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Innovative options for financing the development and transfer of technologies

Technical paper*

Summary

This technical paper provides an overview of issues relating to the topic of innovative financing for technology transfer related to climate change. It also includes an analysis of progress in the area of innovative financing, both in the public and private sectors, and a synthesis of successes and failures.

The paper argues that creating innovative options for financing the transfer of environmentally sound technologies implies finding new ways to 'connect' actors and interests, and not just designing or developing new financing products. An important aspect of this crossover between the financing community and the climate change community is the attention given to elements of financial viability which are at the core of many climate change projects. This paper elaborates on these developments and explores options, with cases and examples from mitigation and adaptation practice.

* This technical paper was commissioned by the secretariat of the United Nations Framework Convention on Climate Change and was prepared by Paul van Aalst of Tjasker Business Development and Financing, Amsterdam, the Netherlands. The paper does not necessarily reflect the views of the secretariat although in some instances the secretariat has introduced some changes, including those suggested by members of the Expert Group on Technology Transfer.

CONTENTS

I. Executive summary

1. Financing the transfer of environmentally sound technologies (ESTs) is an important element of the technology transfer process in the context of the United Nations Framework Convention on Climate Change. The climate change theme has become increasingly important in the financing community, public as well as private, particularly since the entry into force of the Kyoto Protocol in 2005 further generated substantial political and community support. Climate change projects have extras to offer to financiers: financial returns topped up with social, economic and environmental returns. The sum of these returns together with adequate cooperation between policymakers and financiers can trigger access to private and public capital, under hard or soft conditions, for the near term. First movers and pioneers have already started to open up new investment paths that will trigger sustainable investment flows. Such investments can be replicated and/or scaled up to generate larger projects, offering attractive commercial opportunities.

2. Creating innovative options for financing the transfer of ESTs implies finding new ways to 'connect' actors and interests, and not just designing or developing new financing products. Spurred, inter alia, by the dedicated workshops organized by the Expert Group on Technology Transfer (EGTT) and the secretariat, the climate change community and the financing community have begun to appreciate the opportunities of innovative financing to transfer ESTs. The main issue at hand was to find effective ways to connect both communities and, consequently, to develop a (new) type of cooperation that eventually will lead to a sustainable coalition for the financing of climate change projects. Technology development and transfer is at the heart of most climate change projects and is therefore a central theme that recurs in most finance discussions.

3. An important aspect of this crossover between the financing community and the climate change community is the attention given to elements of financial viability which are at the core of many climate change projects. These elements sometimes need to be unravelled, or refined. As a next step these elements need to be included in a project design that connects with traditional financing of projects. Examples include: linking climate change projects to other policy themes, such as energy security or rural development, in order to access additional financing sources; gradually scaling up project size to reduce the relative transaction costs, and extending the term of projects to allow the project to grow to maturity, with more time for cash flows to recover capital costs; or add-on investments with stronger commercial opportunities, which can increase the total return from the project.

4. This paper elaborates on these developments and explores options, with cases and examples from mitigation and adaptation practice. It also makes clear that opportunities exist. It is acknowledged, however, that the domain to be covered is vast and that, therefore, there will inevitably be gaps which will need to be covered by further work. Fully mainstreaming financing for sustainable climate change projects will indeed require more in-depth attention to several parallel themes. Continued capacity-building with financiers and policymakers is essential for creating enabling environments as well for introducing adequate fiscal frameworks that are crucial to continue the promising developments in providing adequate financing for climate change related technology transfer.

5. In preparing this paper the secretariat took into account suggestions from members of the EGTT.

II. Introduction

A. Mandate

6. The Conference of the Parties (COP), by its decision 4/CP.7, adopted the framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention contained in the annex to that decision (FCCC/CP/2001/13/Add.1). The framework covers five key themes and areas for action: technology needs and needs assessments; technology information; enabling environments; capacity-building; and mechanisms for technology transfer.

7. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its twenty-first session, endorsed the proposed work programme of the EGTT for 2005 (FCCC/SBSTA/2004/13). The programme includes an area of work related to innovative financing for the development and transfer of technologies (FCCC/SBSTA/2004/INF.17). In particular, it includes the preparation of a technical paper on innovative options for financing the development and transfer of technologies, drawing on, inter alia, the outcome of the UNFCCC workshop on innovative options for financing the development and transfer of technologies, held in Montreal in September 2004, and the background paper prepared by the secretariat for that workshop.

8. The EGTT, at its seventh meeting in May 2005, agreed to make the technical paper available to the SBSTA at its twenty-fourth session, to allow the SBSTA to incorporate the outcome of the follow-up workshop on innovative options for financing the results of the technology needs assessments (TNAs) held in Bonn in October 2005. The EGTT, at its ninth meeting in May 2006, reviewed the draft technical paper and decided to submit it for consideration by the SBSTA at its twenty-fifth session.

B. Scope of the paper

9. This technical paper was prepared on the basis of the terms of reference recommended by the EGTT at its special meeting in June 2005. It focuses on innovative options to finance the development and transfer of technologies under Article 4, paragraph 5, of the Convention. In preparing this paper the secretariat took into account suggestions from members of the EGTT.

10. At present, the transfer of technology in the context of the Convention is driven mainly by policymakers and climate experts. This paper therefore targets a broad audience of people with an interest in the financing of technology transfer related to climate change, but without a specific background in finance. The paper assumes that the most pressing goal of climate change experts is to implement projects while making efficient use of financing options. The connection of these experts with innovative financing is to create better access to financing from both public and private sources, at the right terms and conditions. Their role in developing better access to financing would be most effective if focused on two areas:

(a) Contributing to the project design and to the project development process to allow better access to financing;

(b) Communicating with financing professionals in the public and private sectors to explore the benefits of cooperation at an early stage.

11. The paper therefore intends to present a framework to assist policymakers and project developers in the climate change area in fulfilling this role.

12. This paper aims to:

(a) Highlight the issues surrounding the topic of innovative financing for technology transfer related to climate change;

(b) Analyse progress in the area of innovative financing, both in the public and private sectors and synthesize successes and, to the extent possible, failures;

(c) Present conclusions and suggest steps that may be taken for further analysis on the subject.

13. The paper does not intend to develop financing expertise for climate change experts[1], nor does it provide an exhaustive overview of the increasing range of public and/or private mechanisms that are available or emerging for funding the development and transfer of technologies. The increasing interest from financiers in the climate change agenda sanctions this approach, indicating that there is a need to build a bridge between the financing community and the climate change community rather than to develop a new curriculum such as climate change financing. This technical paper intends, however, to also serve as input to the work of the EGTT, taking into consideration the following:

(a) The background paper "Innovative options for financing the development and transfer of technologies in the context of the UNFCCC", which was prepared for the workshop held in Montreal in September 2004;[2]

(b) Background material outlining experiences on innovative financing for the development and transfer of technologies has been used and linked with the UNFCCC;

(c) The outcomes of the UNFCCC workshops on innovative financing held in Montreal in September 2004 and in Bonn in October 2005 have been valuable resources in setting out the scope of this paper;

(d) Existing initiatives in different contexts, for example the Global Environment Facility (GEF), the World Bank, the Montreal Protocol on Substances that Deplete the Ozone Layer, the European Commission, the United Nations Environment Programme Sustainable Energy Finance Initiative (UNEP - SEFI) and others have been used and, wherever possible, are explicitly referenced;

(e) The EGTT Practitioners' Guide for preparing project proposals, being developed in parallel with this paper;

(f) Mitigation and adaptation technologies have obtained equal attention, to the extent possible;

(g) Opportunities generated by ongoing activities in the UNFCCC process, such as the clean development mechanism (CDM) and Joint Implementation (JI), and the results of technology needs assessments (TNAs) and initiatives such as carbon funds have been used and, wherever possible, explicitly referenced.

[1] These issues will be discussed in more detail in the "Guidebook on preparing technology transfer projects for financing" which is being developed by the EGTT and will be launched at the twelfth session of the Conference of the Parties.

[2] <http://ttclear.unfccc.int/ttclear/jsp/index.jsp?mainFrame=../html/WshpMontrealPresentations.html>.

III. Transfer of technologies in the context of the Convention

14. This chapter describes the links between innovative financing with the current technology transfer framework under the Convention.

A. Past and current activities on innovative financing under the work programme of the Expert Group on Technology Transfer

15. The need for the EGTT to become involved in innovative financing is based on the need to improve access to financing from a wide variety of available sources, in order to realize the increasing number of technology transfer projects, given the limited capacity of public financing sources. Increasing awareness of the need for and the opportunities provided by the enabling policy frameworks that are emerging to invest in climate change mitigation and adaptation, however, potentially improves access to private funding. It is therefore useful and necessary to explore which innovative approaches and financing mechanisms can be used to enhance access to the available sources of financing.

16. In order to meet the ultimate objective of the Convention to achieve stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, a profound transformation of the global economy is required. This will require widespread use of existing environmentally sound technologies, as well as new 'transformative' ones, to simultaneously achieve the global climate change goals and the broader set of sustainable development objectives, including the eradication of poverty. For example, the International Energy Agency (IEA) has estimated that, based on its business-as-usual scenario, USD 16 trillion in new investments in the global energy supply infrastructure alone would be required between 2001 and 2030. Almost 60 per cent of these investments would occur in developing countries and economies in transition which continue to face considerable challenges in attracting private sector funding. The magnitude of these investments far exceeds the financial capacity of public sources of funding. In order to attract the needed investment flows from international markets and to guide them to sustainable solutions, governments must provide a clear and predictable playing field on which markets can operate and also develop more innovative financing approaches that significantly increase the leverage of public funds.

17. Under the "enabling environments" theme of the framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention (decision 4/CP.7), the EGTT discussed barriers to enhancing financing for technology transfer to developing countries. These barriers, as well as the scale of the above-mentioned investment challenge, prompted the EGTT, in conjunction with the secretariat and representatives of the Global Environmental Facility (GEF) and the United Nations Environment Programme (UNEP), to initiate discussions on innovative options for financing the development and transfer of technologies.

18. The work programme of the EGTT for 2004 provided for a specific area of activity relating to innovative financing, aimed to initiate discussion among EGTT members, Parties, intergovernmental organizations (IGOs) and NGOs on the issue of innovative financing for the development and transfer of technologies in the UNFCCC context. Since then a number of activities have been organized in this area by the EGTT.

19. These discussions led to the UNFCCC workshop on innovative options to finance the development and transfer of technologies held in Montreal in September 2004, hosted by Canada, which offered the first forum at which the subject of innovative financing was discussed in the context of Article 4, paragraph 5, of the Convention and to engage private sector financiers. The workshop focused on possible and actual innovative financing situations and experiences from the public and private sectors. The engagement of the private sector and the willingness to continue strengthening cooperation between governments and the private sector was viewed as critical to the success of the workshop. A key

outcome was increased awareness of the importance of understanding and managing risks, as (perceived) risks were directly linked to the return on investment (ROI) required by the private sector. Governments, in particular those in investors' host countries, could reduce investment risks and stimulate project development, inter alia, by providing a sound enabling environment.

20. Some participants at the workshop noted that, although progress was made in creating a common understanding among the various stakeholders, several outstanding issues remained to be tackled. For example, some participants suggested the adoption of a broader interpretation of Article 4, paragraph 5, in order to move beyond "the climate change cluster" and consider wider sustainable development benefits. One option is to focus on public–private partnerships in the context of Article 4, paragraph 5, reiterating the fact that developing countries need assistance in preparing projects to make them more attractive to investors. In this regard, the need to make project development tools available to project developers was stressed.

21. The background paper prepared for the workshop covers some key concepts regarding the financing of technology transfer, which can be used as ingredients when creating particular financing menus. It concludes that many of these concepts can be applied in the financing of development and transfer of technologies relating to climate change, thus creating new opportunities. Some financing instruments and models already applied in conventional technology transfer appear to offer additional financing opportunities when slightly altered to finance development and transfer of technologies under the Convention. How this can be done, and has been done, is illustrated by a number of financing models and mechanisms relating to climate change.

22. The background paper concluded by providing some guidelines to improve access to financing for technology transfer relating to climate change, which will be presented in more detail in this paper:

(a) Look for added value for particular stakeholders and specify and quantify, as much as possible, the benefits and revenues for stakeholders;

(b) Link the climate change theme to other themes (e.g. resource conservation, poverty alleviation and sustainable development in general) to improve the economic or financial sustainability of a project;

(c) Enact an effective policy framework which is stable and sustainable in order to reflect financing horizons, legally established with binding targets that reflect the long life of capital-intensive projects and which are communicated properly.

23. The workshop on innovative options for financing the results of the TNAs, held in Bonn in 2005, was the next step in this process, demonstrating the progress made since the first workshop held in Montreal. Various projects identified from TNAs and other sources were presented by the participants and commented on by financing experts. The projects were from different sectors and in various stages of preparation. All projects demonstrated opportunities to benefit from the exchange of views with the finance sector, indicating that there are lessons to learn on both sides. Suggestions were made on project design, institutional context and financial engineering, all indicating improved access to financing largely within the existing context of financing.[3]

24. Both workshops indicated the need for **tool kits and handbooks** on innovative/non-innovative financing of technology transfer projects to improve project preparation and assessment in order to ensure that they meet international standards. The EGTT work plan for 2006 includes the development of a Practitioners' Guide to assist project developers in developing countries in preparing project proposals to satisfy this need.

[3] The report of the workshop is contained in document FCCC/SBSTA/2006/3.

B. Technology needs assessments

25. TNAs, as defined in the framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention, aim to identify and analyse priority technology needs of developing countries. TNAs are an important instrument to determine the priorities for building a portfolio of environmentally sound technologies (EST) projects and for programmes to facilitate the transfer of know-how.

26. TNAs in the UNFCCC context are also an important basis to access modern financing for climate change related technology transfer for a number of reasons. First, the technology priorities resulting from a TNA embed technologies into a policy context at the national and international level. The bridge to financing therein is that most investment projects require robust policy environments to satisfy financiers. Only adequate linkage between the results of a TNA and efforts in the public domain can lead to enhanced access to financing. For example, when wind energy or hydropower are identified as priority technologies in the TNA, an appropriate regulatory framework for long-term power purchase agreements can be justified as a policy priority. Such linkages between technology and policy priorities should be clearly identified in the TNA, and financiers and other stakeholders should be involved. The output of a TNA should allow the identification of key private and public actors for next steps. With such elements included in a TNA, wider public and private support to actually move prioritized technologies on to implementation can be obtained. For example, it could help financiers to accept longer financing terms to realize projects which require a long stable period of public support (often up to 15 years).

