**TEC Brief on enhancing access to climate technology financing**

## 1. Introduction

The increases in global investment that are needed to remain below a global temperature rise of 2 degrees Celsius are estimated to be in the order of several hundred billion USD annually between 2010 and 2029 for low-emission generation technologies and energy efficiency in the buildings, transport and industry sectors (IPCC 2014). A further USD 28 to 67 billion per annum are estimated to be needed as additional investment to adapt to climate change in developing countries (UNFCCC 2008). Although the increases in investments needed are manageable, they are far above current levels of investment and would require a 90% reduction in CO2 emissions per unit of electricity by 2050 (IEA 2014). Such a deep transformation will require, in addition to review and revise current production and consumption patterns, a massive deployment of currently available and new technologies, some of which are still to be developed.

Accordingly, the transition to a low-carbon and climate resilient economy will require scaling up and mobilizing a broad range of public, private, international and domestic financial resources. Investment in the development and deployment of climate technologies will absorb a significant share of the scaled up finance. The scale of investment envisaged is such that constrained public finances can only provide a limited share, with significant sources coming from the private sector, including the capital markets. However, public finance has a crucial role of catalyzing the necessary low-cost and long-term private finance, of addressing risks the private sector is unable to take, and to invest in the early stages of development of climate technologies. The objective of this brief is to outline the challenges of financing climate technologies faced by developing countries, review best practices and lessons learnt, and to highlight the roles of different stakeholders in facilitating access to climate technology finance.

## 2. Challenges and risks of financing climate technologies

*Challenges of climate technology financing*

Underinvestment in climate technologies primarily stems from their often unfavorable risk-return profile, as a result of their higher economic and upfront capital cost compared to incumbent technologies, and their higher risks. For technologies with negative abatement costs, misaligned incentives, intangibility of benefits, high transaction costs and lack of standardization in the quantification of energy savings and other benefits, in addition to the upfront capital cost, frequently hamper their financing and uptake. Compared to mitigation technologies, technologies for adaptation face further barriers, including the lack of a revenue model for some technologies, the need for buy-in and involvement of large and complex groups of stakeholders in some cases, inadequate climate information, and uncertainty about the benefits of adaptation.

Obtaining financing for climate technologies is particularly challenging in developing countries due to additional uncertainty and risks that are hard to mitigate in private financial markets, lack of patient and low-cost capital, poor credit-worthiness and lack of guarantees, and low availability of capital for public investment. An analysis of TNAs confirms that the most commonly reported economic and financial barriers are the lack of or inadequate access to financial resources and inappropriate financial incentives (UNFCCC 2013).

*Risk management*

Risks are seen as the “most important factor preventing projects from finding financial investors” (CPI 2013). Thus, transferring some of the risks associated with the commercialization and deployment process is central to addressing barriers to climate technology investment. Policy risks affect those climate investments that rely on revenue and regulatory support; market and commercial risks refer to economic risks and include financial risks, such as access to capital and the cost of financing; technology risks are inversely related to technology maturity. Together they can present insurmountable risks to private investors. Risks can be mitigated through a variety of risk instruments, including publicly backed guarantees, credit and liquidity risk etc. Yet policy and market risks for climate technology investments are

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currently poorly covered by existing risk instruments. Instead, blended and concessional finance are often used to transfer some of the risk from private to public actors.

Whereas creating a favorable risk-return profile by mitigating risk and closing financial viability gaps are necessary conditions to attract private sector finance, it is the combination with effective policies and capacity building that will drive the transition to low carbon and climate resilient economies. Appropriately aligned policies and financial instruments that reduce and transfer risk can significantly lower the cost of this transition.

*Scaling-up climate technology financing*

Scaling up financing for climate technologies will face constraints unless capital markets can be tapped. The capital markets is the only component of the financial sector that can supply the necessary volume of low-cost capital to reach the scale of investment needed. To jumpstart access to the capital markets, multilateral development banks have acted as the initial catalyst for the climate bond market, by issuing the first climate bonds. Since 2013, the market for climate bonds has grown exponentially, reaching USD 53 billion by the end of 2014 (CBI 2015).

