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North South Transitions to Green Economies

Making Export Support, Technology Transfer, and Foreign Direct Investments Work for Climate Protection

By Tilman Santarius, Jürgen Scheffran, and Antonio Tricarico

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For the hurried reader…

Greening the economy in the context of poverty alleviation and sustainable development rests on, among other things, the rapid and effective dissemination of climate-friendly technologies, namely renewable energies.

The worldwide and sustainable transition of energy systems will only succeed if the economic and technological capacities of all countries are involved. Few developing countries already have considerable domestic production capacities for climate-friendly technologies. Therefore, the main task is to significantly scale-up production capacities for clean and energy-efficient technologies the world over.

Enhancing global technology transfer requires significant financing and smart governance. Intensive global cooperation is needed so that know-how and resources from forerunner countries and companies can be tapped and made available for building-up production capacities and demand in developing countries, and for adapting technologies to local needs and circumstances for its most effective use.

Foreign direct investments (FDI) can provide a valuable vehicle in helping to realise global technology transfer. Chapter 2 outlines how a virtuous circle can be set up. What is needed, on the one hand, is a fundamental reform of investment support policies on the side of the investing countries (typically, but not exclusively, “the North”). On the other hand, an adequate enabling environment and investment governance polices need to be established on the side of recipient countries (typically “the South”). In order to advance sustainable technology transfer for a greening of the economy, this paper takes a closer look at both sides.

As a starting point, in chapter 3, the paper investigates the conceptual framework for sustainable technology transfer, namely how climate-friendly technologies can best be transferred, and what barriers to technology transfer currently exist.

Given that FDI so far has not always performed well as regards sustainability and fairness, chapter 4 reviews past experiences with foreign direct investments. Current market framework conditions as well as existing national, bilateral, and multilateral policies for the governance of international investments are reflected on to assess their adequacy for sustainable technology transfer. Some suggestions are made for how bi- and multilateral investment treaties can be enhanced to allow for countries to better govern foreign direct investment.

Chapters 5 and 6 then discuss in greater detail policies and measures in the North and South to boost sustainable technology transfer. On the side of recipient countries of foreign investments, chapter 5 suggests various policies that could create enabling environments to attract sustainable FDI, and ensure that these investments serve both to enhance climate protection and economic diversification. Proposals are made, among others, on how governments can build effective science and technology infrastructures that involve local governments and community institutions in public spending activities for research and development. Comprehensive technology needs-assessments are necessary to inform decision-makers about future technology options and to help select the strategies most appropriate to the country, while specific technology roadmaps can

then draw future pathways in terms of specific capabilities, locations, and timelines. Moreover, policies that combine fiscal and regulatory measures by lowering costs and stimulating demand – ranging from carbon taxes through to codes, standards, and the removal of counterproductive subsidies to introducing feed-in tariffs – can steer investments in desired directions. Furthermore, governments can better engage the banking sector, for example by demanding that banks and other lending institutions finance environmentally sound technologies and projects, or by establishing public "green development banks". Finally, bilateral or multilateral collaboration between countries and companies could be strengthened through various pilot projects by boosting the Climate Technology Initiative, or by establishing Regional Technology Synergy Centres.

On the side of investor countries, chapter 6 critically reviews current export support schemes in industrialised countries, namely export credit agencies (ECAs). However, multiple reasons discussed in this chapter suggest that it is difficult to reform ECAs so that they serve the public interest for climate protection and sustainable development in the recipient countries. This paper, therefore, suggests establishing new regional or national agencies for supporting fair and sustainable technology transfer. Such institutions should be established in accordance with institutional arrangements and requirements currently being negotiated under the issue of "technology development and transfer" within the United Nations Framework Convention on Climate Change (UNFCCC). To make a concrete proposal for one region, this paper offers details about the suggestion for a European Agency for Low-Carbon Technology Transfer. Specific EU climate bonds, issued under the sovereign guarantee of Member States, would be accessible for institutional investors, governments, as well as for citizens at the retail level. The agency can lend to public and private entities, while it can concede guarantees and insurances against commercial and political risks associated with specific investments. While primarily supporting small-scale projects benefiting local communities, individual large-scale investments and projects should be eligible under a selected and limited list of technologies to be regularly reviewed and updated by the board of the agency. A fair and transparent dispute resolution mechanism between the host country and the agency board could settle eventual disagreements and facilitate conciliation, including third parties' involvement. At the same time, the European Ombudsman, elected by the European Parliament, could be tasked to ensure transparent, independent, easily accessible, and effective accountability mechanisms for directly affected communities.

If the creation of attractive enabling environments in the global South goes hand in hand with new ways of careful export support in the global North, this will work as a global and fair Green New Deal. In the end, all sides will significantly benefit: anthropogenic greenhouse gases can be reduced, while at the same time increased global cooperation will help foster sustainable development in the South and a greening of the economy in the North.

1. Introduction: Stepping Up Global Cooperation

The world is facing two major challenges that are closely related to energy. On the one hand, atmospheric CO2 concentrations need to be stabilised at a level that avoids catastrophic climate change. On the other hand, access to affordable, reliable, and clean energy is required to alleviate poverty and ensure decent living standards, in particular for the 1.5 billion people of the developing world in rural areas without connection to the power grid. In order to answer both challenges at the same time, current fossil-based energy systems need to be replaced by sustainable and low-carbon energy supplies. Renewable energy sources, together with complementary efforts to save energy, can play a key role in simultaneously addressing the challenges of global warming and energy access for a growing world population. Similarly rethinking energy production, distribution and use could allow a deeper transformation of our societies for promoting a more democratic approach to managing the commons.

To succeed with such a "sustainable and fair energy transition", it is essential to understand the significance of the task (WBGU 2011). Energy is a key driver of economic growth and social progress. It is "essential to fueling industry, powering infrastructure, connecting goods, people and services to markets, and delivering basic services such as heating, lighting and cooking" (WBCSD 2010). For the billions of people without access to modern energy services to help them escape poverty and establish new productive economic activities, investments in energy infrastructure (on- and off-grid) are indispensable (see Box 1). However, it is central that these new investments promote energy infrastructures to empower local communities and their ways of organising society and political relations around public interests (Hildyard et al. 2012).

Box 1: Energy poverty and development: Facts and trends

• Today, the one billion people (16% of the global population) living in developed regions consume half of the world's energy supply. In contrast, one billion of the world's poorest people use 4 per cent.
• Roughly 1.6 billion people worldwide live without electricity.
• In sub-Saharan Africa, 547 million people have no modern energy services, and as few as 8 per cent of those living in rural areas have access to any electricity.
• Around 2.4 billion people still rely on traditional biomass (wood, straw, dung, etc.) to cover their basic energy needs. In many developing countries, biomass accounts for more than 90 per cent of household energy use. The burning of biomass in simple stoves results in indoor air pollution, causing 1.3 million deaths per year, primarily among young children and mothers.
• By alleviating this "global energy divide", the demand for primary energy is projected to increase globally by a factor of 1.6 to 3.5 between now and 2050, and in developing countries by a factor of 2.3 to 5.2.

Source: WBCSD (2010)

As the energy demand of developing countries grows, the developing countries' share of greenhouse gas emissions is also expected to rise, from 39 per cent today to 52 per cent by 2030 – with China being responsible for 29 per cent of the predicted rise. India is already the fifth biggest emitter of CO2 emissions, yet approximately 45 per cent of its population does not have access to electricity, and approximately 85 per cent of the population lives on less than $2 per day (UNDP 2006). Clean energy could possibly help satisfy the growing energy demands of developing countries, including their growing challenge to produce for domestic consumption as well as export to industrialised countries while cutting carbon emissions.