27. Second, TNAs can contribute to establishing a market-based, demand-driven investment climate. When 'needs' defined in the TNA combine climate change or other policy-related technology needs with actual demand factors, such as energy-use forecasts with an indication of ability to pay by households and industries, the TNA becomes a useful reference document for private and public financiers. Another market-stimulating element in TNAs could be to relate climate change technology needs with business sectors and priority policy areas (e.g. rural development or agriculture) where these technologies generate an economic effect. After all, economic growth generates income and part of this income can be used for financing purposes (taxes for the public sector, net income for households, and reinvestment for businesses).

C. Capacity-building

28. The purpose of capacity-building, as defined in the framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention, is to strengthen the capacities of developing countries to promote the widespread dissemination, application and development of EST and know-how. The initial scope of the needs and areas for capacity-building directly linked to financing are, inter alia:

(a) Enhancement of the awareness of financial institutions (public, private and international) of the need to evaluate EST on an equal footing with other technology options;

(b) Training in project development and the management and operation of climate technologies.

29. The need for capacity-building in these particular areas was highlighted during the two UNFCCC workshops held in 2004 and 2005, respectively.

30. Building capacity at all levels is an accepted feature for most transfers of technologies. To increase access to modern or innovative financing, capacity-building is also an issue of great importance. The capacity that is lacking is often about how to 'translate' technology transfer projects into the

assessment framework used by financiers. Financiers have rather general financing principles which apply to their work. In their view it is the role of a project developer to present the strengths and opportunities of projects in such a way that they interest financiers. Consequently, the focus in training financiers and project developers in the specifics of climate change projects would be on exploring how these projects could fit into that framework. At the same time, financing related capacity-building for climate change experts could be about explaining what drives financiers and how best to match technology transfer projects with financing criteria. With this background, the needs for capacity-building to improve access to financing can be determined.

1. Capacity-building at national level

31. The relevant needs would typically include exploring the match between technology transfer and policy priorities in the sectors concerned, to ensure that the transfer leads to sustainable implementation. Another need at this level is how to create and maintain an adequate regulatory and legal framework, as an important precondition for blending financing from public and private sources.

2. Capacity-building at sectoral level

32. The focus should be on fine-tuning the needs of implementers with those of financiers. Business development services and advisory services may be needed to ensure that sufficient promoters and project developers become active and create a critical mass of projects for market development. Crossovers between sectors have to be developed. For example, developing a wind-powered irrigation system may require changes in the use of crops or harvesting methods. Optimal financing for both projects can be obtained only through a good fit between the two.

3. Capacity-building at project level

33. Project developers require specific skills to prepare proposals that meet international standards. Strengthening these skills in order to improve access to financing should be one of the priorities, as indicated by the second UNFCCC workshop on innovative financing. At project level, capacity-building might also need to focus on implementation skills required to ensure that the financing, once provided, leads to the envisaged results, taking into account proper reporting and monitoring procedures.

34. These and other elements of capacity-building provide the groundwork for improved access to financing. They are also included in the project development cycle, which is presented as an implementation framework in chapter IV.

D. Enabling environments

35. The enabling environment component of the technology transfer framework focuses on government actions to create an environment conducive to technology transfer by private and public actors. An enabling environment aims to improve the effectiveness of the transfer of EST by facilitating its transfer, for example by identifying and removing barriers at each stage of the process.

36. Document FCCC/TP/2003/2 summarizes some common aspects of barriers to, and enabling environments for, technology transfer. The Intergovernmental Panel on Climate Change (IPCC), for instance, indicates that government actions are needed to improve the enabling environment for both 'market' and 'non-market' technology transfer.[4] In a broad sense, these terms could also be used to describe the main difference between the mitigation and adaptation sectors. The energy, industry and transport sectors are the mitigation sectors most dependent on market forces, whereas sectors such as

[4] Intergovernmental Panel on Climate Change (IPCC). 2000. Methodological and Technological Issues in Technology Transfer. Cambridge University Press, United Kingdom. <http://www.grida.no/climate/ipcc/tectran/001.htm>.

coastal adaptation and public health are less dependent on market forces. Although this points to the need for market-based instruments in the energy-intensive mitigation sectors, it does not change the crucial role that international public financial support and the leveraging of available resources can play in stimulating markets.

37. An enabling environment usually refers to facilitating the work of *others*. However, this paper assumes that extensive *cooperation* between policymakers, implementers and financiers is what is needed to improve access to financing for technology transfer projects. The key elements of an enabling environment needed to optimize this cooperation are summarized below. These key elements were stipulated by financiers in the renewable energy market, facilitated by networks such as Basel Agency for Sustainable Energy (BASE), World Business Council on Sustainable Development (WBCSD) and Renewable Energy and Energy Efficiency Partnership (REEEP), when preparing for the 2004 Bonn Conference for Renewable Energies, where the crossover between the public and private domains was a dominant issue. This crossover also applies beyond renewable energy to the wider context of the climate change agenda.

38. In line with a recent statement in this respect,[5] the requirements for a proper enabling environment are generally summarized as:

(a) **Long:** Rules and incentives need to be stable and sustained for a duration that reflects the financing horizons of the projects, especially for large energy-infrastructure projects with considerable initial capital costs;

(b) **Loud:** The signal to the market needs to be loud and clear to attract capital into the sector; policy priorities and plans have to be clear and robust to enable market partners, such as financiers, to join the long-term effort required to realize climate change related technology transfer;

(c) **Legal:** A legally established regulatory framework based on binding targets or implementation mechanisms is needed to provide the basis for long-life capital-intensive investments.

39. Implementing technology transfer projects can contribute to creating such an enabling environment. Projects designed to clearly present the benefits for private and public stakeholders can act as change agents which allow the building up of experience through 'learning by doing'. In fact, the wider range of socio-economic and environmental benefits substantiates the public need for these projects and builds the case for a robust (long, loud, legal) enabling framework supporting the realization of financial returns. Such a project-driven, bottom-up approach can achieve results better and more quickly because of the smaller scale and limited bureaucracy.

40. However, this does not preclude the importance of proactive government action to create proper enabling environments to accelerate technology transfer. In a perfect world, the right policies would first be put in place, followed by orderly project implementation. For now, we need to recognize that there is a constructive-neutral-destructive relationship between policies and project implementation. It needs to be shown that these positive and negative factors can be managed. Getting the policies right requires good projects. Getting projects right requires good policies. The process is iterative.[6]

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[5] Statement prepared by BASE, WBCSD and REEEP for the 2004 Bonn Conference for Renewable Energies <www.reeep.org/media/downloadable_documents/o/a/Financial%20Sector%20Policy%20Statement%20for%20Bonn.pdf> .

[6] UNFCCC. 2006. Preparing and presenting proposals – a guidebook on preparing technology transfer projects for financing.

IV. Financing context for climate change

A. Framework for innovation and implementation

41. Policymakers, project developers and financiers often use their own specific approaches for the financing of climate change related technology transfer.[7] This paper tries to connect these approaches in order to improve access to financing by using existing financing instruments wherever possible.

42. Traditional technology transfer (not specifically climate change related) often has the following characteristics:

(a) Features the newness of the technology but does not balance the risk of the unproven with the comfort of lessons incorporated;

(b) Focus on technology (input) and not so much on potential benefits (outputs);

(c) Project emphasis with limited attention to scaling up, replication and continuity;

(d) Public needs prevail over possible benefits of private-sector involvement;

(e) Suffers from late exposure to the outside world, including financial advisors.

43. This paper assumes that, currently, financing for climate change related technology transfer often comes from public resources related to 'climate change' or to 'technology transfer'. In this context, the paper will present mechanisms to improve access to other sources of public financing and to create linkages to private-sector financing.

44. In many cases there may be options to improve access to financing by adjusting the process and the framework of project development, without necessarily creating completely new financing instruments. In that sense, the 'innovative options' will focus on 'new combinations' of existing instruments and resources rather than on 'inventions'.[8] In other words, an important assumption in this paper is that access to financing can often be improved by including an explicit and clear financing context into the project design and by encouraging cooperation at an early stage between policymakers, project developers and the financing sector.

45. The innovative elements in creating better access have a strong implementation character, as they are related to the integration of the agendas of policymakers, project developers and financiers. These agendas differ on the national, sectoral and project levels. Therefore it is important to present a framework for implementation that includes these three levels and illustrates the process from policymaking to project implementation in a pragmatic way.

46. The project development cycle (PDC) is a proven overall framework for project development, applicable in most sectors. The framework allows an analysis of the various stages of the project while linking them to the general policy level. It therefore serves the purpose of this paper, which is to cover the wider scope of technology transfer and not just at the project level. The instruments and mechanisms presented in this paper can be implemented along the lines of the phases in the PDC.

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[7] Lindlein. P., Mostert., W., 2005. Financing Instruments for Renewable Energy, Kreditanstalt fur Wiederaufbau (KfW).

[8] Joseph A. Schumpeter (1883-1950) gave meaning to the current interpretation of the word 'innovation' by explaining that technical and organizational innovation is more about new combinations of existing resources than about new technical inventions. He also made it clear that, next to the inventor, another person is needed, currently often referred to as the 'process owner' or 'champion', who leads the innovation through process to completion.

Table 1: Financing issues in the project development cycle

Project development phase	Theme / issue involved	Financing issues
1. Overall strategy	Country level implementation plan: e.g.: • Extra power plant • Irrigation programme • Long term agricultural adaptation • Energy-efficiency programme	• What is the legal and regulatory framework • Which multilateral programmes apply • How much lead-time is needed to change the current situation.
2. Sector strategy	• How much energy is needed in the planning period and who will be the purchasers. • Where can cross over to other sectors occur	• Which cash flows are generated and how can they be used for financing • How can leverage for financiers (public and private) be increased • Which multilateral sector programmes apply
3. Pre-feasibility study (desk and field)	• Criteria for ranking projects • Do we build new (risky but modern) or retrofit existing ones (efficient but less effective)	• What is the risk profile of the potential projects from the financiers' point of view • How can risk mitigating factors be built into the project design
4. Feasibility study	• Ownership and capacity-building at the individual project level • Identify potential project partners • In-depth financial and technical analysis	• Who is/are the stakeholders that can make-or-break the project, and how can they be involved • Which public and private actors have a specific interest in project results with a link to financing opportunities
5. Key decision	• Decision-parameters should include financing • (Pre-) select the contract-partners • Adequate financing based on explicit criteria should be a condition precedent to final decision	• Financing process should be balanced with legal procedures: timing and interrelations • Government and other public actors can already take the lead in preparing the necessary rules to allocate adequate budgets
6. Pre-implementation	• Finalize financing in every aspect (contracting, disbursement procedures) • Arrange the internal competences to finance the project(s), e.g. cooperation with other (public) partners • Prepare the tender procedure	• Explore which financing actors will eventually be prepared to join • Explicitly specify the financial, economic, social and environmental benefits • Allocate portions of the project to individual actors and check if appropriate
7. Implementation	• Ensure proper risk management • Develop alternatives for critical problems	• Bring all financing into one basket • Manage the process of dividing the risks, returns and securities evenly among the financiers
8. Evaluation	• Compare results with prior objectives • Specify lessons learned • Decide on possible follow-up projects	• Pre-arrange the terms of reference for follow-up projects • Loans repaid • Equity paid back with agreed financial return

47. Some of the key benefits of using the PDC as an overall framework are as follows:

(a) **Identification and involvement of potential financiers:** Using the PDC helps policymakers, project developers and financiers in listing critical issues and in making explicit assumptions. This facilitates the exchange of information and supports the involvement of specific financiers at an early-stage . Early involvement of financiers can lead to changes in the original project design, which should become clear early in the project development process;

(b) **Inclusion of financing in the critical time path:** The PDC can be used to determine the critical time path, indicating the timing of critical actions and interventions. This is especially relevant when dealing with financing issues that relate to the enabling

environment outside the direct scope of a project, such as regulatory reforms and privatization. Thus, procedures can be initiated in time and resources can be deployed efficiently;

(c) **Monitoring and evaluation:** The PDC is a good instrument for monitoring and evaluating the progress of a project. It is an adequate mechanism to identify lessons learnt and to indicate improvements for scaling up or replicating projects.

1. Implementation via the project development cycle

48. Given the context set out above, paragraphs 49 to 56 describe the financing issues related to climate change related technology transfer by referring to the different phases in the PDC (see table 1).

49. The **overall strategy** in the first phase of the PDC typically deals with long-term issues and cross-sectoral planning. The concept of concessions in the water and electricity sector, for example, requires a legal structure that allows for private ownership of utility investments. Private-sector involvement also requires an independent regulatory body to supervise arrangements between the public and private sectors. It takes a long period of preparation to realize these structural changes, which are crucial to optimize access to financing. Furthermore this is the time to integrate new multilateral financing programmes into the project design, considering the long lead time of these programmes and the need to embed them into broader government policy.

50. The **sectoral strategy** in the second phase of the PDC pertains to strategic issues at the sectoral level. For example, irrigation projects generate cash flows that farmers can partly use to contribute to the costs of financing. To optimize the use of this cash flow for the financing options of the irrigation project, these cash flows have to be identified at an early stage and used to generate support from farmers' associations and financiers. Another example is the use of solar electrification for productive use, for which farmers, fisher folk or their cooperatives need to access a financing scheme. Developing the fundamentals of such a scheme and bringing farmers, banks, and other stakeholders together is a typical issue to address at this stage. In both examples it might be possible to benefit from multilateral programmes at the sectoral level (financing, agriculture, rural development).

51. The **pre-feasibility study** in the third phase focuses on addressing the opportunities and limitations created in the two previous phases. This could imply facilitating cooperation between the financing sector and other stakeholders and to align priorities and principles. Financiers, for example, might have a preference for smaller, easier-to-implement projects in the first phase (or the short term) and larger ones for the second phase, whereas from a climate change standpoint, larger projects might be desired from the start. Another element to include in this phase is the lessons learnt from other similar projects that could serve as risk mitigation by illustrating the business-as-usual character rather than the first-time character of the new projects. Finally, this could be the phase in which financing experts are involved in setting the general design of the financing structure.

