of non-performance. The economic implications of insurance and guarantee products are equivalent. Such products can provide protection against certain specific events that cause non-performance, e.g. political instability, or against general non-performance. The amount of compensation provided can also be full or partial.

The other principal means for the public sector to improve access to finance is by direct provision of capital on terms that are advantageous compared to that which would be available from private capital markets. The capital provided can either be debt capital (loans) or equity capital depending on the requirements of the project/enterprise and the risk appetite of the public investor — equity capital has the potential to generate unpredictable returns, with both upside and downside risk, while loans will generally be repaid at a fixed pre-arranged rate, with risk of default faced by the investor.

The specific circumstances of a project will influence the most suitable choice.

Currency, country and policy risk are risks that are largely determined by public policy decisions. Potentially, national governments and international counterparties with strong links to the government can have the biggest influence on policy development and, therefore, may also be best positioned to bear these risks, for example through targeted credit risk guarantees. One option to simultaneously provide credit risk guarantees and enhance the investment framework by supporting the credibility of the domestic policy framework could be approaches where two countries declare themselves to be jointly and severally liable.

Technology and project risk are best understood by investors, and governments that accept such risks might create perverse incentives that result in underperforming projects and technologies. Therefore technology/project risk guarantees may only be suitable for initial projects using a new technology or in a new country, that otherwise might fail to get access to capital markets.

However, if credit risk guarantees are expanded to encompass the majority of potential risk components, then it is more justified for public agencies to provide direct loans, thus avoiding complexities and transaction costs.

This line of argument suggests that loans are preferable where comprehensive risk coverage is necessary. Credit risk guarantees would be focused on currency, country and potentially policy risk components. Section 5 will introduce additional considerations from the perspective of the supply side that might influence the choice of the preferred instrument.

3.4 Summary

Although the typology set out above is helpful for clarifying distinctions in the properties of different instruments, it is important to acknowledge that the reality can be more complicated and hybrid instruments exist. As a particular example, project development grants are 'loans' that act as a grant unless or until the project becomes financially viable, at which point principal and interest repayments are required. As such they fall both into the category of making a contribution to investment/operation (improving the rate of return of the project) and of facilitating access to finance (reducing the cost of capital for the private sector).

Many programmes of public support combine different Public Finance Mechanism (PFMs) within an overall package. For example, packages might involve making available credit lines for certain types of investment, as well as providing capital cost support to those investments.

As well as the financial benefits of providing PFMs, there are often important intangible or soft benefits from their use. International financial support and expectations about future support can increase domestic support for maintaining regulatory frameworks and low-carbon policies that enhance stability of demand and revenues for investors.

Mechanisms that shift risks away from private actors do however necessitate careful design to retain incentives for project developers to ensure timely and high quality investment and maintenance.

The value of financial instruments such as loans, equity and risk guarantees can be expressed as grant equivalent contributions. This allows for a fair comparison of contributions of different actors towards mitigation actions.

It is sometimes argued that only mechanisms that allow for a maximisation of the leverage ratio of public finance should be selected.[2] The analysis of investors' needs has pointed to a set of additional criteria that can shape the choice of the most suitable instrument or set of instruments. In addition, as section 5 will explore in more detail, institutional ability, scale and cost of providing public finance mechanisms differ, and therefore also need to be considered.

[2] Observed leverage ratios differ across public finance instruments. This can however also represent a selection bias, e.g. investments that are close to commercially viable require little support and will thus show a high leverage ratio. This points to the additional concern regarding: additionality: are projects that are commercially viable receiving public support?

Text Box 1. Case Studies Large-scale Projects

In the case of **concentrated solar power deployment** in South Africa (Edkins et. al. 2009), initial investors face difficulties in accessing sufficient finance for the deployment of a new technology. This technology competes against established technologies and regulatory frameworks in a developing country dominated by one government-owned incumbent utility (Eskom). Some public support might initially be provided through loans and gradually shift towards more selective credit guarantees, which facilitate initial access to finance and contribute to incremental costs by reducing capital costs. It also allows the financial sector to gradually gain experience with the technology in order to be ready for the large-scale financing required as the scale of deployment increases. Additional grants are necessary as reduced financing costs do not initially suffice to cover the incremental costs of concentrated solar power. South Africa has implemented a feed-in tariff that offers the necessary revenue stream and reduces investment risk by guaranteeing the electricity price.

Figure 4 illustrates the complementing roles that domestic and international financial support can play. Loans and credit guarantees are most cost-effectively provided directly through international mechanisms (e.g. World Bank) or bilateral credit guarantees supporting private finance. Only the South African government can implement the necessary regulatory framework including feed-in tariffs for concentrated solar power. However, as incremental costs for the feed-in tariff increase in the initial years with deployment volumes, international support in the form of grants would be necessary. Grants linked to the continuation of the feed-in tariff create incentives for the South African government to maintain the feed-in tariff and thus ensure regulatory stability. South Africa benefits as this attracts investment into the concentrated solar power supply chain.

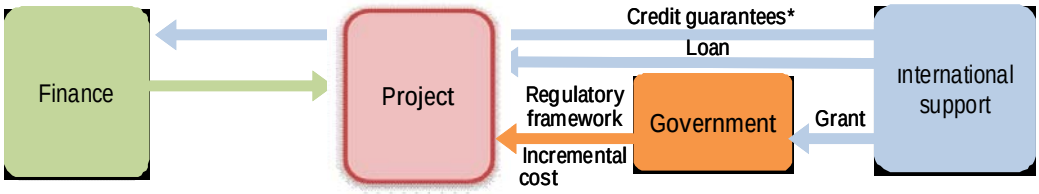


Figure 4. Structure of financial support for large-scale technology projects

The Brazilian country study (Valle Real et. al. 2009), on the **development of rail, waterways and multi-modal terminals** to facilitate a decarbonisation of long-haul freight transport, points to large-scale investment needs. The authors argue that domestic policy frameworks and political economy considerations create the majority of barriers for such a transition. Should international financial support be necessary, then this could also be provided through loans or credit guarantees that reduce capital costs for project developers or the Brazilian national government.

Text Box 2. Case Studies – Small-scale Projects

In contrast to these large-scale power and infrastructure projects, small-scale projects involving agricultural pump sets in India (Singh 2009), energy efficiency improvement of low-income housing in South Africa (Sykes 2009) and renewable energy supply for rural communities in Ghana (Gboney 2009) require rather different financing structures. Transaction costs are too high for international support or international finance to directly engage with individual projects. Hence the support has to be provided through:

- National policy frameworks (e.g. energy efficient low-income housing in South Africa). These frameworks can be supported with international grants.
- Local implementing agencies, which can be public or private and use a combination of loans and grants to pursue improvement of agricultural pump sets or rural energy renewable energy projects.