Climate change is expected to have many negative impacts, particularly in vulnerable developing countries. Reducing carbon emissions contributes to preventing the long-term economic, social, and environmental damages and costs of climate change and helps to accomplish the targets for greenhouse gas emission reductions as set by the UNFCCC and the Kyoto Protocol.

Rising oil prices and dependence on energy imports from fewer and fewer oil-exporting countries have increased the demand for alternative energy paths. With rising oil prices, the competitiveness of renewable energies will further improve. At the same time, higher oil prices – due also to financial speculation on oil markets – have created vast incentives for the development of non-conventional fossil fuel sources, including tar sands, offshore oil explorations, as well as shale gas. Particularly dependent (and thus vulnerable) are developing countries, whose oil supplies largely rely on imports. Furthermore, even some oil-producing countries have problems in accessing oil products, given their very limited refinery capacities, such as in the case of Nigeria.

Scaling-up production of renewable energies would significantly reduce oil imports and diversify the energy sources. Renewable domestic energy sources offer great development perspectives to structurally weak rural areas. A UN study (UNEP 2009) on the potential of green jobs found that renewable energy generates more jobs than employment in fossil fuels. Projected investments of $630 billion by 2030 would translate into at least 20 million additional jobs in the renewable energy sector.

At the same time, it is essential to establish renewable energy sources in a sustainable, democratic, and development-friendly manner. While renewable energies are highlighted as having the least negative impact on climate change, greenhouse gas savings can vary significantly for the specific production and conversion paths and their inputs. There is an ongoing debate about the carbon balance of biofuels and their impact on land use and food security in developing countries (Scheffran and Summerfield 2009). Furthermore, large dams have had outstanding and extensive social and environmental impacts – as well as some impacts on climate change – to the point that many do not regard them as sustainable renewable energy sources (World Commission on Dams 2000). In some cases, large-scale wind farms built on cleared land that had previously belonged to local communities generated social conflicts. If not addressed properly, these and other concerns about possible adverse implications of renewable energies may undercut their support, demanding that renewable energy production and consumption is established in a manner that facilitates sustainable development in the South (Hazell and von Braun 2006).

From a broader economic perspective, renewable industry expansion should be put in the context of the current economic and financial crisis. Several observers raised concerns about a possible next "green bubble" due to highly speculative investments artificially inflating the renewable sector, biofuel expansion (Laughlin 2011) and carbon markets (Friends of the Earth 2009), in particular in emerging economies.[1]

Towards a sustainable and fair energy transition

Stabilising the atmospheric CO_2 concentrations at non-dangerous levels will require – among other transformative actions of our societies – a rapid increase in the scale and speed of low-carbon innovation and technology. For instance, to achieve a 450-ppm scenario by 2050, global emissions need to be reduced by 50 Gt CO_2 compared to 2005 (IEA 2006). With an increase in energy demand in non-OECD countries, a major challenge is to accelerate the diffusion of low-carbon technologies to developing countries (WBCSD 2010).

In both developing and developed countries, there is a significant growth potential of innovative technologies for heating, electricity generation, and transportation fuels. There has been a dramatic shift in policy support in many parts of the world in recent years; the growing demands and rising levels of subsidies for renewable energies have broadened the economic basis of this policy support. This is expected to lead to a large expansion of sustainable energy and energy-efficiency technologies over the next decade and beyond, in particular if current subsidies for fossil fuel technologies are phased out soon.

Beyond the innovation of technologies, the improved dissemination and broad application of these technologies must occur fast enough to prevent global climate disaster. Since fossil-based technology is part of the problem, a radical change in technology use is needed that is environmentally sound, sustainable, and low-carbon.

To achieve this, innovations are necessary in the social and political realms. The global climate policy debate is no longer about whether to take action but about how, when, and where to act; which actions need to be taken; and by whom. While the struggle against global climate change ranks high on global political agendas, policy-makers are struggling to find and agree upon the best policy frameworks. Various conflicting issues need to be bridged and integrated in the future: science and society, economics and the environment, international and domestic policies, global and local governance, public and private spheres, governments and civil society, North and South. Overcoming these differences requires a level of coordination and cooperation unprecedented in history as well as a strong political will to overcome entrenched interests to maintain the status quo.

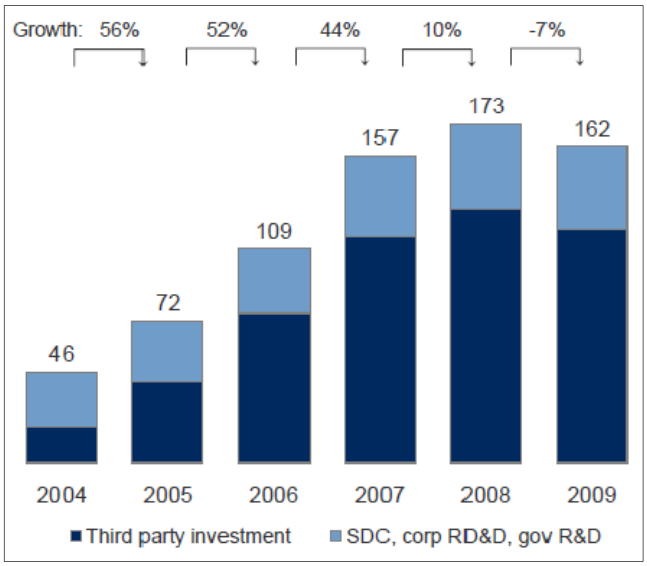
Managing the sustainable energy transition requires tremendous financial resources, and there have been considerable changes in recent years. Countries all over the world – from China and India to Germany and the United States – are spending considerable

[1] This was the case with recent significant investments into emerging renewable companies in India by private equity infrastructure funds; their values were artificially inflated for purely speculative reasons during the IPO listing process.

amounts of money to transform the energy bases of their economies. Since 2000 there has been significant growth in new investment in sustainable energy, with annual growth rates exceeding 50 per cent (see Figure 1). In 2008, the record of $173 billion was reached, followed by a 7 per cent reduction to $162 billion in 2009, largely in response to the economic recession. However, major economies began to spend some of the estimated $188 billion in "green stimulus" policies, including for renewable energy. According to REN21's *Renewables 2010 Global Status Report*, more than 100 countries had some type of policy target or promotion policy for renewable energy by early 2010 (Bloomberg 2010).

However, while scaling-up investment and financial resources in low-carbon technology is important, it does not suffice to generate real change in energy patterns if it is not coupled with the definition of an innovative framework of public interest policies guiding a sustainable and just energy transition, including the regulation of foreign direct investment and international financial and export flows at large.