52. The **feasibility study** in the fourth phase of the PDC is mainly about integrating the various elements from the initial phases. In the case of additional cash flows identified earlier, for example, these should now be put into a financial model. Biogas projects, for example, can lead to increased productive income as well as to a reduced energy bill for the farmer. In this phase the exact numbers need to be determined and translated into the need for additional access to financing, and the support of all stakeholders secured. To what extent are the end users benefiting from a project and does that increase their ability and willingness to pay? What capacity-building is required to implement the plan?

53. In the **key decision** in the fifth phase, the linkage with access to financing is mostly about ensuring that the elements introduced during earlier phases are included in the decision-making process. When public and private financing are to be blended, public financing may be available prior to private

financing, and financial engineering[9] is needed to secure an optimal balance between the two. The terms for private-sector financing should now be explored and external advisors could be hired for an independent review of the financing options.

54. In the **pre-implementation** phase, preliminary rights can be granted to selected financiers to involve them in a legally binding way and to compare quotations or jointly develop the most adequate financing structure. The combined financial, economic, social and environmental benefits of a project can now be allocated to individual financiers and informal meetings arranged to better understand the opportunities on both sides. The shortlist of options can be reduced to preliminary commitments from public and private financiers and from project developers.

55. During the seventh phase, **implementation** issues are the main area of concern. This often implies executing and managing a complex process of disbursement and dealing with a number of unforeseen issues. Currency ratios in international financing may fluctuate outside of a pre-agreed range and financing is blocked or minority financiers may demand extra rights. Most financiers have monitoring systems in place to ensure that final commitment and disbursement advance along pre-agreed milestones. Managing these milestones is crucial to execute the project adequately and to generate reassurances for follow-up projects.

56. The **evaluation** phase assesses whether the results of the (first) project meet expectations. This lays the groundwork for the financing of follow-up projects which could be larger or more complicated, as basic credibility has been established.

B. Types of projects to be financed

57. Technologies for mitigation of climate change can be classified by sector, and energy, agriculture and forestry are key sectors in determining the level of GHG emissions. Important measures to mitigate climate change include increasing energy efficiency, developing renewable energy technologies, reducing emission levels in the transport sector, mitigating emissions from the agricultural sector, building markets for ESTs, and facilitating investment and trade.

58. The scope of technologies for adaptation to climate change is larger. Such technologies range from building design and construction to changes in agricultural practices and approaches to coastal zone management. The process of adaptation relates to the impacts of climate change which will impinge on collective goods and systems, such as food and water security, biodiversity and human health and safety.

59. Climate change is expected to have negative impacts on agriculture, forest lands, human health and coastal zones. The strongest and most direct incentives to adapt to these impacts are usually found within the public sector. Public interventions were the catalyst for the use and transfer of technologies for adaptation worldwide, which were only later taken up by the private sector. In that context, governments are generally considered the dominant stakeholder in technology transfer for adaptation.

60. The following characteristics distinguish adaptation from mitigation. They also represent a barrier to the transfer of technologies for adaptation:

(a) Uncertainty about the location, rate and magnitude of impacts is considerable, which hampers effective anticipatory adaptation and complicates early-stage private-sector intervention;

[9] Financial engineering involves the development and application of financial theory and financial instruments to structure solutions to complex financial problems and to exploit financial opportunities.

(b) Adaptation as such is often not considered a development objective. Cross-linkages with other sectors can be instrumental in improving access to public and private financing;

(c) Technologies for adaptation will often be initiated for site-specific reasons and keeping local conditions in mind. However, design and implementation can be structured by taking into account lessons learnt from similar situations elsewhere;

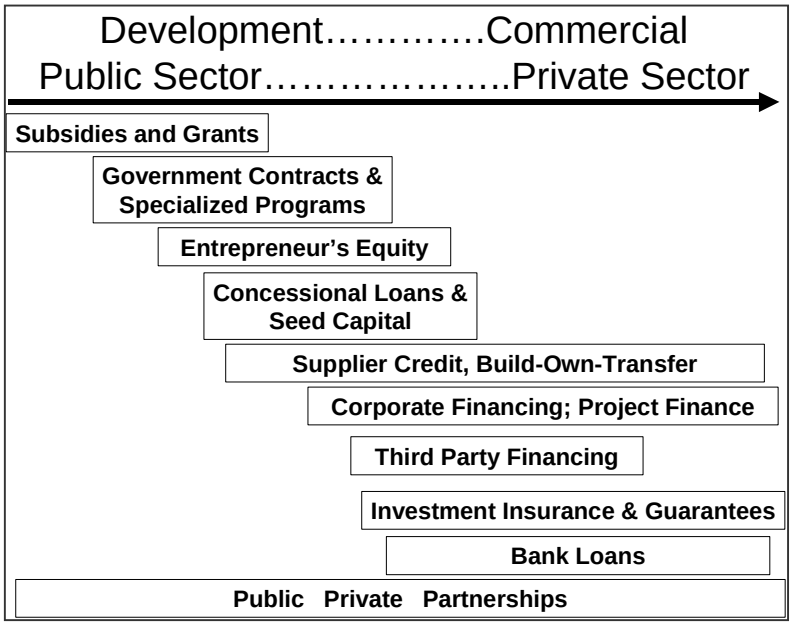
(d) The direct benefits of adaptation, such as crops suited to more arid conditions, are primarily local, as opposed to the direct benefits of mitigation, such as avoided emissions, which are global.

C. General financing instruments for technology transfer

61. A useful framework to classify general financing instruments for technology transfer is the so-called financing continuum.[10] It was developed particularly for small and medium enterprises (SMEs) and has been adjusted to incorporate financing instruments for project development in technology transfer. Obviously the continuum presents a general case, and in practice not every project or enterprise will have to go through every step.

62. The continuum shows various financing instruments and indicates that public-sector funding is often used for the development elements of projects and that private-sector funding is used mostly for the commercial elements (see figure 1). The overlapping boxes indicate that several forms of financing can be used simultaneously in one project or enterprise. Given the often long lead times for obtaining adequate financing, the continuum can assist in considering the total financing package at an early stage of the PDC.

Figure 1: The financing continuum



Note: Adapted from the original by E+Co <http://www.energyhouse.com>.

[10] The financing continuum refers to the supply chain of finance needed to move from project development to commercial reality.

63. The instruments will be described in subsequent paragraphs and linked to climate change related technology transfer. Neither the continuum nor this paper is intended to provide a comprehensive overview of general financing instruments. Instead they indicate how access to financing can be improved by using some of the most common financing instruments.[11]

1. Subsidies and grants

64. Grants and subsidies are general instruments frequently used in the financing of technology transfer and development, in climate change or elsewhere. More recently the concept of 'smart subsidies' has become accepted to apply subsidies properly. Smart subsidies and grants are those used for specific purposes, for which no other funding is available and with clear deliverables, including non-disturbance of market mechanisms. Grants and subsidies are amongst the most scarce (public) goods and are crucial for those elements of projects where no other (private) financing is available. They can be used to attract private financing under the condition that the balance of the funding is secured before the subsidy is disbursed, for example by subsidizing specific costs that prevent a project from becoming financially viable. Subsidies could also serve as an incentive to extend a project to specific target groups or to an area that is less attractive from a financial point of view.

2. Government contracts and specialized programmes

65. Government contracts and specialized programmes are specific forms of subsidies, applicable when technology transfer fits into a wider set of public priorities, initiated usually by a government or other public institution. They can build on the results of earlier subsidized programmes from the pioneering phase and focus on scaling up or replicating these results.

3. Entrepreneur's equity

66. In SMEs, the entrepreneur's personal cash contribution to the company capital is called equity. In many cases this equity is required as a sign of commitment and a precondition to other forms of financing, especially loans (or, in jargon, debt financing), but increasingly also for subsidies, as even a small amount of 'my own money at risk' increases the determination to be creative and dedicated to achieve the goals.

4. Concessional loans and seed financing

67. A concessional loan implies providing a loan with a high default risk. It is typically applied in the preparatory or pioneering phase of implementation when more advanced forms of financing are not yet appropriate, given the specific but uncertain outcome of that phase. In the case of SMEs, this is also called seed financing. Seed financing or concessional loans can overcome the hurdle of access to financing at a moderate risk per project. If used properly, only some projects will fail and the overall risk to the financier will be acceptable. In some cases additional features can be added to the loan, such as no interest charged or repayment required only if the project is successful.

Case: Seed capital

68. A dealer of solar home systems in Africa starts up his company. External capital is needed to buy a stock of solar home systems. The dealer has no experience and no clients so far. The business plan is sound and the projections show that the company will be profitable after two years. A regular loan from a local bank may not be available, as this is a first-time venture for the entrepreneur; the region

[11] A more comprehensive overview of financing instruments can be found in: Intergovernmental Panel on Climate Change (IPCC). 2000. Methodological and Technological Issues in Technology Transfer. Cambridge University Press, United Kingdom. <http://www.grida.no/climate/ipcc/tectran/001.htm>.

has no experience with solar home systems; and the role of the government is unclear. Seed capital, provided by a specialized financing institution or an informal investor, can be a financing option, if it is disbursed in portions on the basis of clear milestones to avoid extra risks. Once this seed capital has been used, a bank loan may be easier to obtain for the remaining financing needs, as meanwhile the entrepreneur will have created an operational track record; the seed capital investor can help to convince the bank; and the seed capital itself forms a buffer for the bank loan, as its repayment will be subordinated and deferred relative to the instalments of the bank loan.

5. Build–own–transfer

69. Build-own-transfer (BOT) financing is applied mostly in public infrastructure projects when governments have no or only limited capacity to finance a project expected to generate a cash flow that can pay suppliers or the operating company. The form of a concession is sometimes found appropriate to structure a BOT transaction. After a specific period, when the project costs have been repaid (with an appropriate ROI) from sales proceeds, the ownership of the equipment is transferred to the government. An important feature in BOT projects is that the builder/project developer is motivated to complete the project on time and within budget.

6. Project finance and corporate finance

70. In corporate finance all assets of a company (or corporation), including shareholder capital, serve as security to the financier. If the company cannot repay its debts, the financier has the right to use all these assets to cover the loss. Larger companies and international corporations can use their assets as collateral to obtain additional debt financing in the form of loans and other financial instruments. Different corporations have different optimal ratios of debt to equity which are determined by internal as well as external circumstances. The process of achieving this balance between debt and equity is known as corporate finance.

71. In project finance, specific investments may be set aside by a company (e.g. a manufacturer of biomass turbines) in a subsidiary (the company that actually operates a biomass plant). Financiers put their money in the subsidiary and have no claims to the parent company in case of default. Thus financiers can focus on one biomass plant and are not concerned with other plants (in which they may not be involved) or with other activities of the parent company (which they may not be interested in). Another advantage is that it increases the company's appetite to operate multiple projects, as its risks are clearly limited to the specific project.

7. Third-party financing

72. In third-party financing (TPF), the use of equipment is financed entirely by a third party, without capital from the equipment seller, the end user, the housing company or the industrial user. The financier will request the guarantees of suppliers or manufacturers for adequate servicing and maintenance to ensure proper functioning of the equipment. The user or beneficiary pays the financier regularly, usually through a lease, an amount related to the value of the energy savings or the energy generated. TPF is appropriate where cash flows are used to repay equipment leases in cases where standard equipment is used (with proven technologies) and in stable market environments.

8. Export credit agencies

73. Export credit agencies (ECAs) facilitate the financing of international trade transactions by offering guarantees against specific risks to (mostly private) parties. Most ECAs run special programmes financed by governments to guarantee against specific risks related to projects with high political relevance. ECAs typically play a role in longer-lasting, large-scale projects where limited currency risks and economic and political stability are needed in order to involve private actors. Government influence

can be useful to support ECAs to become active in priority areas such as technology transfer related to climate change.

9. Guarantees

74. In cases where a high level of risk prevents access to private funding, a guarantee can be more useful than a grant or subsidy. If the (perceived) risk turns out to be real, the guarantee turns into a subsidy; if the risk does not occur during implementation, the money will not be spent. Developing run-of-the river hydropower plants, for example, requires assessing the water levels in the river. In this case there is a risk that the water level is too low for further project development. The government could fund a feasibility study to reduce the risk (the traditional approach with one-off funds) or ask the project developer to pay for the feasibility study and subsequently guarantee the income of the plant if the water level is below a certain level.

10. Loans

75. Loans are the most standard form of financing offered by private (and public) banks. The basic characteristic of a bank loan is that it needs to be repaid (principal and interest) according to an agreed timetable. Regular bank loans for non-personal use are relevant for technology transfer where the risk of non-repayment is negligible or adequately covered by guarantees. Therefore loans seldom form a crucial self-standing part of innovative financing solutions. If loans are used they could finance a specific part of the total investment, where risks are lowest. Standard lending instruments could also be modified and blended with other financing instruments to offer tailor made solutions and form part of more innovative solutions.

11. Public–private partnerships

76. In public–private partnerships (PPPs), public and private partners invest jointly in complex, often long-term projects. Their cooperation is based on a common interest, where risks and opportunities can be addressed along the way within a jointly agreed framework of goals and roles. Financiers, both public and private, can be convinced to finance these risky projects if sufficient risk-sharing options exist that can overcome initial reservations. PPPs often have a ‘problem-solving’ character. PPPs can be useful for both ‘hard’ investments (building dikes or roads) and ‘soft’ investments (developing and implementing a new code of conduct in waste management). PPPs are possible along the entire financing continuum, even though public sector finance will be used for the development stage and private financing more for the implementation or commercial phase of the project.

77. As this brief overview demonstrates, many general instruments are already available for the financing of climate change related technology transfer. Of course, the obvious examples are of projects using mature technologies in stable environments and with direct cash flows.

78. The innovative aspect in applying these instruments is their inclusion in the project development process from the early stages, creating early buy-in of financiers and improving the chances of benefiting from innovative financing. In doing so, we will find that many new applications of existing financing instruments appear to be viable. This paper presents examples of such ‘new combinations’ and provides a guideline for policymakers and experts in the climate change area and the financing industry. Fine-tuning will of course be needed to create ‘fit for purpose’ for every project but that is part of the process of ‘learning by doing’, characterizing the current phase of financing of technology transfer in the context of the Convention.

D. Improving access to financing

79. This section will focus on how to improve access to public and private financing by applying the mechanisms introduced earlier in this paper. Various options will be suggested to link funding from the public and private sectors and new options to involve the international private sector will be discussed. The projected capital flows will depend on the quality of the projects and business plans. Note that improving access to financing does not necessarily imply increasing the total available funding, but increasingly implies how best to access available funding.

