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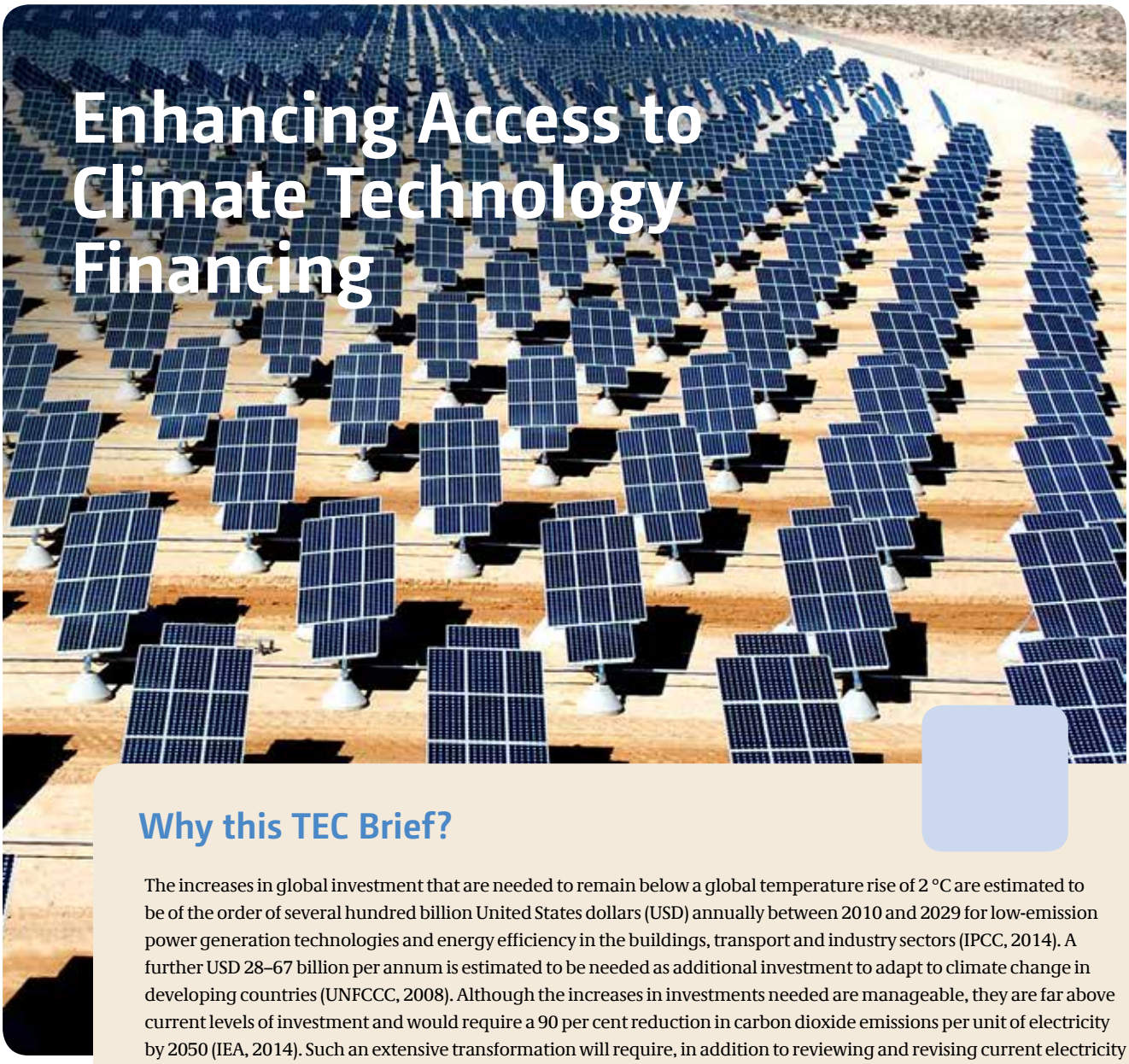

Enhancing Access to Climate Technology Financing

Why this TEC Brief?

The increases in global investment that are needed to remain below a global temperature rise of 2 °C are estimated to be of the order of several hundred billion United States dollars (USD) annually between 2010 and 2029 for low-emission power generation technologies and energy efficiency in the buildings, transport and industry sectors (IPCC, 2014). A further USD 28–67 billion per annum is 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 per cent reduction in carbon dioxide emissions per unit of electricity by 2050 (IEA, 2014). Such an extensive transformation will require, in addition to reviewing and revising current electricity production and consumption patterns, a massive deployment of currently available and new technologies, some of which are yet to be developed.

Accordingly, transition to a low-carbon and climate-resilient economy will require the scaling-up and mobilization of 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 plays a crucial role in catalysing the necessary low-cost and long-term private finance, in addressing the risks that the private sector is unable to take and in investing in the early stages of climate technology development.