Figure 1: Global investment in sustainable energy from 2004 to 2009 (bn $)



Source: Bloomberg (2010)

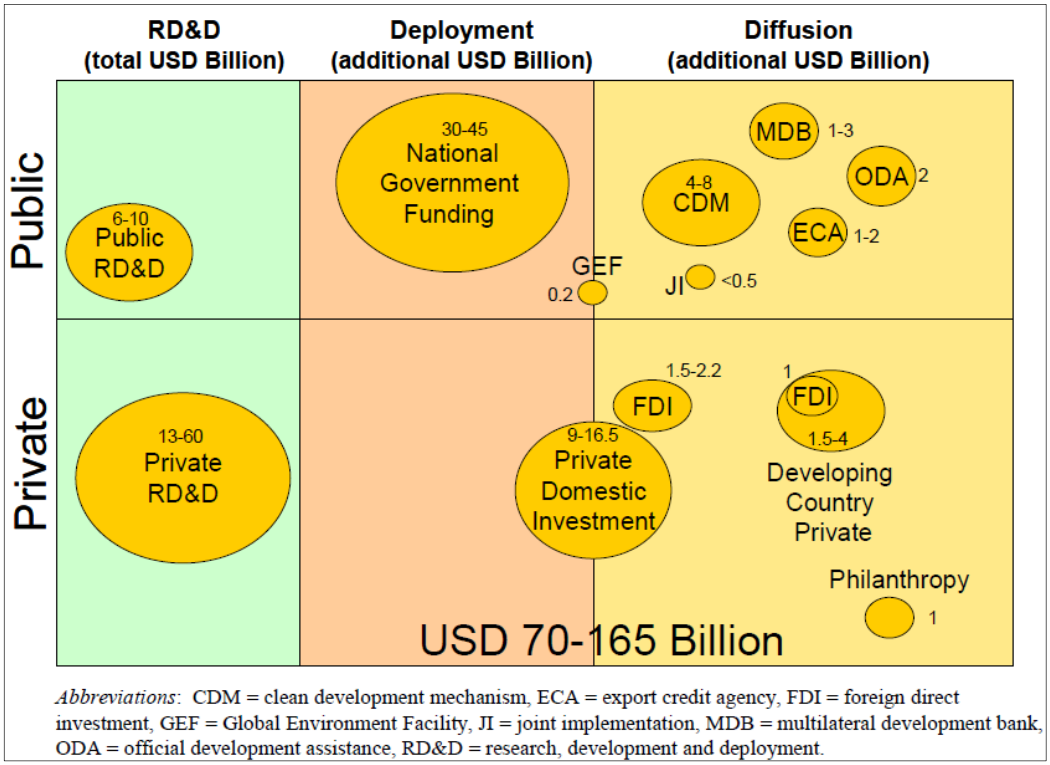
Many countries have already started to foster an increased global cooperation on climate-friendly investments, for example, through foreign direct investment (FDI). Low-carbon FDI is estimated to have already reached a significant level, with flows of roughly $90 billion in 2009 in three key industries alone: (a) alternative/renewable electricity generation; (b) recycling; and (c) manufacturing of environmental technology products (such as wind turbines, solar panels, and biofuels). Yet according to the *World Development Report*, only around 40 per cent of identifiable low-carbon FDI projects – measured by value – during the 2003–2009 period were in developing countries, including projects in Algeria, Argentina, Brazil, China, India, Indonesia, Morocco, Mozambique, Peru, the Philippines, South Africa, Turkey, the United Republic of Tanzania, and Viet Nam. Transnational corporations from industrial countries are major investors, but about 10 per cent of identifiable low-carbon FDI projects from 2003 to

2009 were generated by corporations from developing and transition economies, with the majority of their investments in other developing countries (WIR 2010).

Even though low-carbon technology investments have been steadily rising, the global scale of the challenge in reducing greenhouse gas emissions requires a much larger financial and technological response. For the 2010–2015 period, one estimate indicates that $440 billion of recurring additional global investments per year are required to limit greenhouse gas emissions to the level needed for a 2ºC target to be met. The estimates up until 2030 range even higher: up to $1.2 trillion per year.

Estimates of the financing resources currently available are classified in a UNFCCC report (2009) by the maturity stage of the technology that they are intended for, whether the resources are from the public or private sector, and whether they are under or outside the Convention. The estimates for mitigation technologies, shown in Figure 2, are between $70 and 165 billion per year. For technologies for adaptation, the research and development is focussed on tailoring the technology to the specific site and application; it therefore forms part of the project cost. Current spending on adaptation projects in developing countries is about $1 billion per year.

Figure 2: Estimates of current financing for mitigation technologies



Source: UNFCCC (2009)

Given the sheer magnitude of finances needed, it is clear that public financing, as currently conceived and operated, is not sufficient to address the problem. Current fiscal constrains, in particular in European countries, further limit the scope of action for

climate financing by public financial institutions. Thus, many observers and policy-makers have voiced the need to involve the private sector. Indeed, several studies emphasise that the financial contribution of the private sector is essential for achieving progress in making economies worldwide more climate-friendly, particularly in view of the huge public fiscal deficits worldwide.

Public initiatives are essential to leverage private capital and to channel it into the most climate-friendly direction. However, since businesses can be seen as both part of the problem and part of the solution, climate change policies need to encourage business to make more constructive contributions. The challenge is how public policies can drive the transformation of private investment and financial markets by setting rules and incentivising priorities for these – and possibly reducing speculative attitudes – to make these flows compatible with public interest action.

Box 2: Patterns of financing

(a) The financing resources for technologies for mitigation and adaptation make up only a small share (probably less than 3.5%) of the resources devoted globally to all technology development and transfer.
(b) Most of the financing resources (probably over 60%) for the development and transfer of climate technologies are provided by businesses.
(c) Most of the remaining resources (about 35% of the total) are provided by national governments.
(d) Technology development is concentrated (about 90%) in a few countries/regions – the United States of America, the European Union, Japan and China.
(e) Although R&D is becoming more international, there is no international funding mechanism and limited coordination for such activities.
(f) Only about 10–20 per cent of these resources are used for the development and transfer of technologies to developing countries.
(g) Current financing resources need to be increased significantly, including tighter capital controls, which could mobilise existing domestic resources and channel these – as well as some external resources – into sustainable and productive activities.
Source: UNFCCC (2009)

Estimates of financing needs

- The International Energy Agency (IEA) estimates that developing countries will need annual electricity supply investments of approximately $165 billion through 2010, increasing at about 3 per cent a year through to 2030.
- About half of the necessary financing is readily identifiable, leaving an investment gap in the energy sector of about $80 billion per year. The IEA estimates that international financial institutions, aid donors, and the private sector can close this gap by approximately $11 billion per year through additional investments using existing financial instruments.
- In its 2007 analysis of financial flows, the UNFCCC estimates that $200–210 billion will be necessary up until 2030 to stabilise greenhouse gas emissions at today's levels. The incremental costs of low-carbon investments in developing countries are likely to be at least $20–30 billion per year.
- Today, private sector investments constitute the largest share (86%) of global investment flows and are expected to be essential to addressing climate change. Large additional flows of tens of billions of dollars will also be needed for adaptation.

Source: WBCSD (2010)

2. Export Support and Investment Governance for Climate Protection

There are few strong producers and exporters of climate-friendly technologies among the developing countries. A worldwide energy transition and sustainable economic transformation will only succeed if the economic and technological capacities of all countries are involved. To govern the transition, therefore, the main task is to significantly scale-up production capacities for clean and energy-efficient technologies all over the world, in particular in the global South. Know-how from forerunner countries and companies needs to be tapped and made available for worldwide application and continuous improvement.

In principle, by complementing the mobilisation of domestic resources, foreign direct investments could be a valuable vehicle to advance the transfer of know-how and production capacities for low-carbon technologies into countries that still need to develop this sector. Yet despite the existence of bilateral and regional investment agreements, which guarantee investors' rights, only a few developing countries currently enjoy significant foreign investment inflows. The majority of the world is by and large marginalised from foreign investment flows. The reasons for the lack of foreign investment inflows are diverse, including lack of domestic financing, demand, and market size; inefficient and untransparent bureaucracies; lack of investment stability; corruption and bad governance; and more. At the same time, foreign investors sometimes try to obtain better financial and fiscal conditions, exemptions from local laws, or broader reductions in performance requirements for their FDIs as a condition to operate in certain countries, thus creating dubious environmental, social, and development impacts. In effect, simple liberalisation of investment conditions has not helped in overcoming the barriers; in fact, it has sometimes worsened the environmental and social soundness of foreign investments.