1. Improving access to public-sector financing

80. To improve access to public financing for climate change related technology transfer it is necessary to create **synergies** with other policy areas in the design and implementation of climate change projects. The benefits of integrating the climate change theme with other policy sectors include:

(a) Increased access to public budgets for a particular project, by integrating the scope of a project with other policy areas;

(b) Incorporating more direct financial benefits by integrating projects or priorities from sectors with greater economic importance into climate change projects, thus improving access to financing.

81. A crossover may ultimately result in access to cash flows from other sectors. The 'strength' of the climate change theme is that it represents a widely recognized concern shared by many stakeholders. Therefore, by recognizing the importance of the climate change theme and by choosing more environmentally sustainable technologies, it should be possible to access additional financial resources that address related issues, such as local air quality or the security of energy supply. The linkages with two such mainstream areas are discussed below: poverty alleviation and energy security.

a. Climate change and poverty alleviation: overlap in the utilization of land

82. Effective land use is a key requirement for improving rural incomes and making a significant reduction in poverty levels globally. Over 70 per cent of the world's poor are located in rural areas, with land use as a major source of subsistence. Therefore, improving the productivity of land use systems is required to increase incomes and food security. On the other hand, land use change when carried out with climate change in mind can also contribute to mitigation. To the extent that the land use changes required for poverty alleviation coincide with those required for carbon sequestration, significant synergies could potentially be achieved in meeting both objectives. Some types of change in land use that are appropriate for small- and low-income land users may even be a competitive source of emission-reduction credits.[12]

83. Climate change can also negatively affect traditional efforts to alleviate poverty. Social safety nets may be disrupted by climate-related disasters along with damage to homes, businesses and community infrastructure. Disaster prediction and preventive measures for adaptation to climate change can minimize vulnerability to impacts that could increase the numbers of people experiencing poverty. Additional financing to develop and implement these adaptation measures could be generated by emphasizing these linkages with other poverty alleviation policies.

[12] Adapted from: Lipper L., Cavatassi R., 2003. Land Use Change, Carbon Sequestration, and Poverty Alleviation, Food and Agriculture Organization of the United Nations, Rome, Italy <www.fao.org/documents/show_cdr.asp?url_file=/docrep/007/ae046e/ae046e00.htm>.

b. Climate change linkages with energy policy and energy security

84. The link between climate change, and energy policy and energy security is well known and has recently become even more obvious with the increase in oil prices. The recent decades have shown a steep increase in technology transfer in the energy sector and in the implementation of renewable energy and energy efficiency projects. More funds become available when energy security from traditional resources appears vulnerable and uncertain, and this has little to do with concerns about global warming or climate change. In that sense the oil crises in 1973 and 1979 and the melt-down of the Chernobyl nuclear reactor in 1986 were much more relevant than the report "The Limits To Growth"[13] by the Club of Rome in 1972.

85. The lesson learnt is that an economic impulse (oil crisis) was needed to boost investment in renewable energy, with a weak reference only to climate change and renewable energy. Therefore integrating the climate change theme with energy policy and energy security can improve access to public funding.

86. This reasoning could also apply to the large-scale introduction of clean energy for cooking. Access to public funding to scale up the shift from fuelwood to biogas or LPG can be improved by referring to climate change, but this also needs integration with other policy areas. For example, considerable funding has become available for the promotion of clean energy for cooking because the Millennium Development Goals (MDGs) address indoor air pollution (as affecting the health of women and children), or because of the economic benefits of time saved by women (no need to collect fuel wood any more).

c. Other synergies with climate change

87. Creating synergies with other policy themes seems to be a practical approach to improve access to financing sources for climate change related technology transfer. Of course, this process needs to be supported by adequate awareness raising and capacity-building to create an understanding of opportunities and risks with financiers as well as policymakers.

88. The approach of creating synergies can be extended to many other areas, a few of which are discussed briefly here.

(a) **Industrial and economic development:** ESTs such as solar power and hydropower can be made available in rural areas for productive use. This will create (more) income and jobs, which is an important step in the economic development of rural societies, and may provide access to additional public funding. The introduction of ESTs can also offer significant domestic growth opportunities if local industries can be developed.

(b) **Regional cooperation activities:** Technology transfer includes know-how and expertise to facilitate capacity-building between and amongst developed and developing countries. Regional cooperation among developing countries may also help to increase access to financing, particularly by creating a critical mass for indigenous technologies. In the case of the small island States, there are good reasons for regional cooperation such as economies of scale. Organizations such as the Asia and Pacific Centre for Transfer of Technology (APCTT)[14] could be instrumental in creating an enabling environment, and

[13] Meadows et al., 1972. Limits to Growth, Behrens III Potomac Associates, New York.
[14] APCTT is a regional institution of the United Nations Economic and Social Commission for Asia and the Pacific with the objective of facilitating technology transfer in the Asia–Pacific region <http://www.apctt.org/>.

bodies such as the International Environmental Technology Centre (IETC)[15] could provide support on the implementation side. Budgets for regional cooperation can then be used for the financing of climate change technologies and to create economies of scale. Global initiatives such as the Renewable Energy and Energy Efficiency Partnership (REEEP)[16] and the Global Village Energy Partnership (GVEP)[17] also aim to develop more regional networks to facilitate the sharing of lessons learnt and to present best practices. At the regional level the case of Latin America in the area of energy and markets, facilitated by the Latin American Energy Organization (OLADE) and the Southern Common Market *(*MERCOSUR), are other examples of such regional cooperation.

(c) **Technology development:** Technology transfer may imply the need to improve existing or develop new technologies. TNAs could provide a link between technology development and the climate change agenda by identifying the technology needs and the technology development implications. Traditional climate change related funding could provide the political relevance for new technologies and, consequently, justify the need for additional financing via regular technology development programmes.

2. Mobilizing private-sector financing

89. Private-sector financing for climate change related technology transfer can be obtained from two sources:

(a) **Financial institutions** such as banks, foundations and investment companies;

(b) **Industrial corporations** such as construction companies, suppliers, and purchasers.

90. Financial institutions are typically interested in specific climate change related sectors, such as energy, agriculture or water, when these relate to their core business. In the financing industry, such a core business is a mix of various elements, of which sector specialization and financing instruments are the most important. The actual fit between a financial institution and a specific project depends on a combination of factors and is difficult to identify. Exploring the possible interest therefore requires fine-tuning at an early stage with multiple financial institutions. In larger projects, one might need to involve independent financing experts to establish adequate contact with financial institutions and to select from among various financiers.

91. Industrial corporations often have clear guiding principles for their involvement in climate change related technology transfer and there usually needs to be a link to their business strategy, for example to secure future business in power generation in the case of energy companies.

92. With reference to the financing continuum, private-sector funding gradually complements public financing once technology transfer moves to (commercial) implementation. This can occur in cases where successful pilot projects, often with a major component of public financing, have to be scaled up or replicated elsewhere. As the result of a successful pilot, private-sector interest could be generated and lead to co-financing implementation elsewhere.

[15] IETC promotes and implements environmentally sound technologies <www.unep.or.jp>.

[16] REEEP is a global partnership that structures policy initiatives for clean energy markets and facilitates financing for sustainable energy projects <www.reeep.org>.

[17] GVEP is a partnership of developing and industrialized country governments, public and private organizations, multilateral institutions, consumers and others working to ensure access to modern energy services by the poor <www.gvep.org>.

93. To facilitate access to private-sector funding from financing or industrial corporations, the following mechanisms have proven to be successful:

(a) **Capacity-building:** Financiers can be encouraged to moderate their risk assessment of projects perceived as being politically sensitive.[18] The public sector and NGOs can inform financial institutions and industrial corporations about the opportunities and robustness of climate change related technologies. This helps top management in these organizations to convey the message to their operational staff and initiate a dialogue about how to get involved. This can make it easier for financiers to understand the opportunities and is a first step in making other facilitating mechanisms effective. One effort to reach out to financiers is the Sustainable Energy Finance Initiative (SEFI)[19] which brings together financiers, engages them to do jointly what they may have been reluctant to do individually, and coaxes them to enter into public-private alliances in the sustainable energy finance area;

(b) **Market development instruments:** Risk mitigation instruments provided by public sector or multilateral programmes can help convince financiers who are considering becoming active in a sector but are hesitant because of the initial risk level in a nascent market. The public sector can justify a role of incubator for politically relevant new markets, such as technology transfer related to climate change, for instance by providing financial services tailored to the needs of the technology transfer community. Thus market development instruments by the public sector for the private sector are appropriate for climate change technology transfer. For example, for small-scale renewable energy technologies already commercialized on a 'cash and carry' basis, but where market growth is constrained by a lack of end-user financing, UNEP has been implementing credit enhancement programmes, via guarantees or temporary interest subsidies, which help local banks build dedicated loan portfolios;[20]

(c) **Rules and regulations:** Companies can be motivated by rules that give them a privileged position, for example in public tenders, provided they meet specific standards. Examples include power generation contracts that are open only to companies with a quantified percentage of renewable energy in their energy mix, a percentage set by the public sector. Another example is that governments set standards for emissions and targets for emission reductions to be met by the private sector, which are expected to catalyze investments in emission reducing devices and new (more efficient) devices which can ultimately be applied in a wider context;

(d) **Taxes, levies and subsidies:** Governments can also apply a 'carrot and stick method' to reward or penalize companies via tax benefits (exemptions or tax holidays) or subsidies. Taxes and levies can be applied to polluting technologies or to other business practices that strongly contribute to climate change or that go against adaptation measures. Tax rulings to allow for accelerated depreciation of energy efficient or lower emission capital equipment also provide an incentive for businesses to invest in ESTs rather than in more

[18] As the United Nations Environment Programme (UNEP) states in an article on energy lending: "opportunities do exist 'on the street', under the banker's noses, ands the reasons they have not been picked up have more to do with soft market development barriers than underlying economics".

[19] An initiative developed by UNEP and the Basel Agency for Sustainable Energy (BASE) <www.sefi.unep.org>.

[20] UNEP currently has such programmes in India (photovoltaic systems), Tunisia (domestic solar water heating), Morocco (hotel-based solar water heating) and China (renewable energy), and has other programmes in development in Egypt and Indonesia <www.unep.fr/energy/finance>.

polluting technologies. As a next step, the proceeds of these taxes and levies could be used for climate change related technology transfer.

Case: Solar electricity in Germany – from an incubator market to a global supplier

94. The solar-electricity market in Germany provides a good example of 'long, loud and legal' public-sector support. A sequence of targeted measures has resulted in a robust solar industry sector. Between 1999 and 2003 the so-called "100,000 Rooftops Solar Electricity Programme" provided soft loans via the state-owned KfW Bank for the installation of grid-connected photovoltaic (PV) systems. With the help of this funding, manufacturers of solar equipment and (local) installation companies invested their own equity and took regular bank loans for the financing of equipment and stocks, training, and quality control and marketing to create a market for solar electricity. The programme was designed to support 300 MW but it turned out that, by the end of 2003, approximately 65,700 PV systems with a total capacity of 345.5 MW were granted. Overall, this marks a clear acceptance of the programme by the market.

95. As of 2004, the support programme for solar electricity changed its supporting measures for the solar electricity market to a guaranteed feed-in tariff for the electricity generated.[21] This clearly demonstrates that a potentially viable market has been created, where support to manufacturers and suppliers (to kick-off early-stage development) was followed by output-based support, profiting from the early-stage interventions and moving to the end-user as the beneficiary. As a result, Germany was the fastest growing PV market in the world in 2003, with major private-sector investments in manufacturing capacity, triggered by the incubator role played by the government. According to estimates, the German solar electricity market generated total revenues of over EUR 800 million in 2003. The German PV industry generates over 10,000 jobs in production, distribution and installation.[22] This industry is now positioned to supply solar electricity equipment to other markets, in Europe and elsewhere, as the expensive and risky early-stage scaling up stage was completed in a 'safe' home market and has given it a head start compared with companies from other countries. This case clearly demonstrates an interesting combination of subsidies followed by a market enabling feed-in tariff.

Case: Wind energy has become a mature business sector

96. It is interesting to analyse the case of wind energy and draw some lessons, as wind energy is often considered a good example of climate change related technology transfer. The world has realized the limitations of traditional energy supply for sustained economic growth. In the 1980s, dedicated investors, now called socially responsive investors, invested in small new companies, developing 'modern' wind turbines. Massive public financial support created a stimulating enabling environment for these early-stage investors, initially mainly small industry players, via research and development (R&D) contracts and power purchase agreements. Today, wind energy is a mainstream industry with all major industrial corporations involved and wind power is an accepted source of energy for most utilities.

97. In many segments of the renewable energy market, public sector support is now being reduced, as a financially sustainable market has emerged. It should be noted, however, that many segments of the renewable energy market, such as solar electricity, are still in their infancy. Some of these renewable energy technologies are ready to be scaled up, but they have limited access to financing to do so.

[21] The support programme offers a feed-in tariff of 0.457 Euro per kWh, guaranteed for an operational period of 20 years.

[22] <www.solarbuzz.com/FastFactsGermany.htm>.

98. It is worthwhile to compare the 'profitability' outlooks of the early days of wind energy with current discussions about unprofitable technologies. Many climate change related technologies may not seem profitable at first glance. However, as in the case of wind energy, over time they may evolve into markets with private-sector involvement and adequate access to private-sector financing.

Case: Suzlon Energy, India[23]

99. Suzlon Energy, an Indian wind turbine manufacturer, started its operations 10 years ago and was listed on the Bombay Stock Exchange and National Stock Exchange in India in September 2005 following its initial public offering. The issue was oversubscribed which is an indication of the strong prospects for wind energy in countries like India. Suzlon is now the sixth-largest wind energy company in the world and the largest in Asia, with a subsidiary in Germany for technology development, an R&D facility in the Netherlands for rotor blade moulding and tooling, and wind turbine and rotor blade manufacturing facilities in India.

100. Martinot has estimated that investment in the renewable energy sector grew from USD 7 billion in 1995 to USD 30 billion in 2004.[24] This is an indication of the growth in the current global and largely prospering renewable energy market, whereas a few years ago the sector relied heavily on public financial support. Changes in global and national policy agendas are the basis for this strong growth. The entry into force of the Kyoto Protocol has 'legalized' (as part of the long, loud and legal) the enabling environment for private-sector funding and will help increase the level of funding and further improve access to it.

3. Improving access from public–private sources

101. Sustainable development is an all-encompassing notion that offers a link between the climate change agenda and private sector financial institutions and industrial corporations. Sustainable development is by origin linked to climate change related issues. The concept of sustainable development is an important element in most bilateral and multilateral programmes, and features in the strategies of most large corporations.