As local ownership is critical for the success of projects, but typically local households and communities do not have the wealth to provide collateral, it is essential that there is a grant component at the local level; such support needs to be matched by international grants.

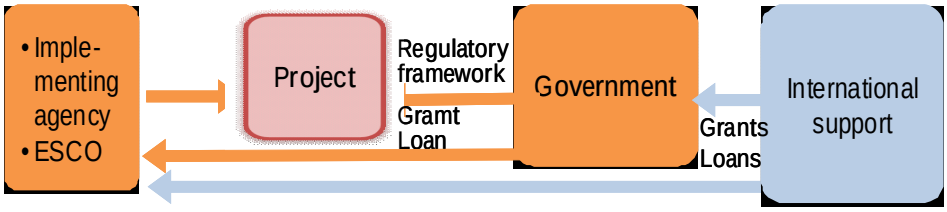


Figure 5. Roles of public and private finance – depends on project type

As full subsidisation of energy services undermines incentives for effective energy use and prevents the development of sustainable business models at the local scale, it seems essential to also involve a loan component at the local scale. As part of this project, country case studies have explored ideas of how micro-credit organisations can provide the larger scale and longer payback periods that are necessary for such energy projects, perhaps by expanding their capital basis with initial grants or loans.

4. Instruments to Provide Financial Support

In this section, we outline the different support mechanisms that are available for use by the public sector to stimulate private sector engagement, discuss options for these mechanisms to be made available by different parties and to different parties, and then consider the factors that might lead one mechanism to be preferred over another.

Using the categorisation of potential support set out in the previous section (Figure 2), the table below presents examples of the support falling into each of the different categories. It also shows that international support can either be targeted directly to specific projects and local implementing agencies, or that it can back national efforts of support provision. Section 5 will discuss the relative merits of both approaches.

	Public Finance Mechanism	**Direct support**	**Indirect support**	
		International to project	*International to national*	*National to project*
Contribution to investment and operation	**Up-front grant** - Standard Technical assistance grants - 'Smart' grants	GEF grants Other bilateral and multilateral DFIs	ODA	Investment support
	Funding during operation	Offset mechanisms (CDM) WB support	Grant linked to continuous delivery (finance +regulatory stability)	*Incremental payment to renewable *Removal of energy subsidies * Carbon tax/cap and trade scheme
Facilitating access to finance	**Provision of equity** - Private equity - Venture capital	ADB Clean Energy PE fund	n/a	Carbon Trust VC fund
	Provision of debt - Loans - Credit lines	IFIs e.g. EBRD, IFC	IMF and WB loans	
	Risk coverage - Full or partial guarantee - Policy to cover specific causes of non performance or all - Other financial products	MIGA political risk insurance	WB/IFC Partial Credit and Partial Risk Guarantees	Export credit agency guarantees

Table 1.

In the following sections, we describe each of the main components in the table and hence describe some of the most important PFMs, as well as the parties which most often provide them.

4.1 Contribution to Investment and Operation Cost

Grants

Grant payments are made by the public sector to help reduce the capital costs of a project or, more typically, to provide complementary institutional support (technical assistance, capacity building, due diligence support etc). In the low-carbon context, investment grants are typically provided when the capital costs of the low-carbon technology are greater than the costs of conventional (fossil) technology. This is the philosophy behind the GEF whose mandate it is to pay the "incremental cost" of global environmental projects. It is most typically reflected in GEF Operational Programme 7, which seeks to "increase the market share of low greenhouse gas emitting technologies that have not yet become widespread least-cost alternatives in recipient countries for specified applications.' (GEF, 2003). However, as well as grants from international bodies such as GEF, national governments often support particular projects through the use of grants, while much overseas development assistance from one state to another is provided in grant form.

Technical assistance grants tend to focus on removing constraints on investment by, for example, improving the capacity of regulatory authorities or the ability of commercial financial institutions to appraise applications for finance. These are typically provided by both multilateral and bilateral financial institutions. Typically these grants have the potential to leverage significant amounts of private capital in the medium to long term.

As discussed above, typically, concerns are expressed over the moral hazard problems of grants. Therefore different forms of 'smart' grants are often made available. For instance, the EBRD supports energy efficiency projects in Eastern Europe through provision of grants, but only provides these grants *ex post*, when the projects are accredited as having delivered the identified improvements. Contingent grants take the form of a grant up to the point when the project meets a criterion for success, at which point it transfers to a loan. Conversely, on some occasions, contingent grants are converted to loans only if the project fails. This approach is designed to provide strong incentives for project success.

Operating Support

Rather than supporting the upfront capital outlay of a project, public contributions can provide ongoing support to it. The latter approach can take the form of a subsidy to the firm/project or to its customers to recompense them for any increase in prices that they would otherwise experience. Such support schemes are best known in the context of renewable energy support schemes, typically defined as feed-in tariffs or tradable certificate schemes.

Provision of support during the operation of the project has the main benefit of improved incentive properties – private sector actors will aim to implement projects rapidly and chose suitable quality and maintenance so as to receive ongoing support. Typically the incremental costs created by such schemes are spread across all electricity users. However, should such costs become significant in developing countries, then international support could either contribute directly towards these costs, or could support energy efficiency measures to allow energy users to reduce their electricity consumption and bills.

The Clean Development Mechanism (CDM) is another example of a support scheme that allows operators to sell CDM credits for every ton of CO_2 avoided through implementation of their project. Again, this creates incentives for the effective implementation and operation of projects that are lower carbon than business as usual technologies.

4.2 Facilitating Access to Finance

Debt Capital

Public support to projects can be provided in the form of debt capital on terms that are in some form advantageous compared to that which would be available from private capital markets, i.e. longer tenors (period of time before repayment has to be made) or lower interest rates. These loans are most often provided by IFIs such as the IFC, EBRD or World Bank.

To augment the leveraging potential of these loans, they are often structured as A/B loans. Although the IFI is the sole contractual lender, some of the value of the loan is retained on the IFI's books (the 'A loan') while the remainder (the 'B loan') is sold to other (private sector) lenders. This allows private sector lenders to share in the 'preferred creditor status' of the IFI. This status grants these organisations preferential access to foreign currency in the event of a foreign exchange crisis thereby mitigating convertibility risk.

As well as IFIs providing debt capital to projects, the same function can be performed by national governments, mostly in cases where there is perceived to be an important benefit to having the project on the country's balance sheet (e.g. 'strategic infrastructure'). In addition, the IMF is an example of an IFI that provides loans to national governments, although this is primarily to promote macroeconomic stability rather than support the growth of specific sectors.