The objective of this TEC Brief is to outline the challenges in financing climate technologies faced by developing countries, to review best practices and lessons learned, and to highlight the roles of different stakeholders in facilitating access to climate technology finance.

Highlights

- Financing climate technology requires a combination of 'long-lasting, 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 catalyse investments in climate technologies.
- Capacity-building and support for national champions at each stage of the technology project cycle are 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 the national level, in particular the integration of technology needs assessments with other relevant national and sectoral plans and programmes.
- Given the different criteria for 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 that developing countries have to follow to request financing.

1 Challenges and Risks of Financing Climate Technologies

CHALLENGES IN CLIMATE TECHNOLOGY FINANCING

Underinvestment in climate technologies primarily stems from their often unfavourable risk–return profiles, as a result of their higher economic and upfront capital costs compared to incumbent technologies and because of their higher risks. For technologies with negative abatement costs, misaligned incentives, intangible benefits, high transaction costs and lack of standardization in the quantification of energy savings and other benefits, in addition to the upfront capital costs, 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 creditworthiness, lack of guarantees and low availability of capital for public investment. An analysis of technology needs assessments (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; and 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 currently poorly covered by existing risk instruments. Instead, blended and concessional finances are often used to transfer some of the risk from the private to the public actors.

Whereas creating a favourable risk–return profile by mitigating risk and closing financial viability gaps are necessary conditions to attract private-sector finance, it is their 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 into. 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 jump-start 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 the 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 worth USD 1–20 million. 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 research, development and demonstration (RD&D) stage through to commercialization, and large-scale diffusion in new markets. Public finance and policy and targeted capacity-building efforts therefore remain key drivers of investment in low-carbon and climate-resilient technologies.

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2 Good Practices and Lessons Learned from Climate Technology Financing

Drawing on experiences with both established and more recent and innovative instruments, projects and programmes, the following section illustrates how different types of finance, both national and international, and support modalities can provide and facilitate access to financing for climate technologies, address risks and overcome barriers. A broader range of financing instruments is available for developed countries, while there are fewer options for least developed countries; hence, the available financial and risk instruments are country-specific (see figure 1).