102. On most public agendas, sustainable development is closely associated with the MDGs.[25] In the financing industry, the common term is socially responsible investment (SRI),[26] and for industrial corporations the equivalent is corporate social responsibility (CSR).[27] The concerns underlying these terms are largely the same, namely a responsibility to "meet the needs of present generations without compromising the ability of future generations to meet their own needs".[28]

103. This sharing of core values between the public and private sectors is promising in terms of increased access to financing in the climate change area. These values determine the long-term direction of capital flows, as it is after all at the highest strategic level in private and public organizations that core values are established. The concept of sustainable development can therefore support the development of a common set of criteria for the financing of climate change related technology transfer.

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[23] <www.suzlon.com>.
[24] Martinot, E., 2005. Renewables 2005 – Global Status Report. <http://www.ren21.net>.
[25] <www.un.org/millenniumgoals>.
[26] See the European Social Investment Forum at <www.eurosif.org> or the USA SRI networks at <www.socialinvest.org> or <www.sriintherockies.com>.
[27] See <www.csreurope.org> or the CSR news-service at <www.csrwire.com>, or the World Business Council on Sustainable Development at <www.wbcsd.ch>.
[28] A generally accepted definition of the World Commission on Environment and Development.

104. Encouraging communication concerning sustainable development is necessary to create ownership and early involvement of the private sector as a stakeholder in the technology transfer process. An example thereof is a recent article in which General Electric Company (GE) and the World Resources Institute (WRI) jointly call for "The Courage to Develop Clean Energy".[29] The article presents the view that billions of dollars will be made available for clean energy and energy efficiency, as there are market opportunities.

105. General Electric and others have also joined with the WRI to implement aggressive new plans to cut GHG emissions resulting from their operations. In the case of GE, GHG emissions that were forecast to rise 40 per cent by 2012 are instead targeted for a 1 per cent decrease. Given GE's size and scale, that can mean a real difference in the world.

106. WBCSD is a coalition of 175 international companies united by the three pillars of economic growth, ecological balance and social progress. Its aim is to provide business leadership as a catalyst for change toward sustainable development, and to promote the role of eco-efficiency, innovation and CSR.[30]

107. Another example of overlap between the corporate business sector and the public sector is the commitment by business leaders at the G8 meeting in Gleneagles in 2005 to ongoing and increased investments in low-carbon technologies. They argued that what is needed is a "step-change in the development of low-carbon goods and services" and that delivering this will require a strengthening of policy mechanisms, with an emphasis on the careful and focused use of market mechanisms.[31]

108. Shareholders are becoming increasingly vocal about the need for corporations to disclose emissions and climate change related business risks. Organizations such as the Carbon Disclosure Project are helping to facilitate this process.[32] Governments can also stimulate consumer-driven market demand through public education and outreach, and measures such as tax policy. For example, accelerated depreciation of energy-efficient or lower emission capital equipment provides an incentive for business to invest in ESTs.

109. These initiatives demonstrate a step-change compared with one or two decades ago. The groups involved in these initiatives can and should be committed to the implementation of climate change technologies, via their core businesses (as expressed in the letter from business leaders to the G8) and via their CSR programmes (as with the WBCSD).

4. Improving access to financing adaptation projects

110. To what extent does the financing of technologies for adaptation differ from the financing of technologies for mitigation, or even from other technology transfer?[33] To answer this question a number of features of adaptation projects must first be addressed.

111. **Sectoral scope and nature of projects:** Both mitigation and adaptation affect several sectors. However, rather than affecting the sectors in terms of GHG emissions, adaptation affects them in a more

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[29] Washington Post, May 21, 2005 by Jeffrey Immelt, Chairman and Chief Executive of General Electric <www.ge.com> and Jonathan Lash, President of the World Resources Institute <www.wri.org>.

[30] <www.wbcsd.org>.

[31] The business leaders were organized by the HRH The Prince of Wales's Business & the Environment Programme of the University of Cambridge Programme for Industry <www.cpi.cam.ac.uk/bep/>. This programme has also published a 'Reference Compendium on Business and Sustainability' of 'public–private partnerships', which describes the critical aspects of sustainable development from a business perspective <www.cpi.cam.ac.uk/bep/downloads/CLG_pressrelease_letter.pdf>.

[32] <www.cdproject.net>.

[33] The EGTT organized a seminar on the development and transfer of ESTs for adaptation to climate change in 2005 at which some of the issues described here were also discussed. See also document FCCC/TP/2006/2.

fundamental and threatening way. Negative impacts of climate change endanger the way in which many sectors function, and adaptation therefore needs to be integrated in all sectors as a more fundamental planning paradigm rather than as a technological switch.

112. **Time horizon and uncertainty:** The time horizon for investment in technologies for adaptation is usually quite long, while the appropriateness of the investment remains uncertain. The positive effects may not become apparent for a long period, and sometimes the climate change related event (the reason for the investment) does not even occur during the lifetime of that investment. Risks and returns over such long periods are difficult to assess and therefore difficult to finance.

113. **Financial returns:** In many traditionally designed adaptation projects, the link to direct cash flows generated through the investment is weak or absent. This often implies that investors looking for a financial return will not be interested in such investments.

114. **Ownership:** As many adaptation projects are typically of a general nature (e.g. protection of the coastline) there is no particular project 'owner'; someone who benefits directly and therefore feels particularly responsible. Strong ownership is a crucial element in the financing of technology transfer, as it is associated with result-oriented problem solving and cost-effectiveness. In fact, the impacts of adaptation often threaten private property directly, and where private interests are involved, private financing can be made available more easily and private-sector interest can be mobilized. This in turn creates opportunities for the use of innovative financial instruments, jointly with public–private partnerships in the protection of the common interest.

115. **Local versus global benefits:** Adaptation projects usually have only local benefits, whereas mitigation projects have global benefits in terms of reduced emissions. This may limit access to a broad array of financing sources.

116. From this discussion of the differences, we can conclude that the same mechanisms which support better access to financing for technologies for mitigation apply also to technologies for adaptation:

(a) **Linkages:** Projects should be designed with linkages to other sectors that have easier access to financing. Billion-dollar assets, such as oil refineries, are crucial to energy corporations that may need to improve security levels against extreme weather events. Therefore there is a shared interest between coastal authorities (island states or elsewhere) and energy corporations to investigate the possible effects of climate change and to develop and implement measures to protect against the negative effects. Investments in research and implementation could, for instance, be shared between these public and private actors. As in this case the private sector has its own strong driver to develop and implement technologies, the leverage of combining private efforts with public efforts could be potentially strong;

(b) **Stakeholders:** Financiers and other stakeholders could be involved in project design to optimize the results of, for example, a pilot project and to ensure that lessons learnt during the initial project will be included in the conditions for the next phase. Results could be communicated while the project is under implementation to, for example, a steering group or advisory board with stakeholders who will be important in the next phase. This may lead to a lower (perceived) risk profile for follow-up projects;

(c) **Identify risks and returns:** Returns, financial cash flows as well as economic, social and environmental benefits should be specified and the associated risks mitigated appropriately. Explicit monitoring and evaluation criteria for all potential benefits should be considered.

117. The PDC can be an appropriate instrument to ensure that opportunities are optimized, especially in complicated cases such as creating linkages with other sectors or in quantifying the costs of adaptation.

118. A number of adaptation measures that include the transfer of technologies are presented below. Each represents an opportunity to widen the traditional scope of a project with the aim of linking to a group of stakeholders who may be interested in financing.

Case: Adaptation financing: Extreme weather events and housing

119. The increasing frequency of extreme weather events is a well-known example of climate change effects.[34] Owners and project developers of real estate in areas sensitive to extreme weather can be encouraged to increase the storm-resistance level of houses. Insurance companies could offer storm insurance only to houses of a certain, specified robustness, or offer reduced insurance rates for these houses. They could also propose incentives to build further inland rather than on the coast. The extra costs of these measures on an annual basis could be rather moderate as these measures also increase the economic lifetime of a house. Governments should also ensure that their incentives do not contradict those offered by insurance companies.

120. Public-sector efforts are required to support insurance companies moving in this direction, for example through direct tax benefits or licence policies. More indirectly, only those companies meeting specific standards in this respect should be eligible for government contracts. Moreover, as part of a wider enabling environment, government policies should be in place to ensure that binding guidelines exist and are monitored.

Case: Adaptation financing: Shifts in the seasons and sustainable agriculture

121. The shift in seasons as an effect of climate change may require changing the crops used by farmers in a region. This typically will also affect the subsequent chain of food processing, trading and supply of services. Changing from current crops and techniques, profitable today, to new types of crops and agricultural methods represents an enormous investment not necessarily adding direct value to the farmers concerned and the others in the value chain. Financing such changes involve major subsidies and an extensive programme of capacity-building. In this case, additional financing could be accessed by creating incentives to facilitate the process.

122. For example, the need to change crops could be linked to themes such as biodiversity or organic farming,[35] for which several financing programmes are available. Promoting biodiversity[36] and reducing the dependency on artificial fertilizers are priorities in many multilateral programmes focusing on rural development. Organic farming constitutes an important growth market, with attractive profit margins and long-term growth prospects. Large corporations such as Cargill or Unilever are already involved in

[34] The website <www.heatisonline.org/weather.cfm> provides interesting data. In the 1980s, the world's property insurers lost an average of USD 2 billion a year to damage claims from extreme weather events. In the 1990s, those losses averaged more than USD 12 billion annually. Weather-related losses for the first 10 months of 1998, totalling USD 89 billion, exceeded the total of all such losses for the entire decade of the 1980s.

[35] Organic farming is farming using natural farming techniques and without artificial fertilizer. See the International Federation of Organic Agriculture Movements at <http://www.ifoam.org> or the Food and Agriculture Organization of the United Nations at <http://www.fao.org/organicag>, or specifically on sustainable development at <http://www.fao.org/sd/ENdef_en.htm>.

[36] <http://www.biodiv.org>.

this shift to more sustainable agriculture, as they increasingly show a long-term interest in securing the supply of crops and support the development of more sustainable agriculture and fishery.[37]

Case: Wind turbines on islands

123. Improving coastal protection is a common measure in adaptation against climate change. As such, these public infrastructure projects do not generate cash flow or any other direct financial benefits. In this case, the investments in the construction of a wind farm could be combined with investments for adaptation purposes, as wind turbines on islands are often situated in the coastal areas. Renewable energy via wind turbines represents a significant contribution to power generation on many islands, which commonly have scarce fossil fuel resources but favourable wind conditions. As the development of wind farms requires close cooperation between the public sector (power purchase agreements, permits) and the private-sector (site development, supply of turbines, construction), the linkages between energy policy and coastal protection can be made relatively easily. In addition the power generated with wind turbines could lead to cost savings on the national energy bill. With an adequate regulatory framework, these savings could be invested in irrigation or used for other productive uses.

Case: The 'Climate Office'

124. Recently more than 40 Dutch NGOs in the area of nature conservation, environment, development and humanitarian support have joined forces to help implement climate change projects. This 'Climate Office' primarily intends to finance adaptation projects, taking into account the social aspects of climate change, and to promote projects that can demonstrate results over a relatively short term.[38] The coalition includes Oxfam, Red Cross Netherlands, United Nations Children's Fund (UNICEF), World Wide Fund for Nature (WWF) and many other national and international NGOs. The initial budget of the organization is EUR 16 million, which has been provided by the Dutch Postcode Lottery.

125. The programme intends to reduce the risks of climate change by integrating responses to climate change and climate variability into disaster risk reduction, poverty reduction and sustainable development efforts. An example of this approach is a WWF project which combines nature protection with improved river management in Nepal.

126. The Climate Office demonstrates that cross-sector cooperation with clearly identified and measurable benefits is becoming common practice and it is another expression of the potential role of private-sector initiatives (although mainly not-for-profit in this phase) in creating new project examples, building on an enabling environment originating from climate change efforts in the public sector.

E. Risks and returns

127. Risks and how to deal with them are at the core of the work of project developers and financiers. Every financial transaction has risks involved and these risks have a 'price'. This price is the risk premium for the financier: the higher the (perceived) risk, the greater the premium required as compensation. Standard types of return include interest payments (on loans) and dividends (on equity). Balancing the risks and returns of a project or a financial transaction is called risk–return management.

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[37] Unilever states: "As one of the world's largest users of agricultural produce, we need to ensure that the materials going into our products are sustainable – it's vital for the long-term health of our business." <www.unilever.com/ourvalues/environmentandsociety/shortstories/Sustainable_Agriculture/>. On biodiversity their web-page on fishery informs about their efforts to support WWF to set up the Marine Stewardship Council, an independent certification programme for sustainable fisheries: <www.unilever.com/ourvalues/environmentandsociety/shortstories/Feeding_Programmes_and_Fish/>.

[38] <www.klimaatbureau.nl>.

128. Financiers may require explicit risk mitigation measures in the form of extra investments, as a pre-condition for their investment, and may require continuous monitoring and reporting, which also has a cost. If risk mitigation measures are not feasible (or too expensive), and the risk remains high, this could prevent realization of the project.

1. Risks and risk management

129. A comprehensive overview of risks associated with financing large-scale renewable energy projects in developing countries is provided in a UNEP report on financial risk management (see also table 2).[39] Financiers are used to assessing these risks and have prepared risk mitigation instruments for most of them. As the matrix shows, most risk mitigation instruments are of a technical nature and typically are part of the work of financial engineers.

130. Risk mitigation instruments identical and similar to those in table 2 can be applied to climate change related technology transfer. In addition to traditional financing risks, climate change related technology transfer can be associated with some (perceived) risks that financiers are highly sensitive to, such as:

(a) **Politically driven nature of the climate change theme:** Subsidies and permits may be provided today but subsequently withdrawn because of changes in government (legal framework) or due to budgetary problems (subsidies). This risk is an important reason for the call for a proper enabling environment that is loud, long and legal;

(b) **Long-term horizon of climate change projects:** Many risks cannot be excluded given the long time period to be considered for an investment, e.g. political conflicts and earthquakes;

(c) **First-time-risk:** Quite often climate change related technology transfer is implemented under 'first-time' conditions, with an uncertain outcome. First-time can pertain to the technology itself or to other factors such as the local availability of fuel for a biomass power plant or the political context (first privatized power plant in country).