Credit Lines for On-lending

As well as direct provision of debt capital to projects, credit lines can be provided to local Financial Institutions (FI) for on-lending, typically towards projects that meet certain criteria. The intention is that the credit line provided to the local FI should form only part of the debt that is on-lent, and that, in turn, the total debt made available from the local FI will leverage other forms of (equity) capital. Consequently, the total value of the projects undertaken should significantly exceed the size of the credit line. UNEP (2008) reports that leverage rates associated with credit lines are typically 2x to 4x the value of the credit line.

The structure of these facilities vary depending on the interest rate that is charged to the local FI, as to whether there are any conditions placed on the local FI's on-lending, and whether the local FI has any recourse to the provider of the credit line in the event that specific projects fail.

These facilities have the advantage of being able to use the existing distribution networks of financial institutions in a host country and hence are often most suitable for large numbers of small diffuse projects. They are typically provided both by IFIs – e.g. the EBRD has extended a number of credit lines to support energy efficiency projects in various countries of Eastern Europe (see text box 3) – as well as by national governments, e.g. the government of Thailand provides credit lines to local FIs for energy efficiency investment with the credit lines underpinned by revenues from a petroleum tax.

In any situation in which debt capital is provided, it is possible for the debt to be either senior or subordinated. This relates to the order in which cash flows are allocated to creditors in the case of an insolvency: senior debt holders receive their interest/principal repayments in priority to subordinated debt holders. As public provision of subordinated debt implies lower risk for (private) senior debt providers, leverage rates for subordinated debt are typically higher than for senior debt.

Equity Financing

While equity capital can be provided by the public sector to finance specific projects, it is (more) often invested in funds specialising in investment in specific geographies and/or technologies, with the funds allocating capital to specific projects. This provides both specialisation and diversification benefits to the providers of the equity capital. Two main sorts of equity fund can be distinguished: private equity/infrastructure funds and venture capital funds.

Private Equity and Infrastructure Funds

These funds invest equity, often with significant leverage, into established companies/technologies that are seeking to expand – and for which additional capital is required. Funds allocate capital on the expectation of an exit in the medium term through either IPOs or trade sales.

In the event that typical private sector investors in such funds (institutional investors such as pension funds, mutuals and insurance companies) consider the risk profile of the projects in which the fund specialises to be too risky, the public sector can play a role by providing either some or all of the equity capital for such funds. This role is typically

played by both bilateral and multilateral financial institutions. Cases include the Asia Development Bank's five Clean Energy Private Equity investment funds and investments by the IFC in a private equity fund investing in Asian clean energy technology (where funding is also supplied by Swedfund – a risk capital company of the Swedish government – and Proparco, the private sector financing arm of the French Development Agency.) Providing equity to funds is generally considered to be associated with reasonably high leverage potential, reflecting the fact that the public sector is taking on more risk than it would through the provision of debt capital.

On occasion, the equity provided by the public sector into the fund may be subordinated or 'first-loss' equity. This creates a hierarchy or 'cash waterfall' for the net cash flows generated by the fund. Typically, these are allocated first to private sector investors up until a certain Internal Rate of Return (IRR) is achieved and only thereafter are returns (often at a lower level) provided to the public sector equity provider. Once their return requirement has been satisfied, excess cash is then allocated pro-rata between all investors (and the fund manager). Consequently, the existence of the subordinated equity tranche provides a buffer, increasing the number of projects that can fail to yield a return before private sector capital providers do not receive a return commensurate with risk. As with subordinated debt facilities, the fact that the public sector is taking on more risk than in the case of a vanilla equity injection allows the public funding to achieve higher leverage ratios.

Venture Capital Funds

These funds provide equity to emerging companies engaged in the development of new, potentially disruptive technologies that can change whole industries. As such the risk associated with investing in these funds is greater than for private equity funds and the corresponding expected returns are higher.

The public sector plays much the same role as for private equity funds although, in the low-carbon space, the need for public investment is likely to be greater given the additional market failure problems associated with innovation. Most of the examples of this form of support are from national governments e.g. the UK Carbon Trust Venture Capital Fund and the Qatar-UK Clean Technology Investment Fund supported by both governments.

Insurance / Guarantee Products

The main form of support that increases access to finance is guarantee products. Guarantees are financial instruments that transfer risk by either attributing some responsibility to the guarantor for the performance of another person or entity, or by allocating losses to them in the event of failure. The guarantor provides protection to the buyer of protection with respect to the performance of a third party (Kothari, 2007).

Insurance products have an economically equivalent effect to guarantee products although there can be some technical differences e.g. insurance products tend to focus on the loss suffered by the party buying the product – and hence are typically bilateral arrangements – while guarantees tend to relate to the non-performance of a third party.

While both insurance and guarantee products are available from the private sector the public sector can either offer preferential rates or extend the scope of the coverage.[3]

Products can differ depending on whether or not they pay out in response to non-performance irrespective of the reason or due to specific reasons. Examples of the former include IFC's direct debt substitutes or ADB's partial credit guarantees. Political risk

[3] This may not be genuine below cost pricing but rather reflect the fact that the public sector can control the risk more effectively and hence can offer better terms.

cover provided by MIGA, a World Bank organisation, is an example of the latter. This provides cover for Foreign Direct Investment in relation to expropriation, currency transfer restrictions, war and civil disturbance and breach of contract. The instruments can also differ depending on whether coverage is available to protect lenders only or both debt and equity investors; and whether the coverage provided is full or partial (the latter is often preferred by providers to alleviate moral hazard concerns).

For partial guarantees, for debt investors, products can be designed either to specifically cover debt service of later maturing debt (appropriate when commercial lenders are unwilling to provide a financing tenor long enough to match the cash flow of a project) or alternatively a portion of payments throughout the borrowing term. Partial credit guarantees also vary depending on whether, in the event of non-performance, any recovered monies are proportionately shared by the guarantor and the creditor (a *pari passu* guarantee structure) or whether the creditor has a priority on all recovered monies (subordinated structure). As in the earlier discussion, a public guarantee that involves the public sector assuming more risk (subordinated guarantee) is typically associated with higher leverage than provision of debt with lower risk. Often products are only available, or available on significantly more preferential terms, if matched by a counter-guarantee by a host government.

As well as international support for projects, national governments frequently guarantee products for their exporters through export credit agencies. The World Bank also offers Partial Credit Guarantees (PCGs) to support government borrowing from commercial lenders or from the bond markets, although these require a government counter-guarantee.