A virtuous circle for sustainable technology transfer

International cooperation can help in overcoming several of these barriers and problems. On the one hand, more regulations and standards are needed to ensure that foreign investments work for climate protection and sustainable development. On the other hand, public money could serve as a mean to overcome limited demand or market size and to reduce forerunner companies' financial risks when investing abroad. This is the carrot and the stick: to unleash private capital for foreign low-carbon investments through public support while governing these investments to maximise their mitigation and sustainable development potential on the ground.

In order to realise such a virtuous circle, industrialised countries must raise – and make use of – public money to support and channel foreign investments into climate-friendly operations. In particular, support should be offered to companies, for example renewable energy companies, that aim to invest in countries with low production capacities and under certain environmental, social, and development conditions. The level of support

should significantly raise companies' interests to go abroad. At the same time, countries should support only those investments that conform to the highest standards at home.

For example, countries can insure investments against financial and market instabilities; pay investment premiums to incentivise investments into markets with limited demand; provide loans with low interest rates to make investments attractive, even where returns on investments are expected to be low; and the like. In some cases, governments may build on existing national (or regional) mechanisms and institutions that already promote foreign investments. However, as this paper shows in great detail after having taken a closer look at the current state of export credit agencies, several challenges remain. Most industrialised countries will have to both radically reform their export support schemes to make them work for climate protection and sustainable development, as well as scale them up to increase the pace of international collaboration.

Those countries receiving foreign investments, that is, countries of the global South, must progressively govern foreign investment inflows (see also UNEP 2011, 553). Strong, stable, transparent, coherent, credible, and ambitious long-term investment policies are key to effectively governing foreign investment inflows and making them not only work for climate protection but for the larger social, economic, and environmental goals. For example, investment policies can channel foreign capital to climate-friendly sectors; require domestic/local companies to hold significant ownership stakes in joint ventures; demand that foreign investors purchase locally wherever possible; mandate foreign investors to offer additional capacity-building programmes and training of domestic personnel; and the like.

National investment policies should be designed in such a way so as to maximise mitigation potentials as well as economic diversification and development. They can be guided effectively by technology roadmaps and should help countries to implement their nationally appropriate mitigation actions. At the same time, investment inflows will create a multiplying effect in Southern economies as a whole, thus triggering further economic activities in adjacent sectors, services, local suppliers, and retailers while leapfrogging into a low-carbon future.

Finally, from a broader macroeconomic perspective, careful management of developing countries' balance of payment is needed for the planning and governing of foreign direct investments in order to reduce external shocks due to financial crises and sudden withdrawals of investments as well as to avoid harmful imbalances, which could make countries' FDIs dependant and heavily indebted in the long run (Woodward 2001).

Reducing risks and sharing benefits

Although the North and South have different responsibilities and capacities, such a smartly designed transformation can reduce the risks and bring benefits to both. While developed countries are expected to take on the incremental costs of low-carbon investments in the global South – and thus to be the main source of the financing needed for the transition – this may become an opportunity rather than a burden for them. Increased foreign investments into environmentally sound technologies will diversify the portfolios of domestic companies, link them to international markets, create

new jobs, and generate returns on investments. In times when the potential for economic growth in industrialised countries continues to shrink, supporting domestic companies to engage abroad and help other countries build up their own local energy industries, could enable a "soft landing" for economies in the North when entering the age of sustainability.

At the same time, financial transfers can create social and economic benefits for the countries in the global South, in particular for rural and urban communities. Benefits first and foremost include employment opportunities, reduction of poverty, and access to advanced technologies. Investments can strengthen domestic markets and develop future export markets, leading to economic diversification. Furthermore, investments may translate into infrastructure development, contribute to rises in local GDP, and result in a reduced share of GDP spent on energy imports, either through energy efficiency or the use of local renewable sources (WBCSD 2010). Protecting the environment and preserving natural resources can provide additional social, environmental, and economic benefits, while also reducing the vulnerability to climate change impacts. Although many developing countries are not major greenhouse gas emitters, new technology investments would help them to enter low-emission pathways and avoid the dirty development paths that industrialised countries have been pursuing.

The sustainable energy transition is significant for the public sector, which in the past has been a main source of the political and societal interventions driving technology development and transfer, such as through direct governmental expenditures, research, regulations, and policies. Renewable energy systems receive a high level of public support, which is justified by the expected energy, economic, and environmental benefits of renewable energies, including a number of co-benefits, such as: sectoral effects of rural electrification; energy security through energy diversification and improved efficiency; local environment benefits; and international funding opportunities.

From a business perspective, there might also be major advantages for the private sector to pursue climate change mitigation and the transfer of low-carbon technologies. Beyond some returns, companies involved in the transfer process are likely to help improve production processes, including enhancing their energy-, material-, and resource-efficiency. Early adopters profit from strengthened productive capacities and enhanced competitiveness. Driving this process would accelerate a developing countries' transition and facilitate leapfrogging into a green economy, assuming that there will be an increased demand as well as new export and domestic opportunities for low-carbon products and services. On the demand side, a growing pool of responsible consumers and the rise of a sustainability-oriented civil society shaping consumer preferences will help to establish such a market (UNCTAD 2010.

However, a key question remains about which type of private sector (large multinationals, listed companies with high reliance on capital markets, small and medium enterprises, cooperatives, other non-profit actors, private companies with public equity, local municipalities' companies, and so on) is best suited for promoting a socially just, long-term, economically sustainable green economy. In particular, identifying new mechanisms and regulations for technology transfer at the global level should include reflections on how to become more responsive in moving towards a more localised, community accountable, and democratic green economy.

3. A Conceptual Framework for Technology Transfer

The importance of technology transfer was realised in the agreements achieved at the 1992 UN Conference on Environment and Development (chapter 34). Likewise, Article 4.5 of the UN Framework Convention on Climate Change requests: “The developed country Parties … shall take all practical steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties. Other Parties and organisations in a position to do so may also assist in facilitating the transfer of such technologies.”

The promise of access to new technologies was a central incentive for developing nations to support the UNFCCC in 1992 but success has been widely questioned and many developing nations feel frustrated about the lack of technology transfer in practice (Feldman 1992; Foray 2008). The importance of technology transfer was also recognised in Article 10c of the Kyoto Protocol. Furthermore, this treaty has created mechanisms to reduce emissions, including the Clean Development Mechanism (CDM), which is focussed on low-carbon technology transfer to developing countries. Although the CDM (as well as Joint Implementation) was expected to generate foreign investment and technology flows, this expectation has largely not been met. Because the Protocol’s mechanisms were designed for compliance with emission-reduction targets of industrialised countries, this created little incentive to maximise the transfer of technology to developing countries. Furthermore, the questionable implementation of the principles of environmental and financial additionality for CDM projects has rewarded dubious – and in some case environmentally and socially harmful – projects (CarbonTradeWatch 2011).

In a different context, at Gleneagles in July 2005, the G8 highlighted the importance of strengthening technology cooperation to develop low-carbon energy options; yet what followed were only some bilateral actions (Mallett et al. 2009). The issue of “technology transfer and development” also figures high in current climate negotiations within the framework of the Bali Action Plan. The climate conference in Cancun (COP 16) in December 2010 suggested a number of concrete measures for technology transfer and investment, offering various opportunities for collaboration between public and private sectors. Yet these negotiations have not been concluded, and thus, uncertainties about the post-Kyoto framework weaken the private sector’s ability and willingness to make decisions in the area of climate change.