131. Actively managing these risks can increase financiers' comfort level, which is necessary since they can effectively make or break the decision to finance a project over a long period.

132. Proper understanding of risks between all stakeholders will result in a balanced risk assessment. As a result of closer cooperation between stakeholders from an early stage, risk mitigation can be allocated to the party responsible for this risk or to the party for whom the mitigation of the risk is most cost-effective. Some risks can be mitigated by governments, others by banks. Risk management can also take place at the national level, in cases where the government provides the proper enabling environment or by supporting an adequate regulatory framework.

[39] UNEP. 2006. Assessment of financial risk management instruments for renewable energy projects in developing countries.

Table 2: Risks associated with large-scale renewable energy projects in developing countries

Risk	Nature of risk	Risk mitigation approach	
		Financial risk management Instruments	Other
1. Project development/pre-construction phase			
Concept to implementation	➢ Feasibility analysis indicates project not feasible/viable ➢ Regulatory clearances delayed/denied ➢ Financial closure not achieved	➢ Grants, contingent grants	
2. Construction phase			
Construction/ completion risk	➢ Time overrun ➢ Cost overrun ➢ Project does not meet technical specifications ➢ Changes to project assumptions make the project unviable	➢ Insurance – construction all risks (CAR/EAR)	➢ Construction through turnkey contract
Counterparty risk	➢ Risk that the construction contractor does not perform as per contract	➢ Surety bonds – performance guarantees ➢ Liquidation damages	➢ Due diligence process
3. Operating phase			
Performance risk	➢ Technical performance ➢ Managing the facility ➢ Damage to or theft of equipment	➢ Insurance	➢ Operation through O&M contract ➢ Product guarantee/ warranty
Counterparty risk	➢ Risk that the O&M contractor does not perform as per contract	➢ Surety bonds – performance guarantees ➢ Liquidation damages	➢ Due diligence process
Fuel supply risk	➢ Intermittent/Irregular fuel supply	➢ Weather insurance/ derivatives	
Market risk	➢ Demand related ➢ Price related, which is a function of policies and regulations		➢ Power purchase agreement
Credit risk	➢ Related to default by purchaser i.e. inability of the purchaser/ utility running to meet their payment obligations	➢ Guarantees ➢ Credit derivatives	➢ Sovereign guarantee
4. Generic – all phases			
Financial risk	➢ Fluctuations in interest rate, currency exchange rate, etc.	➢ Standard derivative products	
Legal	➢ Contract enforcement		➢ Sovereign guarantee ➢ International arbitration
Regulatory	➢ Lack of long-term view/plan on renewable energy ➢ Regulatory uncertainties – changes in approach to determining the feed-in tariff		➢ Assurance statements from regulator on approach / policy directions
Political risk	➢ Currency inconvertibility ➢ Expropriation ➢ Political violence ➢ Breach of contract	➢ Political risk insurance ➢ MFI guarantees ➢ Export credit guarantees	
Force majeure risk	➢ Natural catastrophe, e.g. flood, etc. ➢ Man-made interruptions, e.g. war, strike, etc.	➢ Insurance ➢ Catastrophe bonds	

O&M = Operation and Maintenance
MFI = Multilateral Financial Institution
Source: UNEP. 2006. Assessment of Financial Risk Management Instruments for Renewable Energy Projects in Developing Countries.

133. Projects, by definition, have a limited time period within which all efforts are made. For financiers this 'project-thinking' could complicate life, whereas an approach based on a more continuous implementation, such as a 'pilot project' including scale-up or replication, offers more opportunities to benefit from the lessons learnt in the 'first project' and also in terms of risk management.

134. The approach of a pilot project suggest continuity because, when a pilot is successful, the next phase (less risky, no new start up costs) will follow and may be more attractive for a financier. In a pilot project, one tries to realize the consequences of replication ('serial investing') or scaling up after the pilot phase. From the viewpoint of risk management, this is positive as it could create extra opportunities to apply lessons learnt from a previous phase in a subsequent phase, as well as expand markets to earn more revenues. The financing continuum in essence reflects this notion in the parallel between public/development financing and private/commercial financing. The PDC can facilitate communication at an early stage between stakeholders and financiers to determine the scope of technology transfer after the pilot phase.

135. Bundling of individual smaller projects into one larger project or into a series of projects offers similar benefits: It reduces risks and increases the opportunity to learn by doing. As a consequence, improved financial returns can be achieved, for example start-up costs are only one-off and can be recuperated over a longer period. Bundling (or grouping) can refer to time (next project only after previous project is successful) or to geographic location (in more than one country).

136. The climate change agenda can provide options to improve the risk profile of technology transfer. Climate change policy, integrated in a regulatory framework, can support the reduction of environmental risks for the energy sector and impose emission-reduction investments that apply to the whole sector, in order to ensure fair competition. This linkage between the climate change agenda and investment risks would support the justification for extra investments. In another scenario, climate change policy could make the case for cleaner fuels, or even renewable energy sources, illustrating that environmental risks can create an opportunity.

2. Scale and risk

137. One of the aims of technology transfer in the climate change context is to reach a scale where as many people as possible benefit. This scaling up of activities, often after a successful pilot phase, is a struggle in many projects because large-scale technology transfer (in climate change or elsewhere) comes with institutional and legal issues that have little or no connection with the original project.

138. Technology transfer projects can sometimes better prepare for scaling up or replication by choosing a small initial implementation in order to better incorporate lessons learnt and create more proof-of-concept at an early stage. Once the initial results have been obtained, the path to growth can eventually be smoothed. In the financing industry, some risk mitigation measures limit the risk of premature scale-up. This relationship between risk and scale relates to the case of small island States presented below.

Case: Small island States

139. The potential impacts of climate change on small island States are an important area of concern.[40] Examples include rising water levels and the economic effects on agriculture, as well as extreme weather events (hurricanes) and changes in the composition of fish stocks.

[40] <http://unfccc.int/resource/docs/publications/cc_sids.pdf>.

140. From a financing point of view, the scale of small island States offers some advantages:

(a) Relatively low budgets can generate visible and important effects;

(b) Island-wide participation is relatively easier to realize, ensuring evenly spread benefits and improving the sustainability of a programme or investment;

(c) Disturbing factors are limited, identifiable and manageable;

(d) Regulatory and legal reforms are easy to implement;

(e) The limited size favours (commercial) demonstration projects and pilot phases of larger programmes, which are an important phase in the transfer of most technologies.

141. These advantages can be summarized as:

(a) **Transparent:** The scale of small island States allows for a clear relation between goals, means and results, which is important for all stakeholders. Transparency allows for optimal risk analysis and increases confidence in the project design, which results in optimal access to financing at adequate terms;

(b) **Cost-efficient:** Implementation of projects or programmes is cost-efficient, in the sense that the scale of the project does not require large overheads or long lead-times;

(c) **Replicable ('serial investing'):** The limited scale offers opportunities to learn quickly, which may lead to replicating (and possibly scaling up) a project sooner than if this learning had not been available. This applies especially to the transfer of new technologies and to new applications of existing technologies.

142. In many cases these advantages will outweigh disadvantages such as the diseconomies of scale. To increase the visibility of the needs and opportunities of small island States, concerted action is important, such as under the Alliance of Small Island States (AOSIS). Areas of cooperation between island states could be in developing a longer-term investment horizon, by indicating how and where projects could be replicated or scaled up once a pilot phase has been successfully completed.

143. It should be noted that the potential advantages of a smaller scale could also be achieved in larger regions or countries. Programmes or projects can be implemented within specific geographic or political boundaries, or by breaking up larger programmes into smaller sub-programmes or subprojects.

3. Returns management

144. Financiers (public and private) assess a project proposal in terms of its return relative to the risks, as explained in paragraph 127. One way to make up for increased (perceived) risks is therefore to increase the potential returns of a project.

145. Climate change policymakers and project developers have ample opportunities to improve the returns from climate change related technology transfer projects. In fact, 'returns management' is a key area for the climate change sector to improve access to financing. Project developers could increase access to financing by classifying the returns from a project or programme into the following five categories:

(a) **Financial returns:** Profits, interest payments and other typical returns expected by financiers;

(b) **Economic returns:** Jobs created or securing future agricultural income and produce by irrigation or coastal protection;

(c) **Environmental returns** for example mitigation of GHG emissions;

(d) **Social returns:** Reducing illness (or the future risk thereof) and education;

(e) **Emotional returns:** Human interest by donors for helping poor people or by promoting a more equitable or sustainable world.

146. This classification provides a framework with which to assess the potential returns from a project and hence to identify financiers with an interest in each. Over the last years, there has been an increased recognition that climate change mitigation and adaptation can generate returns on all five categories, directly or indirectly.

147. The concept of 'triple-bottom-line' investing provides evidence of the growing interest of mainstream pension funds and banks in environmental issues. The triple-bottom-line is a performance indicator for investors where, in addition to the traditional *profit*, consideration is also given to *people* and *planet* indicators to determine the performance of their investments. Conferences[41] and advisory services in the finance industry are increasingly addressing this issue, and the screening of investment portfolios taking into account sustainability is becoming standard practice. A specific example of the relevance of screening is the Global Reporting Initiative (GRI),[42] an independent institution with increasing authority amongst investors, which develops a globally applicable framework for reporting an organization's sustainability performance, including economic, environmental and social dimensions.

148. Indicative of this growing interest is the fact that SRI-related assets grew faster than the entire universe of managed assets in the United States of America during the past 10 years.[43] Total SRI assets rose more than 258 per cent from USD 639 billion in 1995 to USD 2.29 trillion in 2005, while the broader range of assets under professional management increased 249 per cent from USD 7 trillion to USD 24.4 trillion over the same period.

Case: E+Co – blending multiple financing sources into fit-for-purpose financing

149. E+Co[44] finances and provides training and other services to SMEs that provide clean energy services to the 'energy poor'.[45] To inform their financiers about the returns mentioned above, E+Co monitors and quantifies a number of specific parameters in its portfolio (see table 3 for a detailed overview):

(a) **Financial returns** on its investments, to pay a return to banks, and other financiers;

(b) The **economic returns** of their portfolio attract private donors and economic development programmes to provide grants or concessional loans;

(c) **Social and environmental returns** are relevant specifically for financiers such as private foundations or endowments, specific government programmes and multilateral programmes;

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[41] Such as by Brooklyn Bridge <www.tbli.org>.
[42] <www.globalreporting.org>.
[43] According to the Social Investment Forum's fifth biennial report on SRI trends <www.socialinvest.org/areas/news/2005Trends.htm>.
[44] <www.energyhouse.com>.
[45] 'Energy poor' are defined as people without access to modern energy, who rely on traditional fuels or have no access to energy.

(d) The **'emotional' returns** have been translated into grant and loan opportunities for private investors, often successful entrepreneurs themselves.

Table 3: E+Co's triple bottom line

Financial	**Social**		**Environmental**		**Clean energy promotion**
Money invested by E+Co	Clean energy generated in MWh	Jobs sustained	CO_2 offset annually (tonnes)	CO_2 offset for life of project (tonnes)	Clean energy technologies
Money leveraged from entrepreneurs and third parties	Households served	Women ownership/share holding/ micro-entrepreneur	Reforested land/number of trees planted	Value of CO_2 offsets for life of project	Geographic distribution (number of countries)
Potential amount of growth capital	People with access to modern energy services	Entrepreneurs receiving enterprise development services	Barrels of oil displaced	Households with access to clean water	Policy activities
NGOs and financial institutions trained in renewable energy financing	Improved income	Entrepreneurs trained	Energy saved from energy efficiency initiatives (MWh)	Kerosene displaced (litres)	Productive use companies

150. Working with the concept of 'returns' in such an explicit manner is a new approach in accessing financing for the climate change area. Awareness of the many benefits of projects has always existed, but mostly in a general way. The truly innovative next step would be to make these benefits explicit and to quantify them so that they can be measured and monitored.

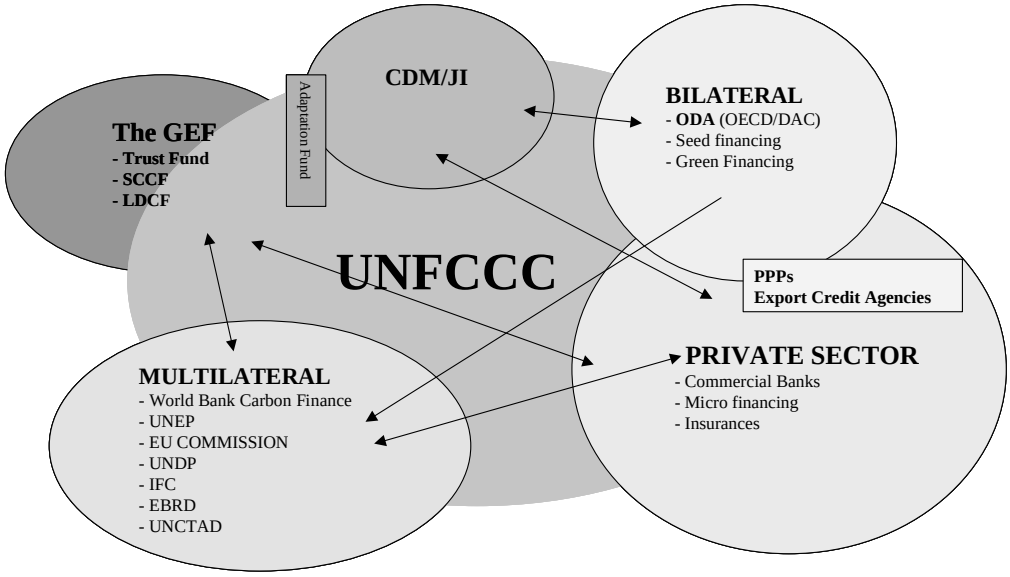
V. Multilateral and other activities on innovative financing

A. Financial opportunities under the Convention

151. The UNFCCC has catalyzed a multitude of investment instruments and opportunities targeted at technology transfer. Figure 2 shows the most important ones and illustrates their mutual relationships. The entry into force of the Kyoto Protocol has created extra momentum for the climate change policy theme, increased confidence in the market mechanisms and will help reassure current and potential financiers that 'climate change' issues are worth investing in.

152. The important contribution of the UNFCCC process and the Kyoto Protocol to increase financing for technology transfer is not only in terms of the innovative instruments they have brought, such as the project based mechanisms, but also the enabling environment that is being created.