Other Products

There are other ways of alleviating risks and hence improving access to finance:

Either national or international bodies could offer financial instruments to underpin the carbon price in a particular country. Such instruments include contracts for difference (a contract between a buyer and a seller of an asset specifying that the buyer will receive from the seller the difference between the current value of the asset and its value at contract time) and put options (a contract where the buyer purchases the right to sell the asset at a contractually agreed price) (Ismer and Neuhoff, 2009).

The public sector can provide equity/debt investment to private sector providers of guarantee/insurance products or other risk mitigation activities. For instance the Currency Exchange Fund (TCX)[4] is a fund that offers those investing in developing markets the opportunity to hedge their local currency risk through selling currency and interest rate derivative products, initially to those who have invested in the fund. The fund mitigates its risk through having a diversified geographic base coupled with a first loss tranche of capital provided by the Dutch Ministry of Foreign Affairs. Other investors include DFIs such as the African Development Bank, EBRD and KfW and private sector investors (ABN AMRO).

[4] TCX (2009) 'The Currency Exchange Fund N.V.', May. Available at: http://www.tcxfund.com/smartsite.dws?ch=TCX&id=1617

Text Box 3. Case study Energy Efficiency - EBRD energy efficiency credit lines

Often packages of support provided by DFIs make use of a number of different instruments in concert to promote private sector engagement. A paradigmatic case of this is provided by the EBRD credit lines for financing energy efficiency and renewables investments in the residential, municipal, SME and industrial sectors in various countries across Eastern Europe.

The scheme makes use of four separate instruments, each designed to target a specific barrier to private sector engagement:

- Credit lines are made available to local banks for on-lending, at the banks' risk, to (part) finance energy efficiency and renewable investments in the industrial, SME, residential and municipal sectors. Although provided on commercial rates to participating banks, these help to overcome the problem that required tenors can often be longer than those typically provided for business lending.
- Problems of technical expertise are tackled through technical assistance packages resulting in e.g. consultants providing free energy efficiency advice, assisting potential borrowers in preparing loan applications, building the capacity of loan officers in local banks to understand and evaluate energy efficiency investments.
- In many instances, performance fees of 1-2% of the eligible loan value are paid to the bank upon agreement of the on-loan helping to overcome concerns that banks may have over market demand and potential misperceptions of risk
- Capital grants covering between 7.5% and 20% of the capital cost of specific projects are disbursed when the project is accredited as delivering the improvements identified helping to overcome straightforward cost problems.

The relative importance attached to each of these different instruments differs across the countries in which the schemes haven been implemented.

To date, framework credit lines in excess of €850m have been agreed, with 11 schemes operational across 9 countries/regions. A further two schemes are expected to be introduced in 2009 with framework credit lines summing to €120m and which will extend the scheme's geographic coverage to Moldova. Up to the end of 2008, the EBRD reported that €362m had been disbursed across 25 banks and that this, in turn, had supported more than 24,500 sub-loans.

The schemes to date have been successful at both leveraging private sector capital and reducing CO2 emissions. Across a typical cross section of countries, leverage rates of between 0.1x and 1.5x have been achieved when measured against all EBRD contributions and between 5.8x and 70.5x when measured against the subsidy component of the EBRD support. Subsidy per tonne of annual CO2 saving varies between €5 and €235 depending largely on the sector where support is targeted.

These case studies is based on research and analysis undertaken for UNEP and partners due to be published in October 2009.

Text Box 4. Self-Sustaining Markets in Solar Homes Systems in the Developing World

Many homes in rural areas in the developing world lack electricity because they are remote and there are insufficient funds to connect them to the grid. Such households typically rely on biomass fuels, kerosene and batteries for their heating, lighting and electrical appliances. Small-scale solar photovoltaic systems can act as a low cost means of rural electrification. However, self-sustaining markets in such solar homes systems (SHS) often do not tend to emerge without some degree of public support, because even small systems are nevertheless expensive for many households, and both households and distributors may lack access to credit.

The World Bank and International Finance Corporation, working in tandem with the Global Environment Facility, have supported the development of SHS markets in over 20 countries (IFC, 2007; Miller, 2009), with varying degrees of success. Such interventions typically need to simultaneously tackle more than one barrier to market development, often related to financial infrastructure. For example, potential customers may lack access to credit, distributors may be unable to raise loans for inventory and recruitment without collateral, and consumers may have low confidence in an unfamiliar technology. Rural areas by definition imply higher overheads for distribution and after-sales service, and initial low sales volumes create few opportunities for economies of scale for distributors.

The public support offered typically takes the form of: concessional refinancing of small loans to consumers by micro-finance institutions and local banks; provision of direct incentives to dealers in the form of installation grants; technical assistance, in the form of grants for staff training or development of quality standards; and concessional loans and guarantees offered to dealers to supplement their working capital. Social enterprises may be key distributors in addition to, or instead of, profit-making enterprises.

Two countries where efforts to develop the market for solar homes systems have been particularly successful are Bangladesh and Sri Lanka. In Sri Lanka, credit institutions borrow money on concessional terms to on-lend to dealers and customers. In Bangladesh concessional loans to refinance consumer credit have been disbursed to dealers. In addition, a major Bangladeshi SHS social enterprise, Grameen Shakti, was support by an IFC/GEF loan at an early stage of its development. Installation grants have also been deployed in both countries.

These two countries have seen an exponential increase in sales of SHS units, with hundreds of thousands of units now installed. However, specific circumstances related to country characteristics or timing of support may have played a part in this success. The experience of Bangladesh and other countries such as Kenya and Papua New Guinea suggest that 'piggybacking' on existing social ties and infrastructure created by micro-finance lenders or large employers can be a significant factor in scheme success.

These case studies is based on research and analysis undertaken for UNEP and partners due to be published in October 2009.

5. Experience with the Provision of Support through the Different Mechanisms

Capital investment is financed predominantly through private sources. However, a wide array of public and not-for-profit organizations play a role in facilitating these investment flows, including development institutions, investment promotion agencies, international institutions and philanthropic organizations. Typical current annual financial flows via the organisations/mechanisms identified in Table 1 are presented in Table 2 (for all purposes, not solely those which are climate change-related).

They will all have a role to play in financing the investment needed to build a low-carbon economy. Their respective roles will differ and some of them may have to adapt to meet the new challenges. There may even be a case for new organizations, as the case of the Adaptation Fund – set up under Kyoto to help vulnerable developing countries adapt to climate change – has shown.

Every organization has its distinct profile and comparative advantages, which it derives from its mandate, expertise, governance structure, size and location. In deploying the financial instruments discussed above it makes sense to use organizations according to its specific strengths. Without undertaking any organization-specific diagnostics, we can surmise how the financial instruments we propose might best be deployed.