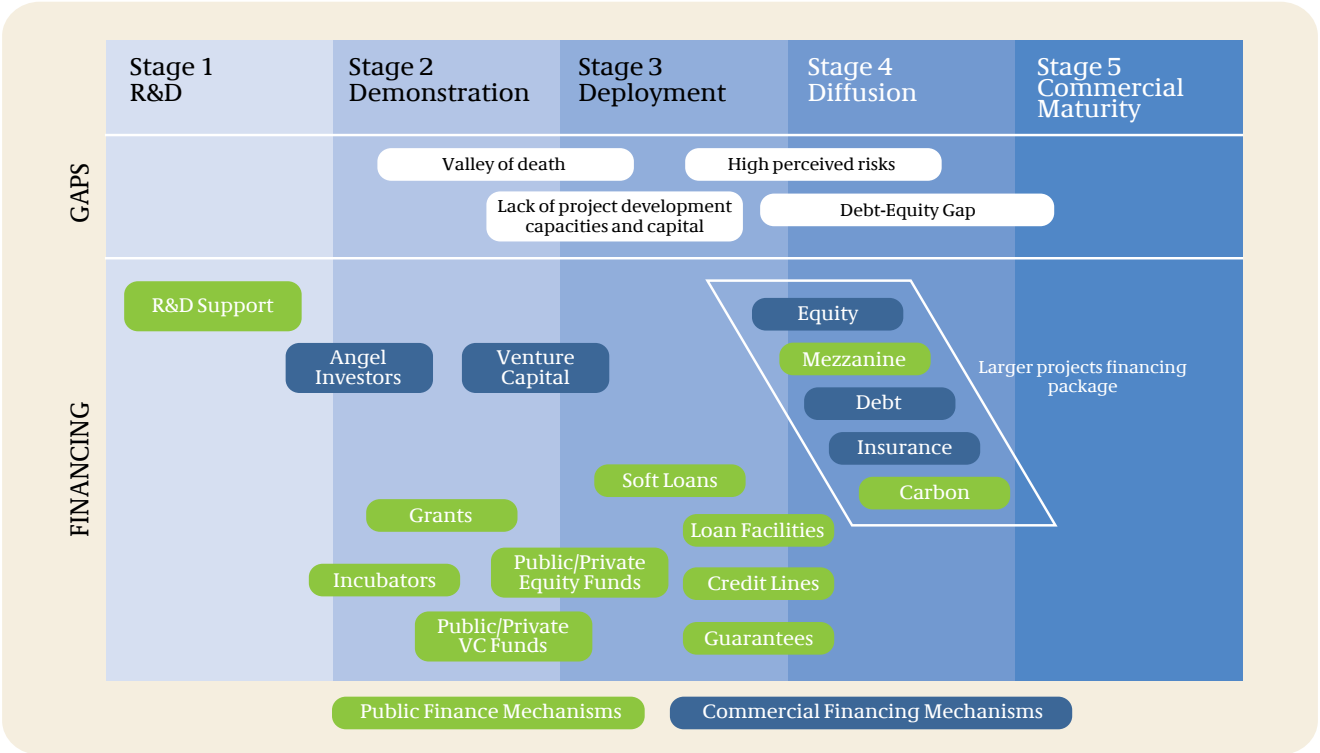
CREATING INVESTMENT OPPORTUNITIES THROUGH PRICE SUPPORT INSTRUMENTS

One of the most frequently used policy instruments for attracting private investment in climate technologies are feed-in-tariffs (FiTs). FiTs are specific to energy technologies and provide price support to increase return on investment. FiTs have historically placed considerable cost burdens on governments. To reduce these burdens, international support may be required. An example of sharing the additional cost of renewable energy between donors and the host country is the GET FiT programme led by KfW. The programme is designed to address key barriers confronting investors looking at potential investments in small renewable energy projects, with the main feature being 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 catalysing private-sector investment that 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 by both private and public investors, usually at concessional terms, with donors taking a subordinate position, thereby filling a gap in capital and mitigating risk. Grants can be blended in, further reducing the costs of debt and of risk mitigation, and

Figure 1: Positioning public finance instruments to address financing gaps in the technology cycle (Source: UNEP, 2008)



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) programme of the Clean Technology Fund. 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 costs of newer, less-advanced CSP technologies. Another example is the Climate Technology Initiative (CTI) Private Financing Advisory Network (PFAN) collaboration with REEEP to develop a new model for climate technology projects that 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 venture capital (VC)/ private equity (PE) funds to jump-start 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 the International Finance Corporation. The fund is unique in India by investing in early stage innovation in cleantech, which strongly overlaps with climate technologies. International financial institutions (IFIs) have started to invest in climate VC/PE funds, and to establish PE funds in partnership with donors and the private sector.

FINANCING BASE OF PYRAMID CLIMATE TECHNOLOGY PRODUCTS

Base of pyramid (BOP) innovation and financing of climate technology products remain 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 RESEARCH, DEVELOPMENT AND DEMONSTRATION

Publicly funded international RD&D targets underaddressed needs in areas and sectors that were 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 is an example of internationally funded RD&D of technologies that generate significant social and environmental benefits. The European Union's Horizon 2020 programme is an example of a regional research and innovation (R&I) programme that supports companies, in particular, innovative small- and medium-sized enterprises, 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 TECHNOLOGIES FOR ADAPTATION

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 potential mechanisms to complement grant-based funding for early stage adaptation technology solutions. Microfinance is another potential source of finance that could be tapped into 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.

Business models for 'climate proofing' infrastructure are hard to develop because of the challenge of monetizing the benefits, and because of the uncertainty and information gaps in 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 to build farmers' assets, thus reducing their climate risk vulnerability. 'Smart' agricultural and water technologies, including those that are information technology enabled, also offer opportunities for VC investors.

The diverse nature of technologies for adaptation and of the sectors and contexts in which they can be applied and integrated, in combination with the difficulties in 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 lack of bankable projects and the challenge of accessing finance for project and technology developers are being addressed by a range of programmes, including the Seed Capital Assistance Facility, 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 projects bankable by giving access to financial advisers who can advise on structuring projects and securing investment.

A key lesson learned 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 advisers early in the project development drastically increases the chances of successful capital raising.

3 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 risks to climate technology investments requires understanding of the specific risks, the capacity constraints and the 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 draw 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 method for designing a successful incentive scheme or financial instrument, and the use of public resources should be designed to ensure the most appropriate

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allocation of risk between actors. Successful programmes 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.

ACTIONS BY DOMESTIC POLICYMAKERS/ GOVERNMENT AGENCIES

Policymakers and government agencies have a critical role of fostering innovation, and of creating the policy and regulatory frameworks that incentivize and support the development, commercialization and diffusion of climate technologies. Governments not only fund RD&D, which is the riskiest aspect of technology development, but may also invest in the commercialization stage of climate technologies.

- Establish climate technology innovation policy frameworks.
- 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

- Develop, pilot and expand the use of risk mitigation instruments tailored to climate technology investments.
- Catalyse VC/PE investments 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 policies.
- 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 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.

Photo: "Windmill energy early in the morning" by minyucui is licensed under CC0 1.0

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Contact Details

The Technology Executive Committee may be contacted through the United Nations Climate Change Secretariat (UNFCCC):

Platz der Vereinten Nationen 1, 53113 Bonn, Germany
E-mail: tec@unfccc.int
Website: www.unfccc.int/ttclear/tec

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