Figure 2: Funding targeted for climate change activities



1. Global Environment Facility

153. As the financial mechanism of the UNFCCC, GEF allocates and disburses about USD 250 million per year in the climate change focal area. While some of these funds are used to finance the communications of Parties not included in Annex I to the Convention (non-Annex I Parties), a large share is used to support technology transfer projects in energy efficiency, renewable energies, new low-GHG energy technologies and sustainable transportation. Moreover, the GEF provides financing to the least developed countries from the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF).[46]

[46] See: <http://unfccc.int/cooperation_and_support/funding/items/2807.php>, or <http://www.gefweb.org/projects/Focal_Areas/climate/climate.html>.

Table 4: A selection of approved projects by the GEF involving innovative financing mechanisms.[a]

Country	Project title	Non-grant financing mechanism	GEF funding (million USD)	Executing agency	Description of non-grant financing approach
Malaysia	Biomass-based power generation and cogeneration in the Malaysian palm oil industry	Risk mitigation	4	Ministry of Energy, Multimedia and Telecommunications	A renewable energy fund to support prospective biomass energy users. The "Energy Business Fund" will use resources from the GEF as initial capital.
Chile	Removal of barriers for rural electrification with renewable energies	Risk mitigation, fund established	6	Comisión Nacional de Energía (CNE)	Combination of investment guarantee fund and technology risk mitigation fund.
Egypt	Energy efficiency improvements and greenhouse gas reduction	Loan guarantee programme	4.11	Ministry of Electricity and Energy in cooperation with United Nations Department of Economic and Social Affairs (UNDESA)	Implement a pilot programme to provide partial loan guarantees to support the technical performance of selected, semi-private companies.
Uganda	Uganda photovoltaic pilot project for rural electrification	Revolving fund	1.8	Ministry of Natural Resources	The model was implemented with rural micro-financing institutions and involved granting village banks a revolving fund for consumer loans.
Sri Lanka	Energy services delivery	Consumer credit through microfinancing institutions	5.9	Renewable Energy Fund Management Unit of the Ministry of Finance	The project stimulated private-sector participation in PV development by providing consumer credit through microfinance institutions.
Hungary	Hungarian energy efficiency co-financing programme	Loan guarantee programme	0.7	International Finance Corporation	Partial credit guarantees to share in the credit risk of energy efficiency undertakings by domestic financial institutions
Regional	Development of geothermal energy in Europe and Central Asia and World Bank–GEF Geothermal Development Fund	Risk mitigation	25.7	World Bank/ International Finance Corporation	Provides a drilling risk guarantee facility for resource risks

[a] UNDP/GEF experience with innovative financing mechanisms for environmental projects; report of a technical workshop on concessional lending, Montreal, Canada, July 2002.

154. The importance of the GEF is that it provides financing for innovative programmes with a long-term perspective. Projects financed and co-financed by the GEF are implemented by specialized implementing agencies which include development organizations and banks. This integrates the results into wider networks of local stakeholders and proponents.

155. GEF funds are provided as grants to the country. In practice, implementing agencies and local proponents often choose to provide the GEF support through financial instruments other than grants. In order to increase the leverage of GEF funding, the grants are used to (co-)finance instruments such as

loan and guarantee programmes, seed money, and funding for capacity-building.[47] Some examples of projects are presented in table 4, highlighting the instruments for which the grants were used.

156. A typical example of the positive effect of the long-term horizon of the GEF is its catalytic role in market development. The energy efficiency sector can be a challenging market to develop but is clearly a market with public interest. With such a clear policy mandate, and a clear vision of the goal, the GEF can overcome hurdles at several stages of market development. A successful approach to overcome these hurdles was the IFC/GEF energy efficiency programme in Eastern Europe, which started in the mid-1990s in Hungary. Here, IFC provided training for bankers and partial credit guarantees for banks that were willing to make initial investments in new and innovative technologies and approaches for saving energy. Moreover, development support for project developers was provided. The programme was able to leverage significant amounts of direct financing and could scale up, even though the partial credit guarantee was never fully exposed and only very rarely called upon.

2. Project-based mechanisms under the Kyoto Protocol

157. The Kyoto Protocol foresees that reducing GHG emissions will have environmental as well as financial benefits. It was recognized that stakeholders needed to establish innovative mechanisms to create a market mechanism for these financing components. The Kyoto Protocol provided for innovative flexible financing mechanisms, such as the CDM and JI. Projects financed under these mechanisms must result in measurable benefits involving the mitigation of climate change and contribute to the sustainable development of host countries, for example through the transfer of ESTs.

158. The CDM offers a dedicated legal framework and a marketplace for parties who are required to reduce GHG emissions. That is an important innovation in its own right, once again demonstrating that public initiatives can catalyze investment flows for climate change related technology transfer. The 165 CDM project activities registered as of April 2006[48] are expected to produce in excess of 340 million certified emission reductions (CERs) before 2012, which is the end of the first commitment period of the Kyoto Protocol. The official CDM CER pipeline of more than 730 activities, including the 165 registered activities, is expected to deliver more than 910 million tonnes by the end of 2012 (this is equivalent to the combined emissions of the United Kingdom of Great Britain and Northern Ireland, Finland, New Zealand and Austria in 2003). Examples of CDM project activities are available on the CDM website.

159. The CDM has some of the features of an innovative approach to increase access to financing:

(a) Linking various policy sectors to the climate change theme;

(b) It is another revenue source for projects through the sale of CERs;

(c) CDM is ‘project based’. By developing standardized methodologies and putting them into the public domain, the first projects for each methodology create templates and capacities for the development of repeat projects, as well as confidence in the technologies and project viabilities;

(d) Benefits of projects are quantified, which is important if new stakeholders are to be involved, in particular double-bottom-line[49] and triple-bottom-line investors.

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[47] GEF. 2004. Climate Change Program Study. New York.

[48] <http://cdm.unfccc.int/>.

[49] Investors which seek a second bottom line look to measure their performance in terms of positive social impact, next to the conventional bottom line to measure their financial performance.

160. More experience needs to been gained with CDM in order to maximize its impact. For example, for smaller projects, the procedures to access CDM funding are too complicated and transaction costs are high.[50] Currently an important limiting factor of the impact of the CDM is the uncertainty over the value of CERs created after 2012.

161. The confidence of stakeholders in the carbon market is reflected, for instance, in the presence of private institutions supporting the optimal functioning of the emission-reduction markets. Commercial companies such as EcoSecurities[51] and Climate Change Capital[52] focus on realizing the climate change related financial benefits of projects.

162. The World Bank Group is a leading financier in carbon finance and manages a range of carbon funds, funded by national governments as well as by private companies. The World Bank Group's range of carbon funds includes:[53]

(a) The Prototype Carbon Fund (PCF);

(b) The BioCarbon Fund;

(c) The Community Development Carbon Fund (CDCF);

(d) The National Carbon Funds;

(e) The Umbrella Carbon Facility (UCF).

Case: Honduras-based enterprise with triple-bottom-line impact

163. The case of La Esperanza highlights the added value of one of the World Bank funds, in this case the CDCF. La Esperanza, a Honduras-based enterprise, is developing a 12.8 MW run-of-river hydroelectric project utilizing an abandoned powerhouse foundation. La Esperanza showcases clean energy and the triple-bottom-line benefits which include permanent jobs, improved roads, reforestation, potable water and displacement of GHGs.

164. La Esperanza's developers were supported initially by a specialized investment company with their business plan preparation and a USD 250,000 loan for construction of the first powerhouse. Following this investment, in May 2003, a local Honduras-based private bank approved a term loan to complete the first phase (1.2 MW). In 2004, after a follow-on investment of USD 200,000 by the investment company, financing was secured for full construction via the Central American Bank for Economic Integration (CABEI) and Finnish development bank Finnfund for the balance of the 12.8 MW. A historic milestone in the global carbon market was reached in October 2005 when the Executive Board of the CDM issued the first-ever CERs to La Esperanza. La Esperanza sold the certified GHG emission-reductions to the CDCF for USD 1,395,000.

165. This case brings together various issues discussed in this technical paper:

(a) Promoters involved professional financing specialists at an early stage;

(b) The pilot project was developed with a long-term view and with a framework similar to the PDC;

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[50] This issue has already been recognized by the CDM Executive Board and fast-track procedures are being developed.

[51] <www.ecosecurities.com>.

[52] <www.climatechangecapital.com>.

[53] <www.carbonfinance.org>.

(c) A limited initial investment at appropriate terms formed the basis for the total financing package, postponing some major investment risks until at least some track record had been established;

(d) Non-financial benefits (environmental, social and economic) were included and quantified at an early stage;

(e) An enabling environment created by the Honduran authorities was in place;

(f) Innovative funding was available from a pioneering carbon fund.

166. Other organizations have emerged to facilitate projects to address the complexity of the emission-reduction systems or the transaction costs of smaller projects, which are considered the main obstacles for the current emissions trading models. Examples of such facilitating organizations are the CleanTech Venture Network[54] and the Climate Investment Partnership (CIP).[55] The emergence of such organizations highlights the desire of private financiers to explore the emission-reductions market and an increased willingness to learn by doing, following a long period of broad and intensive capacity-building by various (multilateral) organizations.

167. It is important to note that many of these initiatives are public–private partnerships. This is important as it reflects the joint responsibility for the climate change theme and is thus an important success factor to improve access to innovative financing opportunities.

B. Experiences of other organizations and processes

1. Development finance institutions

168. The World Bank is active in the climate change area for a number of reasons.[56]

(a) The impact that climate change could have on the Bank's developing country partners. According to World Bank research, about USD 4 billion a year of its investments are exposed to climate-related risks and USD 500 million a year is spent on managing or recovering from climate related disasters.

(b) Sustainable development is the key reason for engagement of the World Bank in carbon finance operations. The World Bank sees its role as ensuring that the benefits of carbon finance are spread wide and deep, that the carbon market becomes an instrument to help achieve sustainable development in its client countries.

169. The impact of climate change on their core business and new opportunities for sustainable development in its client countries are mentioned as the main reasons. Earlier in this technical paper, suggestions were made on how to involve large institutions in the financing of climate change projects (paragraphs 90 and 101). Some key suggestions are now recognized in the World Bank's rationale to be engaged in the climate change area.

170. The association of European Development Finance Institutions (EDFI)[57] organized a workshop on Renewable Energy and Carbon Finance early in 2005, recognizing their increasing role in the sector. More DFIs are investing in projects or funds related directly to the climate change theme. Recently

[54] <www.cleantech.com>.
[55] <www.climateinvestors.com>.
[56] Adopted from "Why the World Bank Cares about Climate Change" in the World Bank Carbon Finance Annual Report 2005 <http://carbonfinance.org/docs/2005_CFU_Annual_Report.pdf>.
[57] <www.edfi.be/index.htm>.

Belgian and Finnish development banks BIO and Finnfund have invested in CAREC, a Central American clean energy fund, which is also supported by CABEI (see the La Esperanza case above) and the InterAmerican Development Bank.[58] KfW, the German development bank, is one of the biggest financial providers for renewable energy worldwide.[59]

171. An example of clean energy investment and carbon financing supported by development finance institutions (DFIs) is the Cleantech Fund[60], an investment fund supporting small-scale clean energy projects in Latin America with on-going activities in Brazil, Mexico and Peru. The USD 20 million fund will invest in wind farms, hydropower stations and biomass plants. Dutch development bank FMO supports the Cleantech Fund in attracting other financiers and investors. FMO has an option to purchase carbon credits for the projects in which Cleantech Fund has invested.

172. The interest of DFIs indicates that, under certain circumstances, there is an opportunity for climate change related technology transfer in emerging markets. An important aspect of this growing interest is that it leads to investments by private financiers, local and from abroad. In that sense, the growing interest of DFIs is a sign that some segments in the climate change arena are about to reach a stage where scaling up to commercial levels can be achieved.

2. United Nations Environment Programme Finance Initiative

173. The United Nations Environment Programme Finance Initiative (UNEP FI)[61] is an example of an effective instrument to mobilize private-sector financing. UNEP FI is a global partnership between UNEP and the private financial sector. It provides a platform for high-level meetings of financing professionals to share experiences with the leading financiers of climate change related technology transfer. Specific themes in the work programme include carbon finance and the financing of renewable energy. An important value added of UNEP FI is that it helps to create mutual understanding amongst financing institutions and with the UNEP community. It operates as a catalyst by providing backgrounds and perspectives within the 'own' group of financiers, as well as to public policymakers. Experience of policy developers in the climate change area will, via UNEP FI, become available to financial institutions at a policy level where it is likely to positively affect these companies' goals.

3. African Rural Energy Enterprise Development

174. The African Rural Energy Enterprise Development[62] (AREED) programme facilitates the work of SMEs in the modern energy sector. AREED creates market awareness for potential entrepreneurs and provides enterprise development services via a network of local NGOs. By collaborating with specialized financial institutions, qualified enterprises can obtain financing to start or expand their 'modern energy company'. These new enterprises can meet the energy needs of people without access to energy, while reducing the environmental and health consequences of existing energy use, particularly low-quality biomass fuels such as wood and dung.

175. One of the lessons learnt from the AREED programme is that there is a need to obtain buy-in from various stakeholders. Local partners are in the process of strategically linking the AREED programme to national development strategies. In this case, an enterprise development programme seeks

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[58] Other investors in CAREC include Triodos, a private Dutch bank with a focus on sustainable banking.
[59] <www.kfw-entwicklungsbank.de/DE_Home/Service/OnlineBibl48/PDF-Dokumente/Handout_Erneuerbare_Energie_e.pdf>.
[60] See <www.econergy.com/cleantech_fund.html> for details. Other development finance institutions investing in the Cleantech Fund are the Multilateral Investment Facility of the Inter-American Development Bank, and the GEF.
[61] <www.unepfi.org>.
[62] <www.areed.org>.

linkages with elements of the climate change agenda, as it turns out that the success of the AREED programme can be sustained only if the clean energy sector is anchored properly in the policy sectors of energy supply, health and sustainable rural development.

4. Johannesburg Renewable Energy Coalition - Patient Capital Initiative

176. The Patient Capital Initiative (PCI) is one of the concrete outcomes of the Johannesburg Renewable Energy Coalition (JREC), which is a coalition of governments aiming to achieve the commitments on renewable energy made at the World Summit for Sustainable Development (WSSD) in Johannesburg in 2002. The PCI is sponsored by the European Commission (EC) to design an innovative public–private financing mechanism to create, and increase access, to affordable (risk) capital to support renewable energy and energy efficiency projects and small businesses in developing countries.