Grant support may most naturally be provided through bilateral development agencies such as Britain's DFID, Sweden's SIDA or America's USAID. These organizations currently support individual projects, but increasingly offer budget support to governments in the context of mutually agreed poverty reduction strategies or similar plans. A significant fraction of their funding is channelled through multilateral development banks or the UN, often via dedicated facilities like the Clean Investment Funds or the UN-REDD Programme Fund. An organization that specifically provides environmental grants (covering the incremental cost of a globally beneficial activity like GHG mitigation) is the Global Environment Facility (GEF). The GEF serves as the financial mechanism to the UNFCCC, which means that most Convention-related finance is channelled through the GEF. Philanthropic institutions and NGOs complement traditional development aid in important ways, usually focusing on small-scale projects and the grassroots level.

Public finance and technical assistance on the policy environment is the purview of multilateral development agencies like the World Bank and the regional development banks. Also active in this field are bilateral development banks such as Germany's KfW. These are the organizations that could most naturally support, for example, the development of renewable support programs like a national feed-in tariff. UN agencies like the UNDP and FAO are also strong on technical assistance, often smaller-scale and more narrowly focused, but they do not generally provide finance.

Commercial finance and risk coverage needs to be provided by organizations with an explicit private sector focus and mandate. Experience has shown that differences in corporate culture can be an important barrier to the effective implementation of public-private partnerships (see Vivid Economics 2009). Organizations with this comparative advantage include export credit agencies at the bilateral level and international financial institutions with a private sector orientation (e.g. IFC and EBRD).

Using existing organizations and leveraging their strengths helps to enhance the cost-effectiveness of the low-carbon transformation program. Existing institutions can hit the ground running and can draw often on decades of relevant experience. Building up new institutions would take much longer time and risks duplication with existing players.
Yet there are risks, including the fact that not all organizations have an equally good track record. Also, there are political economy challenges such as whether existing

institutions would wholeheartedly endorse the new objectives and adjust their internal and external workings accordingly, or whether they would see climate change finance as a means to pursue their original objectives.

	Public Finance Mechanism	**Direct support**	**Indirect support**	
		International to project	*International to national*	*National to project*
Contribution to investment and operation	**Up-front grant**	GEF: $735 million [3] Cool Earth Partnership (Japan): $400 million[5] International Climate Initiative (Germany): $160 million[3] UN-REDD Fund: $50 million [4]	Bilateral ODA: $81 billion[2] Multilateral ODA: $13 billion [2]	
	Funding during operation	Primary global CDM market: $2-3 billion World Bank IDA grants: $2.6 billion [3]		Fossil fuel subsidies in 20 largest non-OECD countries: $220 billion [7] Direct world-wide government support for renewables deployment: $10 billion[8] EU ETS market: $92 billion [3]
Facilitating access to finance	**Provision of equity**	IFC: $1.7 billion [3] ADB: $120 million[3] AfDB: $220 million [3] EBRD: $1.6 billion [3]	n/a	Example: UK Carbon Trust has co-invested $10.8 million since inception
	Provision of debt	IFC: $5.7 billion [3] ADB: $1.8 billion[3] AfDB: $1.1 billion[3] Cool Earth Partnership (Japan): $1.6 billion[5]	IMF: $0.7 billion [2] WB: $24.7 billion [3] ADB: $8.7 billion[3] AfDB: $2.9 billion[3]	Diffuse examples of governments lending to businesses, often for specific policy purposes (SME support, energy efficiency, etc.)
		Unclear split between sovereign and non-sovereign lending IADB: $11.1 billion [3] EBRD: $5.9 billion [3]		
	Risk coverage	MIGA guarantees: value of $1-1.5 billion per annum[1]. Actual payouts are very rare, amounting to only a few million.	WB PCGs: $1.6 billion since 1990 WB PRGs: $0.8 billion since 1994 IFC guarantees: $1.8 billion per annum [3]	Export credit agency guarantees: e.g. UK $1.8 billion[4], USAID $0.2 billion[2], US Ex-Im Bank Sub-Saharan Africa $575mio.[4] OECD to IDA countries only: $1.3 billion per annum [2]

Table 2. Illustrative values of different financing mechanisms[5]

[5] Sources: World Bank (2009b); EBRD (2009); IADB (2009); AfDB (2009); ADB (2009); GEF (2009); OECD (2009a); OECD (2009b); Capoor and Ambrosi (2009); IFC (2008); Carbon Trust (2009). USAID (2009), Export Credits Guarantee Departmnet (2009), Export Import Bank of the United States (2008) [1] Based on typical figures over the period 1999-2007. [2] 2007 figure.[3] 2008 figure.[4]

A key challenge for all organizations, old or new, will be scaling. Financing needs for mitigation and adaptation have been estimated at close to $500 billion a year by 2030 (World Bank 2009). This is about five times the current level of official development assistance and ten times the IFIs annual lending volume. No single public institution has the capacity to administer this volume of flows and indeed ensure effective use in a context of limited absorptive capacity.

Moreover, there are subtle but important differences between the nature of climate change finance and the philosophy of the existing development architecture, in particular, as reflected for example in the Paris Declaration on Aid Effectiveness. Climate change support is not about aid, with donors and recipients. It is about taking joint responsibility for a global problem, with each party contributing according to their means and their common but differentiated responsibilities. It is not clear to what extent existing institutions are able to adjust – and, equally importantly, are perceived to adjust – to this different philosophy.

Moreover, efficiency in implementation may not be the only concern. One other factor that is likely to feature prominently is governance. At its most basic level, governance is about ownership and control. This has proven to be a crucial issue for climate change institutions. Among developing countries there is a fair amount of distrust and disillusion with existing international financial institutions, in particular the GEF. There has been a strong push, therefore, for institutions where developing countries feel a stronger sense of ownership. At the same time, developed countries want to maintain some control over the use of the resources they provide. In the case of adaptation the result of this tension has been a dedicated new institution, the Adaptation Fund that has a governance structure acceptable to all.

More subtly, governance is also about the level of influence the UNFCCC exerts over the low-carbon transformation process. In that respect it may be useful to distinguish between several levels of influence.[6] At the core, there will have to be organizations that are under the direct control of the UNFCCC and implement the decisions of convention parties. The GEF, as the financial mechanism of the Convention, the Adaptation Fund and the control bodies of the CDM fall into this category. Further removed, there will be organizations that undertake relevant work but are not directly controlled by the UNFCCC. They may report to the convention either directly or indirectly via UNFCCC parties that control them. UN agencies and the multilateral development institutions probably fall into this category. At the outer edge, but by no means less important, will be organizations that function independently of the Convention process but are nevertheless crucial to global mitigation efforts. NGOs and philanthropic institutions are the obvious examples.