In essence, therefore, the current international climate regime lacks what the private sector needs most: a strong international and national commitment by governments and a clear, stable, and predictable policy framework (see also WBCSD 2010). Recent climate summits in Cancun and Durban showed that governments are not willing to agree on a comprehensive international policy framework to prevent runaway climate change, so alternative routes need to be explored before it is too late. The current

international climate change regime so far has not strongly encouraged low-carbon foreign investment and related technology flows, particularly into developing economies. It has become clear that there is a dire need for creative mechanisms – both at national and international levels – to effectively mobilise the private sector's contributions to cross-border capital flows and technology diffusions, especially to the global South.

What is sustainable technology transfer?

Technology transfer is widely seen as the main instrument to bridge the technology gap between North and South and, increasingly, between a few high-growth and many poorer developing countries. There is a range of literature on the process of technology transfer that covers various issues of innovation, development, behavioural change, and economic development (see the overviews in IPCC 2000 and Karakosta et al. 2010), although there are no overarching theories. In the following, we outline a few points that should be remembered when analysing the innovation, transfer, and diffusion of low-carbon technologies. This is followed by a section that identifies important barriers and obstacles to technology transfer.

Technology transfer reaches beyond the trade of "end products" and can include the entire lifecycle of a given technology, including research and development, design, testing, assembling, building, production, maintenance, transport, utilisation, dismantling, and waste management. Since the ultimate goal is to facilitate technology development in other parts of the world, the trade of "end products" can rather be seen as an auxiliary function of technology transfer at the beginning of the process. More important, however, is that the necessary enabling environment and infrastructure needs to be created so that as many stages of the technology lifecycle as possible can be accomplished domestically. Moreover, technologies often need to be adapted to local needs and conditions. Ultimately, technology transfer will involve three separate technology flows: a) physical goods and equipment, b) skills and know-how for operating and maintaining equipment, and c) knowledge and expertise for generating and managing technological change. It is not sufficient to only transfer technology goods without also the knowledge of how to (re-)produce them and the skills of how to use and maintain them.

Note that technology transfer is embedded into societal structures, and it transforms them at the same time. In order to be produced, used, and maintained, a technical system requires resources and infrastructures for its operation as well as human and social capital that rests on the working capacity of people who maintain and operate it, as well as on their knowledge, skills, expertise, and communication. Some gaps can be closed domestically by building the capacity needed; other gaps have to be acquired internationally, provided they can be relocated. This may be feasible for individual components (such as mechanical tools or vehicles) but it is more difficult for whole network systems (such as power grids or transport systems). A particular challenge is to organise the transfer of human capital, assuming that human beings may only temporarily want to relocate, and in limited numbers.

Throughout the process of technology transfer, various stakeholders are involved, such as governments, private-sector entities, financial institutions, NGOs, and research/education institutions. In addition, stakeholders in North-South transfers include, inter alia, project developers, technology owners, technology suppliers, product

buyers, recipients, users of the technology, financiers and donors, governments, international organisations, NGOs, and community groups (IPCC 2000). To overcome the various barriers to technology transfer, the interests and influences of all different stakeholders need to be considered and incorporated, for example, through stakeholder dialogues.

How does the actual transfer of technologies take place? Three different "pathways" can be distinguished (Karakosta et al. 2010): government-driven pathways of technology transfer, which are initiated by governments to fulfil specific policy objectives; private-sector-driven pathways, which primarily involve transfers between commercially oriented private-sector entities; and community-driven pathways, which involve community organisations with a high degree of collective decision-making. No doubt, private-sector-driven pathways have become the dominant mode of technology transfer. More specifically, technology transfer is often driven by transnational corporations that are seeking to expand their markets. However, during the last years, technology transfer has been increasingly organised by multilateral organisations and NGOs that are concerned with promoting technology transfer to support development in a more sustainable and equitable manner. Table 1 illustrates the importance of the different types of financing to various transfer routes. The main focus of this study is on government-driven pathways.

Table 1: The relative importance of particular types of financial flows to technology transfer pathways

Technology transfer pathway	Government	Private sector	Community
Cross-border movement of personnel	–	+++	–
Foreign direct investment	+	+++	–
Foreign portfolio equity investment	+	++	+
Government assistance programmes	+++	–	++
Joint ventures	+	+++	–
Licensing	++	+++	–
Loans	++	+++	–
Meetings, workshops, conferences, and other public forums	+	–	+++
NGOs	+	–	+++
Open literature (journals, magazines, books, and articles)	+	+	+++
Trades in goods and services (includes purchases, sales, exports and imports)	+	+++	–

(+) Minor; (++) secondary; (+++) primary component of pathway

Source: Karakosta et al. (2010)

In order to go beyond the narrow scope of technology transfer, which seeks to support access to specific technologies, the diffusion of new innovations will require a broad approach to capacity-building to enable developing countries to generate their own innovation systems. Recent research suggests that large increases in low-carbon diffusion rates can be achieved through an emphasis on system-wide capacity-building to improve internal innovation and absorption systems. It is important that countries

move beyond a narrow national competitiveness to capture the global public-good aspects of low-carbon innovation.

To build effective innovation systems in developing countries, international collaboration will be vital to achieve the necessary commercial scale for low-carbon technologies (Tomlinson et al. 2008). International technology dissemination entails the acquisition, mastery, diffusion, and "indigenisation" of knowledge, technology, and skills in a host country, all of which are not only transferred across borders, but also absorbed by local actors. In this context, "acquisition" means movement of the technology to local players; and "mastery" requires that local actors are fully capable of using the knowledge and building on it (i.e. they have the "absorptive capacity" to do this). Indigenisation of technology is a long-term concept, implying that the technology has become part of the national knowledge and innovation system – including the diffusion to other enterprises and the further research, development, and innovation in the host country (WIR 2010).

Addressing barriers and obstacles to technology transfer

To develop and utilise the huge potential for low-carbon technologies in the developing world, a number of barriers and obstacles that limit their availability and applicability need to be overcome. Barriers arise at each stage of the technology transfer and investment process, including infrastructure and ownership, cost and financing, regulatory and policy barriers, and other factors that vary across countries.

Lack of capacity-building and domestic infrastructure

A key barrier to technology transfer is the South's lack of domestic infrastructure and absorptive capacity, which is more significant at early stages of development than for technologies in the later stages of commercialisation. Since capacity-building is neither easy nor quick, attempts at capacity-building have a long history of failure (UNDP and HIID 1996). Previous development assistance projects (e.g. small-scale renewable-energy technologies in the 1970s and 1980s), often were considered failures because of poor technical performance and lack of replication of the original projects as well as lack of attention to user needs and local conditions. Despite the emphasis on capacity-building and a few success stories (e.g. Solar Home Systems in Kenya and Bangladesh), the record of capacity-building in practice so far has been mixed. There is a great deal of uncertainty about precisely what capacities are needed and how they are developed (IPCC 2000). Without investment in capacity-building, the skills qualifications in developing countries will remain at a lower level compared with industrialised countries.

Macro-economic conditions and market failure

In many countries in the South, the macroeconomic conditions are poorly developed, in particular in the financial sector. Key factors that increase investment risk are high or uncertain levels of inflation and interest rates, high import duties, and often changing tax or tariff policies. Due to low prices and subsidies for conventional energy, there are negative incentives to adopt energy-saving measures and renewable energy technologies. Often proper market conditions are missing, for example a lack of manufacturers and consumer acceptance, or diminishing confidence in economic, commercial, and technical viability of low-carbon products and technologies. As a result,

market demand is concentrated in high-income and transition economies with large industrial population centres and existing power transmission infrastructure.