Case: Patient Capital Initiative

177. In the context of the PCI it has been proposed to establish a Global Renewable Energy and Energy Efficiency Fund (GEEREF). GEEREF intends to blend the capital of public and private investors, and subsequently provide targeted support to small- and medium-size projects and enterprises. GEEREF will invest in regional subfunds to allow for increased leveraging of commercial funds and to accommodate regional differences in conducting business and/or needs. GEEREF funds will enable the investments to be supported on a longer term than usually accepted. The fund aims to bring a financial return to all investors, recognizing that private investors need a higher financial return and that public investors value the economic, social and environmental benefits of renewable energy investments more than most private investors. The size of the envisaged fund-of-funds is EUR 100 million and the total capital leveraged is expected to be over EUR 400 million. There is consensus that the PCI can make a real difference in creating a sustainable renewable energy marketplace in emerging markets.

178. At this stage, the most notable element in the PCI is that it constitutes a firm expression of interest from the EC to finance renewable energy in developing countries, only a few years after signing an ambitious document at the Johannesburg Summit. The EC is expected to come up with a concrete co-financing proposal and a firm commitment in the second half of 2006. These messages are important for the wider climate change agenda as they confirm that consensus in the public arena, as with the JREC in Johannesburg, can indeed lead to establishing innovative financing mechanisms over a reasonably short period of time.[63]

C. Financial opportunities under other conventions

179. The following provides some examples of lessons learnt and cross-linkages with related policy areas.

1. Convention on Biological Diversity

180. In the implementation of the Convention on Biological Diversity (CBD), an initiative was launched under the name ‘Business and the 2010 Biodiversity Challenge’. This initiative aims largely at the same outcomes as the UNFCCC workshops on innovative financing with representatives of the financial communities. The meetings in the context of the CBD have focused on how to engage industries with a direct footprint on biodiversity and those that affect biodiversity, primarily through their supply chains.[64]

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[63] Impax Capital. 2004. JREC Patient Capital Initiative – Final Feasibility Study, November 2004. <http://europa.eu.int/comm/environment/jrec/energy_fund_en.htm>.

[64] From the report of the second ‘Business and the 2010 Biodiversity Challenge’ meeting in São Paulo, Brazil, 3-5 November 2005. <www.biodiv.org/doc/meetings/biodiv/b2010-02/official/b2010-02-03-en.pdf>.

181. The CBD context does not consider complex (technological) innovations as a prerequisite for change. It is emphasized that better access to financing is a matter of better alignment of interest between public and private partners and of creating stronger stakeholder involvement, by pointing out the financial, economic, environmental and social benefits. This is in line with the approach developed in this paper with regard to climate change.

182. Interestingly enough, the reference to the supply chain in the CBD context, in order to engage industries, is similar to the link to the 'core business' proposed in this paper to mobilize financing from industrial corporations in the climate change area (see paragraph 90). This link to the core business can relate to future business in power generation or to the continued supply of agricultural produce. The following case is an example of eco-tourism as a crossover between the climate change and the biodiversity agendas.

Case: Eco-tourism[65]

183. Eco-tourism can generate additional budgets for climate change related technology transfer. Eco-tourism is often linked to sustainable forestry or sustainable management of coastal reefs to preserve popular tourism destinations. Income from tourism can be a real long-term alternative to income from diminishing forestry or fishery practices, which will not economically sustain the local population over the long term. Moreover, eco-tourism generates direct public income from tourist spending, such as entry fees and taxes. Finally, the synergies that eco-tourism can provide with other policy areas could increase access to other financing windows.

184. For example, multilateral financing programmes can be accessed to preserve forests, reefs or coastal areas in the interest of a sustainable eco-tourism sector while addressing the climate change agenda. The additional income from eco-tourism can also help to put climate change on the agenda of national governments. It is important to note that these examples mostly add new funding and do not take budgets from other sectors. Thus it will be a safe and accepted way for generating new financing. One of the innovative elements in this example is that the term 'climate change' is rarely used.

2. The Montreal Protocol on Substances that Deplete the Ozone Layer

185. Similar linkages to the biological diversity agenda exist with the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol), which sets out the time schedule to 'freeze' and reduce consumption of ozone-depleting substances. The Montreal Protocol, signed in 1987, has been successful in a relatively short period. Production and consumption of many ozone-depleting chemicals have already been phased out in industrialized countries and a schedule is in place to eliminate the use of other chemicals. It is interesting to note that the success was partly attributable[66] to new technologies that were already available, together with an adequate enabling environment (clear and strict legal framework).

186. There are some interesting similarities with the climate change theme, where a clear and strict legal framework was mentioned as a key prerequisite, which has apparently contributed to the success of the Montreal Protocol. This enabling framework, amongst other factors, stimulated the use of existing technologies, which grew quickly from the pioneering stage to mainstream technologies. Although the capacity-building issues seem to be less important in the Montreal Protocol, since many of the stakeholders are large manufacturing industries, it is a good example of the catalytic effect of a clear and strict legal framework in an area closely related to the climate change theme.

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[65] Netherlands Development Organization (SNV). 2004. Reference Guide on Climate Change & Rural Energy. <http://portal.snvworld.org/public>.

[66] <http://hq.unep.org/ozone/Treaties_and_Ratification/2B_montreal_protocol.asp>.

VI. Conclusions and next steps

A. Conclusions

187. This section describes some of the major conclusions associated with innovative options for financing the development and transfer of technologies. In preparing these conclusions the secretariat took into account suggestions from members of the EGTT.

188. Innovative financing for technology transfer projects is an issue that cuts across many of the key themes of the technology transfer framework under the Convention. TNAs, capacity-building and enabling environments contribute strongly to better access to financing, for example when the financing theme is addressed at an early stage and with an early involvement of climate change professionals and financing professionals.

189. The project development cycle (PDC) is one of several instruments used to optimize access to innovative financing. The framework of the PDC is particularly useful to ensure that specific innovative financing options are considered and explored at the appropriate stage on the critical path in project or programme development. The breakdown into strategic and operational building blocks facilitates the development of innovative financing options, as it creates explicit linkages for the input of policymakers, project developers and financiers.

190. Public and private financing play a complementary role in maturing technologies via technology transfer, as is illustrated in the financing continuum (see paragraph 61). The overlapping position of the different financing instruments in the continuum indicates that there is room to manoeuvre, between the various instruments, and that calls for cooperation at an early stage between stakeholders to determine the optimal financing mix for a given project. There is an increasing range of public–private partnerships that offer good examples of a practical and effective mode of cooperation between the private and public sectors to overcome a wide range of finance-related barriers to implementation.

191. Access to financing instruments across the financing continuum, such as subsidies and project financing, can be optimized by analysing and quantifying the benefits of technology transfer projects as well as (most importantly) the risks associated with the project. Socio-economic and environmental benefits should be included explicitly in this effort. By demonstrating quantified non-financial returns, it should be possible to gain wider access to potential financiers than if just financial returns are presented, particularly when the risks associated with the project are high. An increasing number of financiers, public and private, are indeed interested in a specific mix of these benefits. Most importantly, however, it is equally (if not more) important to establish reasonable forecasts of expected revenues and expenditures related to the project (if any), and to assess the associated risks. This information helps project developers identify and target financing actors more successfully.[67]

192. As regards public-sector financing, one way to improve access to financing is to create synergies between climate change projects and programmes with other policy themes with a stronger connection to financial, social and economic benefits. Poverty alleviation, energy policy and industrial development represent good examples of such linkages. Early-stage involvement of public financiers in the critical path of project realization is an important issue here, because of the likely complexity of the integration of separate policy areas.

193. In the private sector, financial institutions, foundations and industrial corporations have shown an increasing interest in climate change related projects, driven by a variety of internal and external forces. This interest is based traditionally on financial benefits linked to the core business and only

[67] These issues will be discussed in more detail in the "Guidebook on preparing technology transfer projects for financing" which is being developed by the EGTT and will be launched at COP 12.

loosely related to the climate change theme itself. Capacity-building in the private sector, combined with effective financial support mechanisms and an enabling and enforcing legal framework, can help stretch this interest beyond the traditional level to include social and environmental considerations.

194. Access to private-sector financing can be improved by involving the private sector, for example in public–private partnerships. Specifying and quantifying the benefits for the private sector is an important tool to facilitate this involvement. At the policy level, stronger involvement of the private sector can be triggered by integrating the climate change agenda with the rules and regulations or taxes and subsidies that directly affect the investment decisions of private companies.

195. The case of wind energy demonstrates how a pioneering market has matured in the relatively short period of 20 years. Many of the success factors in the wind energy sector, such as specific roles and collaboration between the private and public sectors in supporting the wind energy sector in the pioneering stage, apply also to technology transfer in other sectors and particularly to that of climate change today.

196. Sustainable development is an overarching concept for the public and private sectors, in which climate change plays a prominent role. Sustainable development is a platform for private and public interests to prioritize climate change related investments. The implementation of the concept (from values to strategies to operations) is now gradually getting to scale, and improving access to financing is an important element of this operational agenda. The growing support from international networks, as well as from leading institutions such as the World Bank, is an important milestone in this process.

197. It often appears to be more challenging to develop innovative financing options for adaptation projects than for mitigation projects, so clearly extra effort is required to access additional and fit-for-purpose financing for adaptation projects. Negative impacts of climate change endanger the way in which many sectors function, and adaptation therefore needs to be integrated in all sectors as a more fundamental planning paradigm rather than ‘simply’ as a technological switch. Uncertainty about the effects of an investment, the limited financial returns, primarily local rather than global benefits, and the difficulty of creating strong ownership of the results make up the extra challenge of financing for adaptation projects. However, in essence the same instruments and mechanisms apply to both adaptation and mitigation. Creating linkages to sectors with a regular cash flow, or involving international corporations as stakeholders in a technology transfer project, can be considered to improve access to (private-sector) financing for adaptation projects.

198. Risk and return are key words in financing, and access to financing can be improved by adequate risk management. In addition to traditional financing risks and associated risk mitigation, technology transfer in climate change also has to deal with the politically driven nature of the issue, and the long time horizon for many climate change projects. Optimal cooperation between stakeholders and consultation at an early stage in order to explore the allocation of risks is needed to deal with these specific risks. The impact of these efforts is considerably improved by adequate capacity-building and by establishing a proper enabling environment.

199. With regard to environmental risks, climate change policy can be instrumental in providing clear rules and regulations for investors, supporting the application of modern technologies as part of an investment decision, and possibly turning a risk into an opportunity. On the policy planning level, one could emphasize the need to start with smaller scale pilot projects, followed by scaling up or serial investing, while incorporating the lessons-learnt from previous implementations. This would reduce the investment risks of premature large-scale implementation and thus improve access to financing. Such risk management issues can often be addressed in a timely and proper manner via the PDC framework.

200. As regards the potential returns (or benefits) to financiers, climate change projects typically are in good shape. Increasingly, the financing community is interested in the environmental, economic and social benefits of mitigation and adaptation projects according to the triple-bottom-line (profit, people and planet). Specifying and quantifying these elements is an important aspect of increased access to public and private financing, of which the financing instruments under the Kyoto Protocol are a good example.

201. Multilateral programmes and institutions have been, and still are, crucial to the financing of technology transfer for climate change. First, their funding generally consists of substantial budgets and is based on long-term commitments, which are key factors for an adequate enabling environment (long, loud, legal). Second, multilateral funds usually operate via networks and implementers, thus feeding into a wide network, which is crucial in a relatively new area such as climate change, and which needs a wide group of stakeholders to generate momentum for success.

202. Innovative multilateral options, such as those under the Kyoto Protocol, fit well within the framework for innovative financing options developed in this paper. Stakeholder involvement, quantifying environmental benefits and an enforcing and enabling legal environment are at the core of this framework. Intermediary organizations and private and public institutions are emerging to facilitate this process of innovation and creativity and to support its maturation.

203. Similar to the climate change area, other policy areas such as biodiversity and ozone depletion have developed financing mechanisms which offer promising crossovers with climate change and use instruments similar to those introduced in this paper.

204. The nascent interest of European DFIs is in line with the idea that climate change financing is gradually attracting (semi-) private-sector capital in addition to public funding. All in all, these are expressions of the fact that, from a financing point of view, climate change has become more than just a political issue but increasingly an economic one, as well as a business opportunity.

B. Next steps: Unleashing untapped resources

205. This paper has discussed a variety of innovative financing options to increase access to funding for climate change related technology transfer. In order to establish further the concept of technology transfer for climate change and to integrate climate change concerns into overall investment activity, a number of next steps can be envisaged.

206. First, further exploration of financing options based on new and updated information is essential given that this is a fast-moving area.[68] Simultaneously, experimentation with the tools discussed needs to be continued. Gaining (more) experience with available mechanisms and budgets is a worthwhile endeavour and can lead to valuable insights as to what works and what does not. In that sense, innovative financing pertains to looking for innovative ways to use traditional financing more creatively.

207. Second, in order to have a larger impact and for the real transfer of technologies, it is important that the circle of actors is expanded and awareness raised. The communication and outreach on the results of the experiments to new stakeholders, financiers, project developers and policymakers is necessary in order to increase awareness and hence access to financing for new technologies. Rather than focus exclusively on the policy debate, or wait for a regulatory framework to be changed, the climate change community has the opportunity to set relevant and meaningful examples with existing financial resources and enabling environments.

[68] As indicated in the World Bank report, "Towards a Clean Energy investment Framework" <http://www.developmentgateway.org/aideffectiveness/rc/ItemDetail.do~1061407?itemId=1061407>.

208. Even if many examples in this paper are drawn from the mitigation and energy arena, it is important not to forget that many of the same mechanisms apply to investments in technologies that are important for adaptation. In fact, as this area is just about to develop, the exchange of information between potential stakeholders and potential partners is even more crucial for awareness raising and impact in terms of investments, to speed up the exploration of new ways of cross-sector cooperation, to specify and quantify financial and other benefits and to create public–private partnerships. Adaptation is an area in which cross-fertilization with the other environmental conventions might be particularly promising.

209. Implementation activities can indeed be gradually scaled up while more experience is gained with the risks. In parallel, the climate change community can seek for access to new and innovative financing by actively involving other stakeholders. This may be the fastest way to optimize the implementation of technology transfer for climate change, although the concern of the international community for the effects of climate change may call for a quicker scale-up. In other words, as stated during the 2005 UNFCCC workshop on innovative options for financing the results of the technology needs assessments, “Action is the innovation”.

Annex

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