This paper suggests that the design of international support structures needs to match the support that can be provided through bilateral and multilateral mechanisms to the specific needs identified in NAMAs to shift individual sectors in developing countries onto low-carbon growth trajectories.

Figure 6 illustrates the relative size of different mechanisms of development and climate cooperation, using areas proportional to their volume listed in table 2. It shows that the majority of grants are provided in bilateral cooperation to governments in developing countries. In contrast, almost all financial support is provided through multilateral organisation, with the larger share provided to individual projects and programs. What would be the implications, if this pattern were to be replicated for climate cooperation?

2009 figure.[5] Based on total figure of $10 billion for 5 years announced in 2008.[6] These figures do not imply that developing countries have benefitted from financing of the same magnitude as these are estimates of the value of EPRAs closed in 2008 and actual payments would depend on project registration and performance.

[6] We are grateful to Ian Johnson for introducing us to this distinction.

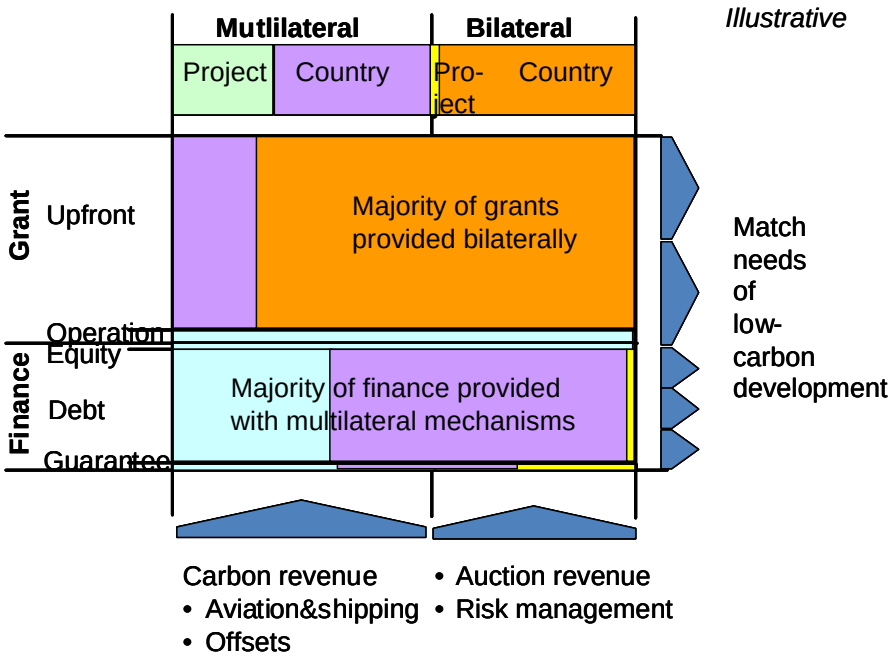


Figure 6 Mapping needs for low-carbon development through mechanisms to institutions *Please note that volumes of debt are not translated into grant equivalent values in this figure*

First, it will be essential to calculate the relative share of different support mechanisms that are required to facilitate low-carbon transitions in developing countries. The examples discussed in section 3 suggest that both access to finance and grants have a relevant share.

Second, if bilateral mechanisms provided the majority of grant support, then commitments to provide support through bilateral cooperation and hypothecation of auction revenue from national emission trading schemes would have to match the needs for grant support of developing countries.

Third, if multilateral mechanisms are to provide the majority of grant equivalent support through debt provision, then again they need to be equipped with the corresponding resources. This has two components. (i) Pledges of soft money that can be used to complement (subsidise) the commercial lending and cover the incremental costs of low-carbon options. This could take the form of IDA-style replenishment rounds. It is money that can be "used up" as it does not count against the share capital. (ii) Capital increases in IFIs (e.g. EBRD is thinking of one); that capital can either be paid on or pledged. It allows the IFI to increase its lending activity, but in a commercial way, i.e. expecting repayment (otherwise the equity gets eroded and the IFI goes bust)

Fourth, public risk guarantees and insurances are currently provided to a limited extent by multilateral organisations and to a larger extent by national governments. Multilateral organisations struggle to expand their provision of such guarantees, as this always requires reserving capital on their balance sheets. National governments are less constrained as they can underwrite debt or risk guarantees. Risk guarantees, either provided in a bilateral manner or issued by national governments to allow multinational organisations to provide additional debt are therefore likely to play a far stronger role in future climate cooperation, and will also require more careful monitoring to avoid undue exposure of individual actors and countries.

Given the current context of reform of international financial systems, increasing the power of the mechanisms outlined above will require instituting safeguards on the

financial arrangements set up over the past two decades (a "shadow banking system") and incentivising banks to provide more credit for low carbon or carbon saving activities. The latter could be supported by allowing lower deposits for such activities with the risk borne by the Central Banks of Annex 1 countries and re-insured through an arrangement akin to Special Drawing Rights at the IMF backed by new deposits from the same Central Banks. This is not the place to discuss here the details of such a system, but to invite the best specialists in the field to internatilize this perspective in the debates on the future of the financial systems.

6. Climate Finance and the Evolution of Financial Systems

If all mechanisms designed to support carbon abatement initiatives are mobilized successfully, capital flows could be reoriented towards low carbon intensive infrastructures in DC at the scale of $400 (140 – 675) billion a year for mitigation and $75 (30 – 90) billion for adaptation as estimated by the recent World Bank Development Report (World Bank 2009).

This supposes that all climate oriented mechanisms could be structured within a consistent view of the reforms of global finance. Indeed, aid alone will not suffice as the usual drivers of donor fatigue cannot but be exacerbated in the context of a 'return of depression economics' (P. Krugman 2009) and that of a re-equilibrium of world economic wealth (rendering the North/South division line an inaccurate Rich/Poor division line). But this context does not change the mere fact that, given the past responsibilities of the Annex 1 countries in the climate problem and given they still have a far higher average per capita income, the North has to make a credible proposal to trigger flows of climate oriented funding to the South.

Margins of freedom between the political constraints on large transfers and the political necessity of a palatable offer to non-Annex 1 countries exist because we are not faced with a problem of capital shortage at the aggregated level but with a problem of misdirection of savings in a context where emerging countries are capital exporters and some rich countries capital importers.

This redirection of savings starts obviously from the project level, through the leverage effect of concessionary funding or of a reformed Clean Development Mechanism. But these tools cannot go very far to leverage private and public finance without the existence of risk mitigation instruments in favour of climate friendly investment and of instruments capable of realigning and increasing households' savings in the direction of such investments while securing the liquidity of the lent money. The challenge is indeed to reconcile the desire of borrowers and investors to secure long term funding on infrastructure projects with the desire of the lenders to hedge against investment risks and to readily access money. This is true for the actors of the financial system (sovereign funds, pension funds, saving banks) but also, and more fundamentally, for individuals specifically in societies with very low social protection as is often the case in emerging economies.