Lock-in due to lack of information, innovation, and diffusion

Many developing countries have only limited experience in green technologies and lack the strong knowledge base, integrated physical infrastructure, financial resources, and institutional capabilities needed. Innovation- and invention capacity are overwhelmingly concentrated in high-income countries and are missing in many developing countries, thus limiting their ability to engage in effective decarbonisation and adaptation (Tomlinson et al. 2008). Even in China as one of the leading countries in technology production in the global South, more than 85 per cent of the patents in China's core high-tech economic sector are owned by companies in developed countries (Liu 2007). Since most low-carbon technologies are new or under development, it is costly to acquire and use them, limiting their diffusion rate and penetration (World Bank 2008, 68).

Deficits in research and development spending policy

More than 80 per cent of global research and development is conducted in just 10 countries. Most of it is directly undertaken by transnational corporations, including the technologies required for climate change mitigation (National Science Board 2010). Despite some recent increases, public spending in energy-related R&D over the last 25 years has fallen by up to 50 per cent in real terms in major developed countries (IEA 2008). During the past 15 years, only 7.7 per cent of R&D budgets in IEA member countries was devoted to renewable energy technologies. Solar heating and cooling represents only 0.55 per cent, and solar PV only 2.68 per cent (Karakosta et al. 2010). Wind power, geothermal energy, and concentrated solar power receive even less money, which suggests that public R&D funding is somehow inversely proportional to the energy potential (IEA 2006).

Experts unanimously agree that the amount of R&D funding for low-carbon energy technologies needs to be increased tremendously. For instance, the Stern report has called for a doubling of R&D funding, and a much larger increase in deployment funding (Stern 2006).

Intellectual property rights

The adequate governance of intellectual property rights (IPRs) is a major requirement for successful technology transfer and investment. Insufficient IPR protection can deter international firms from transferring technologies, while strict protection of IPRs by supplier firms can prevent recipient firms from gaining access to the knowledge necessary to imitate, and then innovate, on the basis of new technologies, creating barriers to easy dissemination. Patenting rates in carbon emissions technologies have risen by 20 per cent per year since 1997 – a faster increase than in traditional energy technologies. It is worth noting that governments financed much of the basic research undertaken at universities and public research laboratories, and the majority of the financing has come from a relatively small number of countries. There has been a marked expansion of patent applications in developing countries, leading to a five-fold increase in applications in the last four years of the period studied. However, all expansion occurred in a small group of emerging economies. For instance, China is a significant source of new environmental technologies and holds a significant share of

global patents in solar energy and fuel cells. Other emerging economies are important sources for other technologies, for instance Mexico in hydro/marine technologies and India in solar PV technologies. Therefore, the issue of low-carbon technology transfer and patents increasingly needs to be discussed not only from a North-South perspective, but also a South-South perspective. Failure to address the proprietary and appropriability issues related to IPR can severely inhibit the development of technological capacities within countries that still need to build up their own domestic innovation capacities.

Financial and political obstacles for foreign investment

Only a few developing countries currently enjoy the economic and political conditions for significant foreign investment inflows. Among the economic factors are the lack of viable market structures, domestic financing, and investment stability. Inappropriate characteristics of the banking system – such as inadequate banking regulations, supervision, and oversight – can adversely affect long-term investment, the import of capital goods, and technology transfer. Simple liberalisation of investment conditions has not worked to overcome the barriers; sometimes it even worsened the environmental and social conditions for foreign investments. With their nascent regulatory and institutional structures, their small markets, and their emerging indigenous firms, developing countries are particularly vulnerable to transnational corporations and their potential for anti-competitive practices (WIR 2010). Equipped with cutting-edge technology and the capacity to implement more capital-intensive and efficient production processes, transnational corporations may effectively crowd-out domestic companies in developing countries, especially those operating at an (overall) lower level of efficiency, output, and quality. This can lead to reduced competition in host country markets and thereby contribute to the potential for market dominance and restrictive business practices.

4. Foreign Investments and Sustainable Development

The impact of foreign direct investment on development in general has been a much debated topic. International financial institutions as well as the Organisation for Economic Co-operation and Development (OECD) and its member states have increasingly promoted FDI with the assumption that it creates new jobs, spreads best-practice social and environmental standards, and stimulates the transfer of technology, eventually leading to economic growth. On the other hand, civil society organisations and labour unions have documented many negative effects of FDI, such as human rights violations, harmful environmental practices, and tax evasion by transnational companies in developing countries. Furthermore, volatility in FDI flows have contributed to regional and global economic imbalances, which are at the heart of unfolding systemic financial and economic crises.

Lessons learnt from past experiences

In theory, FDI may positively contribute to sustainable development in several ways. The mainstream economic argument in favour of FDI-led development is the existence of spillover effects on domestic companies in terms of technology, marketing, and management knowledge; movement of employees; and imitation of production (OECD 2002). But this happens only in some sectors and in some cases – for instance the establishment of special export zones prevents spillovers from happening. FDI may also augment economic growth, if it contributes positively to the capital and current account balance and government revenues. These issues are quite hot at the moment in the G20 debate on capital controls as part of the policy options for reducing global economic imbalances and on transfer mispricing by transnational corporations, which is at the heart of tax avoidance via offshore financial centres.

Conventional FDI has often brought negative social and environmental impacts and has not necessarily contributed to significant employment creation in the long-run. In particular, transnational corporations have been repeatedly accused of not producing positive spillovers, but rather just generating pollution and environmental destruction, most severely in extractive industries and the energy sector (Singh 2007).

In order to attract more FDI, many developing countries have opened their markets by conceding better terms, for example through tax cuts and loosened environmental and social legislation. In addition, several countries have had to fully liberalise their capital accounts under pressure from structural adjustment programmes of the International Monetary Fund and the World Bank. Yet this has not even contributed to a significant increase in FDIs, but rather has reduced host countries' policy space in the long-run. The lack of capital controls has contributed – together with trade and investment liberalisation – to the generation of global and regional imbalances, thereby putting the entire global economy at risk.

As empirical evidence shows, FDI is not an automatic route to economic growth, but in many cases and for various reasons, FDI has led to an outflow of capital rather than an inflow. In several developing countries, profit remittances are even higher than FDI

inflows. Not to mention problems related to tax evasion and transfer mispricing by foreign investors. Therefore, these issues raise once more the need to identify under which conditions FDI can contribute in the long-run to the common good – in terms of wealth redistribution, long-lasting development, and climate mitigation and adaptation – more than just arguing whether international investment is good or bad in itself (SOMO 1999).

Today, a web of about 3,000 bilateral and regional treaties on investment – centred on investment liberalisation and biased in favour of investors' rights – regulate FDIs internationally. Policy prescriptions and practices differ from one case to another, likewise the mechanisms to redress possible violations of these treaties (IISD 2011). Furthermore, each individual operation is ruled by specific project investment treaties, with their own sets of rules, clauses, and related mechanisms – often biased in favour of protecting investors more than the public interest (Hildyard and Muttit 2006).

Lately, in particular in the vein of the economic and financial crisis, multilateral and national development institutions have turned their attention back towards supporting FDIs and portfolio investments as a key engine for economic growth in developing countries. This controversial shift, often based on macroeconomic assumptions still disputed by the academia and civil society (SOMO 2008), has raised new questions about what kind of investments should enjoy public support. For example, pivotal question are: Under which conditions can transnational companies be true actors fostering sustainable development? Or should public support rather be focussed on local economic actors, including new types of indigenous private sector actors?