Despite increased availability of climate finance, there is a lack of bankable climate technology projects, and a lack of risk capital, including early stage/construction capital for project development in developing countries. The lack of adequate financing is particularly acute for the first deployment in a new market, before a technology has established a track record. Project developers in developing countries therefore continue to face challenges in accessing financing, in particular for smaller projects, of 1 to 20 million USD. Large finance and support gaps exist for a broader range of less well-known technologies, for adaptation technologies and for the commercialization stage when many technologies face the "valley of death".

Overall, there remains a significant need for climate finance that is prepared to take on more risk and that is suited to smaller investment projects. A suite of public finance and risk mitigation instruments is called for, targeted at critical finance gaps that can take climate technologies from the RD&D stage through to commercialization, and large scale diffusion in new markets. Public finance in concert with policy and targeted capacity building efforts therefore remain key drivers of investment in low carbon and climate resilient technologies.

**3. Good practices and lessons learned from climate technology financing**

Drawing on the experience with both established and more recent and innovative instruments, projects and programs, the following illustrates how different types of finance, both national and international, and support modalities can provide and facilitate access to financing for climate technologies, address risk and overcome barriers. A broader range of financing instruments is available for developed countries, while there are fewer options for LDCs, hence the available financial and risk instruments are country specific.

*Creating investment opportunities through price support instruments*

One of the most used policy instruments for attracting private investment in climate technologies are Feed-in-tariffs (FiT). FiTs are specific to energy technologies and provide price support to increase return on investment. FiTs have historically placed considerable cost burden on governments. To reduce this burden , international support may be required. An example of sharing the additional cost of renewable energy between donors and host country is the GET FiT program led by KfW. The program is designed to address key barriers confronting investors looking at potential investments in small renewable energy projects, with the main feature a front-loaded results-based premium payment designed to top-up a host country's own FiT, combined with technical assistance.

*Closing viability gaps and transferring and reducing risk with blended climate finance*

Blended climate finance has been successful in catalyzing private sector investment which would otherwise not happen under prevailing market conditions, by compensating for the higher cost of newer and riskier technologies. In blended project finance, investment capital is provided both by private and public investors, usually at concessional terms, with donors taking a subordinate position, thereby filling a gap in

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capital and mitigating risk. Grants can be blended in, further reducing cost of debt and of risk mitigation, and can be combined with technical assistance and capacity building. The approach allows for demonstrating the viability of new and risky technology projects, paving the way for financing on fully commercial terms.

The importance of blended and concessional finance that is market and technology-specific, and hence targeting the specific barriers faced by a new technology, is illustrated by the Concentrated Solar Power (CSP) program of the CTF. International public finance, bolstered by strong domestic backing, has helped to close viability, risk and knowledge gaps, and is expected to contribute significantly to reducing the cost of newer less advanced CSP technologies. Another example is CTI PFAN's collaboration with REEEP to develop a new model for climate technology projects which combines grant and loan elements, in a phased financing approach.

The most commonly used public finance instruments in climate mitigation projects remain concessional finance, including public sector first loss investment, and grants. Loss absorbing equity provided by the public sector and risk mitigation instruments are used much less frequently.

*Venture Capital/Private Equity*

While crowding out the private sector should be avoided, there is a role for publicly backed VC/PE funds to jumpstart climate technology investment ecosystems. A successful example of a cleantech VC fund seeded by public finance is Infuse Ventures in India. The government of India has a first loss position, and investors comprise private and public investors, including IFC. The fund is unique in India by investing in early stage innovation in cleantech, which strongly overlaps with climate technologies. IFIs have started to invest in climate VC/PE funds, and to establish PE funds in partnership with donors and the private sector.

*Financing BOP climate technology products*

Base of Pyramid (BOP) innovation and finance of climate technology products remains largely neglected, in part because exploiting the market at the BOP requires business models that are tailored to lower profit margins and longer time frames. The development of new business models and innovative financing instruments is as important as the development of new technology products.