Thus, helping the South to switch towards a climate friendly development pattern does not boil down to asking taxpayers of the Annex 1 countries to send unprecedented amounts of money to emerging economies in order to help them to become low carbon intensive super powers. Mechanisms to secure carbon saving investments will entail financial costs since the risk has to be taken by somebody, but with a leverage effect high enough to make the order of magnitude of the sacrifice politically acceptable. Indeed, the objective is not to send $X billions per year to developing countries but to redirect the use of global private savings, including the large savings of new emerging economies, towards low-carbon infrastructure investments including those of the OECD countries.

This opens a broader perspective. Since Gleneagles, developed countries have asserted their willingness to link climate policies with the transformation of economic

globalization into a mutually benefiting process and the prevention of new threats to security (energy, climate refugees and local political instability). The current financial crisis provides an impetus to make a step further in that direction through linking the reform of financial systems to the decarbonisation imperative and by the same token shortening the duration of the depression economics as characterized by (P. Krugman 2009): "For the first time in two generations, failures on the demand side of the economy – insufficient private spending to make use of the available productive capacity – has become the clear and present limitation on prosperity for a large part of the world".

In this context, reforming the financial systems such that they simultaneously trigger and sustain a long wave of climate friendly infrastructures works in both developed and developing countries would accelerate global economic recovery in a sustainable way. That the major part of this wave benefits developing countries is of interest for developed economies because the spread of the financial crisis to emerging markets makes a global rescue for developing countries part of the solution to the crisis. Moreover, expanding public and private spending on energy, transportation and housing infrastructures by providing aid to state and local governments, would help reduce one of the major structural imbalance of the world economy, i.e. the disparity between the saving/consumption ratio of the US and China (and possibly in a few years between the US and India and other emerging economies) that generates huge capital flows from the latter to the former that are compensated by an under evaluation of the Yuan that in turn undermines part of the industrial system in many countries.

Securing investments in carbon saving infrastructure necessitates three levels of analysis: a) enhancing the expected social return of carbon saving projects b) enhancing the profitability of enterprises through participating carbon – saving initiatives c) enhancing the capacity of governments and of the banking system to fund carbon-saving programs and policies. A set of diversified tools needs to be developed to address these three levels in various activity domains and local/national circumstances and a consistency rule has to be found to secure their economic efficiency in terms of GHGs emissions reductions and to limit the costs of the fragmentation of funding mechanisms.

Using Finance Mechanisms to Secure a Credible Low-carbon Transition

In the absence of a clear world carbon price this consistency rule can be based on an agreed upon « social value of carbon » that could be retained in all climate finance mechanisms. If indeed the international community expresses the political will of meeting some long term GHGs concentration target, this means that it attaches some value to the ton of carbon or, more precisely a series of values that express the marginal cost at various points in time of respecting an emissions trajectory consistent with the long term objective. Obviously this value is very uncertain because it translates various beliefs about the marginal abatement costs and the marginal damages caused by one ton of GHGs. But modelling literature provides orders of magnitudes and ultimately this value will be a matter of political negotiation. This social value of carbon would then play the role of a reference price.

To understand the role of this social value of carbon in linking climate policies and the reform of the financial system, let us come back to the way governments respond the current financial crisis. Through various techniques government de facto socialize "bad debts" to secure the interbank loans. The question is "in exchange of what and in view of what reform of the financial system"? The modern financial system relies on a trading of promises in which it is possible to increase the equity value of a firm by a higher debt and the purchase of financial assets themselves grounded on the future value of other assets. In such a system, speculative bubbles (the dot-com bubble, the housing bubble) proved to have some virtue for the real economy as long as they do not burst before a new bubble takes over. This is why there is some piece of truth in the suggestion underlying the

headline in the satirical newspaper The Onion: "Recession-Plagued Nation Demands New Bubble to Invest In".

Today the modern monetary and banking systems rely on a significant disconnection between the back up of promises and the existence of a pre-existing counterpart. The prevention of the return of panics and of 'runs on the bank' relies almost entirely on a pure convention, i.e. banks are required to hold liquid reserves, maintain substantial capital and pay into the deposit insurance system. The 'strongbox' behind this convention is the working capacities of nations which guarantees that something of value will be created when the money is actually spent. The crash of Iceland demonstrates that the content of this strongbox is not unlimited; there will never be any certainty about whether future wealth will be high enough to make the mortgage payments of the credits granted to produce it.

This indicates a potential use of the social value of carbon. Long since gone is the time when the confidence game was entirely based on a pre-existing and tangible wealth and the art of the managers of the monetary and banking institutions and the role of the regulations of these institutions was to find the right balance between a risky laxity and an inhibiting rigor. An agreed-upon social value of carbon would provide some certainty around the value produced by the abatement of one ton of carbon and guidance for the credits necessary to fund the carbon saving investment. Doing so could make them less risky and more attractive for private and public investors.

Such a value could first be used by the development banks in the selection of projects. On projects capable of delivering demonstrable abatement the experience of the CDM indicates that project developers tend to sell forward credits at a discount rate that reflects delivery risks and the value of carbon at the time of the delivery. The financial intermediaries active on the secondary market take on delivery risks but there is no chance that such a secondary market will take on these risks with moderately higher sell-on prices if one moves from the project level to the sector and program level with a higher amount of up-front investments. This is why there is a need for using the social value of carbon in risk coverage mechanisms which could be extended to projects, which do not deliver GHGs emissions abatements but avoided (and non measurable) emissions. For example, the discounted sum of the expected emissions reductions valued at the ex-ante agreed value of carbon could be used to cover a default payment of one of the participants in a project or program if viability is threatened. Such a mechanism could leverage National Insurance Funds (similar to export credit agencies) created by Annex 1 countries the capital of which would be provided by governments and that would be fed by a slight levy on the credits to the project. Additional support could come from the creation of an international re-insurance fund to back national efforts.

Ultimately, (though beyond the scope of this paper to delve into the details of such a discussion) the magnitude of the challenge is such that securing an increase in the power of climate oriented funding, insurance and re-insurance mechanisms requires two major building blocks. The first is the collection of households' savings in bonds or liquid deposit accounts dedicated to carbon saving investments which could be paid at, at the minimum, interest rates akin to those of similar financial products due to the lower risk-premium attached to the loans funding these investments. There would be the additional benefit from the rise of an environmental ethic in public opinion (such as the equitable trading products or the ethical funds). The second is the reform of the banking system itself during a period in which new safeguards will have to be set up to prevent the return of financial crisis. The objective should be to reform the system such that banks are interested in granting more credits to carbon savings activities, the risk being ultimately taken by Central Banks of the Annex 1 countries and re-insured by the IMF

7. Conclusion

Financial support ultimate goal should be to support investments necessary for low emissions development strategies, in the absence of or in complement to carbon trading systems aiming at 'buying' cheap tons of carbon at given points in time. Figure 7 illustrates how public and private actors work together to introduce new technologies, business practices and training and develop suitable regulatory frameworks.