To sum up, the overall empirical evidence in the history of FDIs provides mixed results. It suggests that spillover effects do not come automatically or "for free", but instead require active government intervention to capture the benefits. A key requirement is a certain "absorptive capacity" at the company and country levels. This evidence, coupled with similar mixed results regarding social and environmental consequences of FDIs, contradicts the national investment promotion policies and the proliferation of trade and investment treaties aimed at the liberalisation of FDI that have been promoted by international financial institutions, the World Trade Organization (WTO), and the OECD in the last decades. These arrangements, in fact, have restrained developing-country governments from using industrial policies or other regulations that have been successfully applied in the past by the Asian Tiger economies and Western countries to reap the benefits of foreign investments.

A key lesson can be learnt from past experiences with FDI in developing countries: Sustainable development can only be facilitated by foreign investments when the right policies are already in place at the national level, and when host countries still retain the right to select foreign investments and benefit from investment revenues in an adequate manner by balancing investors' rules and duties.

Such a selective and focussed approach – which might imply also a shrinking of some FDIs that may not seem appropriate to sustainable development – requires specific policy measures, including the following: capital controls as a powerful lever for regulating FDI entrance and exit from a country and for contributing towards the reduction of dangerous external macroeconomic imbalances; precise policies aimed at shaping investment inflows towards the transfer of environmentally sound and climate-

friendly technologies to developing countries and reducing investments in high-carbon sectors, such as extractives; a revision of existing international investment treaties in order to regain sufficient domestic policy space for an effective governance of investment flows. In this regard, this paper will take a closer look at the various drivers and factors that shape international investments treaties, and which policy choices are available to reform them.

Challenges in reforming international investment treaties

The vast majority of international investment treaties cover investment in general, and only a few address investment in specific sectors that are relevant for climate change – as, for instance, the Energy Charter Treaty, or the Energy Protocol of the Economic Community of West African States. “Investment” is usually defined broadly to include both tangible and intangible assets. Agreements therefore not only cover financial flows, but also, among others, intellectual property rights. One of the most significant provisions in many treaties is the right for investors to have disputes with the host state resolved through international arbitration rather than through the host state’s domestic courts. The prospect of arbitration has sometimes discouraged governments from pursuing regulations in their citizens’ interest – the so-called chilling effect.

Investment treaties generally bind each contracting state to provide certain standards of treatment to investors from the other contracting state (SOMO 2003). Such clauses generate a significant bias in favour of the protection of investors’ rights and often do not help in establishing a balance between its rights and duties (Seattle to Brussels Network 2010). In fact, most investment treaties do not consider any specific matters regarding environmental and social protection; coherence with other international agreements; and the promotion of the global public good.

At the same time, many treaties include a provision for “defence of necessity”, which means that treaties shall not be construed to prevent any contracting party from taking any measure that it considers necessary for the protection of its essential security interests. This provision can also be referred to under customary international law, despite the threshold of qualifying for it being quite high. To date, no investor-to-state dispute has ever considered the defence of necessity provision in an environmental context. However, given the potential for climate change having far-reaching and serious impacts, it would appear possible to argue – at least for more vulnerable countries – that climate change jeopardises both their essential security interests and their public order (IISD 2010).

The more gravely and incontrovertibly urgent that the host state’s need is to take measures, the more likely it will be found to fulfil the defence of necessity provision under both the treaty (if it contains such a clause) and customary international law. Thus, “necessity” is probably more likely to succeed as a defence with respect to a measure taken under urgency to adapt to the effects of climate change. While the need to mitigate climate change is essential, mitigation is required at a global level, and it would be difficult for an individual host state to prove that a certain type of mitigation measure is indispensable to avoiding catastrophic climate change.

Given these challenges, there are three pathways to turning international investment treaties into a tool to address climate change. First of all, it is crucial to avoid that treaty provisions limit the scope of host-state intervention in addressing climate change; in other words: To enhance a host state's policy space, including strengthening the defence of necessity provision in the treaties. Secondly, treaties could become a tool to address climate change more generally by including some fairly comprehensive instructions to their parties regarding how to minimise the environmental impacts of investments in the energy sector – and possibly other sectors; how to promote cooperation in the research and application of environmentally sound technologies; and how to encourage favourable conditions for their transfer and dissemination ("do no harm" approach through environmental and social safeguards clauses). And thirdly, treaties should be designed to actively promote climate-friendly investments by using treaties as a lever to generate low-carbon FDIs.

In practice this would mean preserving more policy space at the host-state level for promoting climate-friendly policies and incentives where possible, and to eventually insert specific safeguards in existing treaties to minimise environmental and climate impacts associated with FDIs.

Concerning the third and more transformative dimension, to some extent the Clean Development Mechanism of the Kyoto Protocol can be regarded as a new type of international agreement to promote investments from developed-country investors into developing countries, with sustainable development being a central aim. However, CDM investments are propelled by the binding obligation of Annex B countries to the Kyoto Protocol to achieve compliance with their quantified emission limitation and reduction commitments. No other investment agreement outside the UNFCCC context so far contains comparative obligations on developed countries' investments.

At the same time, the CDM remains quite controversial because of its significant backlogs in the verification, validation, and certification processes; its procedural complexities; and its pure market-based approach. Moreover, the CDM has a questionable record in practice, since cases of projects abound that undermine local sustainable development in the name of a difficult-to-quantify and -verify action against climate change (CDM Watch 2011).

Drawing upon the controversial experience of the CDM and moving beyond this, investment treaties could contain a mechanism under which investments meeting the climate-friendly criteria specified in the agreement would be entitled to the agreement's investment protections and/or investment incentives. Concerning the certification and validation, broad guidance would be set at the international level and specific approval would come from the host government. All investments that do not meet the climate-friendly criteria would not be entitled to the agreement's investment provisions.

In the absence of a multilateral framework on investment and the high fragmentation of investment regulations, as well as the lack of binding multilateral treaties for emission reductions, it should be a high priority for governments to limit harmful climate implications of the existing investment regulations in any way possible. One proposal is to establish coherence between investment and climate policies through a new set of investment agreements at the bilateral or regional level.

However, a major limitation remains for climate-friendly technology transfer with existing provisions protecting IPRs and is today harmonised by the TRIPS agreement (Trade-Related Aspects of Intellectual Property Rights) of the WTO. In particular, the role of limitations and exceptions to exclusive rights, which are contemplated in the TRIPS agreement, in facilitating access to new technologies – including environmentally sound technologies – remains highly contested in international fora, even as bilateral and regional trade agreements have steadily imposed constraints on the discretionary exercising of such policy options. Urgent action to rebalance the needs for coordinated innovation incentives and access to new products and technologies is needed. However, note that strong political will and consensus at the international level is currently lacking, as the recent and ongoing case on “TRIPS and health” has shown.

Given the difficulty of reviewing and reforming WTO agreements in the short term, the only solution for developing countries is to exploit safeguards and exemptions within these agreements possibly by moving joint positions within the WTO concerning the review of the implementation of existing agreements, thereby creating precedents and a positive jurisprudence in this regard (TWN 2008).

In addition, a specific role for public action and agencies in preventing that negotiations on new investment following the TRIPS prescriptions should be identified, so as to offer an alternative regime for the acknowledgement of innovations and intellectual properties. This alternative will be explored in chapter 5. Furthermore, as will be detailed in chapter 6, the existence of export credit agencies is based on a systemic exemption from WTO agreements against state subsidies, so that similar general exceptions for public technology transfer mechanisms could be defined from the TRIPS agreement.

5. Policies for the South: Governing Investment Inflows

To address the challenges and overcome existing barriers of technology transfer, it is essential to create the right framework conditions with incentives to create a large-scale technological shift towards a lower-carbon and more energy-efficient economy that also delivers affordable energy solutions. This shift relies both on scaling-up investment flows into the development and deployment of low-carbon technologies – which also requires adapting behaviours and lifestyles to favour these technologies – as well as on scaling-down energy- and emissions-intensive investments that further lock economies of the South onto a fossil development path.