*Internationally financed RD&D*

Publicly-funded international RD&D targets unaddressed needs in areas and sectors underserved by the private sector, developing and disseminating technologies and practices on a wider scale in partnership with national and other international organizations. The Consultative Group on International Agricultural Research (CGIAR) is an example of internationally funded RD&D of technologies that generate significant social and environmental benefits. The EU's Horizon 2020 is an example of a regional research and innovation (R&I) programme that supports companies, in particular innovative SMEs, and other types of organizations engaged in R&I, including by helping to gain access, via financial instruments, to risk capital, including loans, guarantees, counter-guarantees and hybrid, mezzanine and equity finance.

*Financing adaptation technologies*

In contrast with mitigation technologies, sources of financing for climate change adaptation technologies have largely been public and will likely continue to be so for the most vulnerable countries, with many projects being at the community level, or infrastructure-connected.

Among alternative sources of financing, innovation prizes are seen as a potential mechanism to complement grant-based funding for early stage adaptation technology solutions. Microfinance is another potential source of finance that could be tapped for adaptation technologies that generate immediate development benefits. In partnerships with microfinance lenders, small adaptation technology projects could be pooled under a single holding structure that could in turn contract financing with a development bank.

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Business models for climate proofing infrastructure are hard to make because of the challenge of monetizing the benefits, and because of uncertainty and information gaps about the climate change impact at the location. In the agriculture sector, sources of financing for climate smart technologies could either be public or private, and do not necessarily add costs, although upfront capital costs may pose a barrier to investment, for example in drip irrigation systems.

A growing number of new business models are being made possible by information and communication technologies, including smart phone applications to access finance along agro-value chains. Improved access to finance and market information and data helps build farmers' assets, thus reducing their climate risk vulnerability. "Smart" agricultural and water technologies, including those that are IT enabled, also offer opportunities for VC investors.

The diverse nature of adaptation technologies and of the sectors and contexts in which they can be applied and integrated, in combination with the difficulty of measuring and monetizing their adaptation benefits adds to the challenge of facilitating access to financing. A better understanding of finance options is needed.

*Building the capacity of project developers, incentivizing early stage investment, and facilitating access to climate finance for small-scale projects*

The dearth of bankable projects, and the challenge of project and technology developers to access finance, is being addressed by a range of programs, including the Seed Capital Assistance Facility (SCAF), which provides seed financing and technical assistance to early stage VC funds and project developers, and CTI-PFAN which provides mentoring and investment facilitation services to project developers. Such programmes provide critical links between project developers and private investors, build the capacity of project developers and entrepreneurs, and help to make project bankable by giving access to financial advisors who can advise on structuring projects and securing investment.

A key lesson learnt for project developers, including in the TNA process, is the importance of seeking advice from financial experts on how to structure a project and arrange the financing before approaching a lender. Involving financial advisors early in the project development drastically increases the chances of successful capital raising.

**4. Possible actions by key stakeholders for enhancing access to climate technology financing**

Climate technologies face a number of different barriers determined by their diverse characteristics, their commercialization stage and the investment and market context in which their deployment is sought. Many new climate technologies require testing, demonstration and adaptation in a new market, which necessitate a form of public support until they can compete with more mature technologies embedded in long-lived infrastructure. Similarly, the development and deployment of endogenous climate technologies require targeted efforts to spur innovation, support entrepreneurs and facilitate access to seed and early stage risk capital. Addressing the barriers and risk to climate technology investments requires the understanding of the specific risks, the capacity constraints and finance gaps that prevent investment.

Public finance actors can provide important support and risk sharing for climate technologies, balancing 'push' factors that strengthen innovation and technology adoption capacity and 'pull' factors that pull new technologies into the market. Public and private sources of finance can be complemented by alternative sources, e.g. carbon finance, pricing measures, and prizes. There is no single way of designing a successful incentive scheme or financial instrument - the use of public resources should be designed to ensure the most appropriate allocation of risk between actors. Successful programs and financial instruments, such as those reviewed in the preceding section, could be replicated and scaled up, while new approaches and financial instruments, including a broader range of risk mitigation instruments, could be piloted and evaluated.