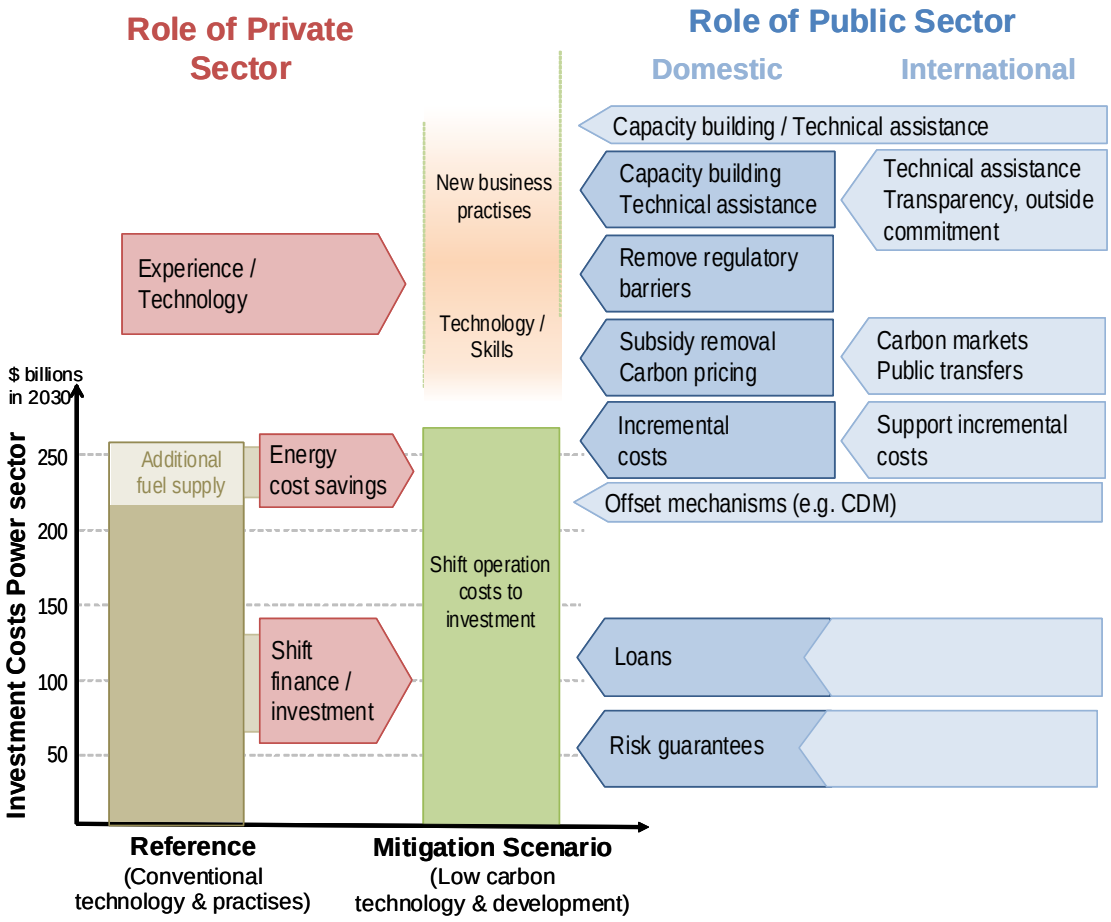


Figure 7. Shift of investment and finance towards low-carbon technologies & practices

International financial support can target project developers, investors and developing countries governments**.** A bottom up analysis is required to identify the needs of these actors and to tailor the choice of suitable financial mechanism including loans, equity, risk guarantees and grants.

The choice of mechanism is intrinsically linked with the institution that can provide the mechanism.

- Bilateral cooperation offers the flexibility to tailor a grant to specific needs of a sector or country, and might therefore be the preferred option to facilitate transition strategies. Only where incremental costs are clearly defined, e.g., with technology demonstration projects, multilateral organisations can use standardised methodologies to offer grant support.
- Multilateral organisations offer a stronger track-record in the provision and management of loans, e.g. for infrastructure development.
- Both bilateral cooperation and multilateral organizations offer good examples for the provision of risk guarantees.

An additional criterion is the scale at which these mechanisms can be provided. If carbon pricing on international aviation and shipping creates international fungible funds. This offers prospects for large volumes of grants to be provided at multilateral basis, otherwise grants are more likely to be provided in bilateral settings

The annual needs for public financial support for mitigation actions in developing countries will increase during the initial years of the low-carbon transition, as capacity and experience with the implementation of actions increases. If incremental costs are financed by newly issued dedicated bonds (at national or international level), then public finance needs will be increasingly stretched as this additional demand for public finance coincides with increasing costs of serving old bonds. Additional bonds or credit guarantees backed by governments in developed countries might however be a suitable approach to facilitate access to finance for low-carbon investments in developing countries. In this case the bonds will be served by revenues from low-carbon projects. This shows that a clear and consistent strategy will be important to enhance the credibility of low-carbon transition strategies.

The expected increase in support over time creates a strong incentive for developing countries to pursue and accelerate low-carbon development strategies/NAMAs, so as to create the capacity to absorb the support and to qualify for further support.

The value of financial instruments like loans, equity, and risk guarantees needs to be expressed as grant equivalent contribution and accounted for under UNFCCC. This allows for a fair comparison of contributions of different actors and ensures they deliver against their commitments.

Tailored financial support can help developing countries to pay for the incremental investment necessary to shift a sector or technology to a low-carbon growth path, and perhaps most importantly, create the framework to shift the overall investment strategy to low-carbon choices and to minimize investment risks.

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Climate Strategies is grateful for funding from the government of Australia, Agence de l'environnement et de la maîtrise de l'énergie (ADEME) in France, Ministry of Foreign Affairs (MFA) in Norway, Swedish Energy Agency, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) in Germany, Department for Environment, Food and Rural Affairs (DEFRA), the Office of Climate Change (OCC), Department for International Development (DFID) in the UK, The Carbon Trust in the UK, Corus Steel, Center for International Public Policy Studies (CIPPS) in Japan, European Climate Foundation (ECF), and the German Marshall Fund of the United States.