*<u>Actions by domestic policy-makers/government agencies</u>*

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Policy-makers and government agencies have a critical role of fostering innovation, and of creating the policy and regulatory frameworks that incentivizes and supports the development, commercialization and diffusion of climate technologies. Governments not only fund RD&D, the riskiest aspect of technology development, but may also invest in the commercialization stage of climate technologies.

- Establish climate technology innovation policy framework.
- Establish policy and regulatory frameworks that incentivize climate technology adoption, reduce investment risk and provide price support where necessary.
- Create institutions supporting the integration of climate technology considerations in development and economic planning.
- Fund climate technology related RD&D and provide financial support during early commercialization.

*Actions by international stakeholders*

International public finance has a key role in covering incremental costs and in providing risk capital and risk mitigation instruments as well as providing technical assistance, capacity building and policy support for climate technologies.

*Donor community*

- Expand international support for revenue support instruments.
- Expand the availability of grant funding and of risk capital, e.g. through IFIs, bilateral cooperation and national development banks, including for adaptation technologies;
- Provide grant funding for technology demonstration/pilot projects; technical assistance, e.g. technical feasibility studies, and capacity building.
- Provide grant funding and seed capital for adaptation, and BOP innovation and technologies.
- Support collaborative RD&D.
- Expand the availability of financial instruments other than grant funding, including risk capital, concessional loans, guarantees and performance-based instruments.

*International Financial Institutions (IFIs)*

- Develop, pilot and expand the use of risk mitigation instruments tailored to climate technology investments.
- Catalyze VC/PE investment where appropriate.
- Establish dedicated climate technology funds for riskier investments, and for adaptation technologies.
- Create incentives and provide expertise resources for the integration of new and innovative climate technologies in investment projects.
- Act as an anchor investor for climate bonds.

*International organizations*

- Support climate technology capacity development, and knowledge sharing programmes.
- Support the development of bankable climate technology projects, including support for project developers and entrepreneurs, and testing of new business models.
- Act as connectors between technology, policy and investor communities.
- Provide policy support, including for innovation and RD&D policy.
- Support technical assistance, capacity building and technology demonstration projects.
- Provide climate technology financing readiness support.

*Private sector*

Private financial institutions, such as national and international banks and pension funds, play a key role in enhancing access to climate technology financing, including through the creation of innovative financing options. Companies generally invest where they see business opportunities, but both established

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companies and entrepreneurs can play a more proactive role in the development and deployment of new climate technologies.

- Develop and test new business models for adaptation and BOP technologies.
- Develop appropriate insurance, risk mitigation and loan products.
- Invest in and undertake RD&D of climate-friendly technologies, products and services.

**5. Highlights**

- Financing climate technology requires the combination of Long, Loud and Legal policy incentives , market facilitation and public finance.
- Public finance for climate technologies should be used efficiently through financial and/or other instruments that share risks, both real and perceived, between public and private actors, to catalyze investments in climate technologies
- Capacity building and support for national champions in each stage of the technology project cycle is important for effective climate technology financing and technology transfer
- Market development could be facilitated through providing information, data and business support for new entrants and business models.
- Wide, early and effective stakeholder engagement helps reduce risks and barriers to investment in relatively newer technologies.
- It is important to ensure an integrated approach between technology and climate finance related plans and programmes at national level, in particular the integration of TNAs with other relevant national and sectoral plans and programmes.
- Given the different criteria and evaluations of international climate finance and technology support, there is a need to enhance coherence between international institutions, in order to reduce the complexity of processes which developing countries have followed to request financing.

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**About the Technology Executive Committee**

The Technology Executive Committee (TEC) is the policy component of the Technology Mechanism, which was established by the Conference of the Parties in 2010 to facilitate the implementation of enhanced action on climate technology development and transfer. Along with the other component of the

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Technology Mechanism, the Climate Technology Centre and Network, the TEC is mandated to facilitate the effective implementation of the Technology Mechanism.

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