Many low- and zero-greenhouse gas energy technologies to date are not yet cost-competitive at scale without some combination of investment support mechanisms, technological advances, and regulatory regime improvements. A lesson learnt from the vast number of proposals to the CDM is that an abundance of potential projects, technologies, and investment opportunities alone will not necessarily materialize into de facto capital flows for implementation on the ground. Thus, although the private sector could offer innovative market-based solutions with no government intervention, in many cases, governments can accelerate or steer the process by creating adequate frameworks for investment, including specific regulations tailored to particular technologies and their stage of maturity.

In particular, governments can play an important role in guiding private investments and transforming the conditions under which technology transfer takes place. The effectiveness and success of investment policies will depend upon integrating climate change issues into a wide range of strategic choices. National strategies to promote low-carbon foreign investment- and related technology dissemination must be synergised across areas of policy-making, including energy, technology, industry, transport, construction, urban development, as well as social and environmental policies to ensure sustainability.

Additional effort is required to create an enabling economic environment that takes the risk of developing new technologies and that allows for the rapid diffusion of new ideas and technologies (Tomlinson et al. 2008). Creating enabling market structures and regulations will facilitate the penetration of new technologies into the market and ensure that countries have the capacity to adapt innovations to suit their local circumstances. Government support for such technologies could contribute to creating economies of scale that reduce costs (Karakosta et al. 2010). In short, government intervention is needed to shape markets in order to develop domestic control over technology and economic processes in the long run in support of self-sustained development.

A collection of possible policies for low-carbon technology transfer and investment governance is given in Box 3. In the following, five steps for creating an enabling environment and implementing appropriate policies will be suggested for helping to channel foreign and domestic private capital to climate-friendly sectors and meeting various criteria and objectives, including climate protection, economic diversification, and socially inclusive development. Such policies need to be ambitious and effective, credible and transparent, coherent and long-term, as well as economically and legally sound. Given the complexity of the challenge, there is no “one policy fits all” solution.

Policy interventions need to be adjusted according to the nature of the technology, its stage of commercial development, and the political and economic characteristics of both supplier and recipient countries.

Box 3: Policies for low-carbon technology transfer and investment governance

- Provide a technology needs-assessment and technology roadmaps to select the strategies most appropriate to the country, its capability, and technology options.
- Establish national systems of innovation to develop absorptive capacity and an enabling environment for sustainable technology transfers.
- Build targeted capacities and infrastructures, strengthening information access, awareness, education, and training for public and private stakeholders involved in technology projects.
- Promote prototypes, demonstration projects, extension services, and technology dissemination through linkages between manufacturers, producers, and end-users.
- Create the macroeconomic and market conditions to attract domestic and foreign investment, and facilitate technology transfer with benefits in adjacent sectors.
- Strengthen economic diversification and job creation.
- Demand that foreign investors support domestic capabilities and markets.
- Incentivise new products and business opportunities through feed-in tariffs and other financial incentives.
- Support and encourage initiatives for collaborative research, development, demonstration, and deployment.
- Help to build facilities, networks, joint ventures, and partnerships across public and private sectors.
- Attract private capital for selective foreign investments in line with national sustainable development strategies.
- Define and enforce legal structures to encourage technology transfer and investment, addressing concerns about IPRs.
- Create political stability and involve key stakeholders and social networks, including directly affected citizens and communities and civil society organisations.

Building a science and technology infrastructure

The basis of technology development and transfer depends upon its science and technology infrastructure, which comprises a set of specific, industry-relevant capabilities such as technology centres, research facilities, and educational institutions that support the development of technical skills (Justman and Teubal 1995, 260). Having a viable science and technology infrastructure in place is a prerequisite for the attraction of private investments.

Investing in research and development is an essential precondition to build the technology infrastructure, and to augment the human capital of a country. Historically, governments have played a key role in supporting research and development through national laboratories, universities, training centres, and through international

collaborative ventures. Public funding remains a major source of R&D activities in both industrialised and developing countries, involving either general support to national R&D institutions and laboratories, or direct funding of specific projects to set government priorities. Effective RD&D policies alleviate technical barriers and reduce costs by improving materials, components, system designs, and tools for installers and users.

Moreover, due to the failure of top-down and technology-centred approaches, it is now widely recognised that involvement of community institutions is an essential contribution to environmental projects and is therefore an important factor for successful technology transfer. The involvement of local government agencies, consumer groups, industry associations, and NGOs can help to ensure that the technologies being adopted within their particular country/region are consistent with their sustainable development goals. Besides the involvement of such community institutions, lessons from technology-intensive economies teach that technology increasingly flows through private networks of information and assessment services, management consultants, financial firms, lawyers and accountants, and technical specialist groups. Governments can strengthen the growth of such networks for technology transfer through various initiatives, including (IPCC 2000):

- expansion of opportunities to develop firms for management consulting; accounting; energy service; law; investment and product rating; trade; publishing and provision of communication; access to and transfer of information, such as Internet services;
- encouragement of industry associations, professional associations, and user/consumer organisations;
- participatory approaches to enable private actors, public agencies, NGOs, and grassroots organisations to engage at all levels of environmental policy-making and project formulation.

Developing technology roadmaps and performance benchmarks

Many projects in developing countries fail because they use technology that is inappropriate due to lack of capacity-building, ill-defined ownership, or lack of infrastructure. Any new technology framework should minimise this risk and ensure efficient diffusion of the appropriate technologies. Often there is a substantial lack of reliable statistical data on issues such as energy use, infrastructure, and demand. Solid data will “help policymakers design the most cost-effective policy options and impact assessments, while business can reduce uncertainty and thus risk premiums” (WBCSB 2010). To overcome information barriers, governments have a key role in creating the necessary information assessment and monitoring capacity, supporting various options (IPCC 2000):

- Develop improved indicators and collect data on availability, quality, and flows of technologies to improve monitoring of implementation.

- Develop technology performance benchmarks to indicate the potential for technological improvements.
- Link information systems to international or regional networks through well-defined clearing houses (such as energy-efficiency and renewable energy centres), information speciality firms, trade publications, electronic media, and NGOs and community groups.
- Support technology information centres to overcome information barriers, and involve private information networks through specialised consulting and evaluation services.

A comprehensive technology needs-assessment provides the understanding required for informed decision-making about future technology options in order to select the strategies most appropriate to the country, its capability, and technology options. This includes the identification and assessment of the specific needs for a technology and how that technology fits into the domestic environment. To fully undertake technology needs-assessments, developing countries might need administrative and technical support.

Technology roadmaps help to draw future pathways in terms of capabilities, locations, and timelines. They prepare the ground for the promotion of technology prototypes, demonstration projects, and extension services through linkages between manufacturers, producers, and end-users. They also facilitate planning about the identification and development of solutions to technical, financial, legal, policy, and other barriers.

A number of factors might affect host government's prioritisation and targeting of foreign investment to boost prospects for technology dissemination. For instance, a government may identify targets by comparing potential growth sectors and assessing the country's natural resources and created assets. For example, Morocco has chosen to enter into renewable power generation and environmental technologies manufacturing for a number of reasons (reduce its dependence on foreign fossil fuels, supply and export power, encourage rural electrification), and the choice includes an assessment of where the technology can best be secured, as well as an analysis of patterns of low-carbon foreign investment in the sector (WIR 2010).

Creating climate-friendly market conditions

Due to high unit costs, difficult management, as well as lack of markets and infrastructure, many new low-carbon products and services can only develop and emerge on a sustainable basis if they are supported by market-creation mechanisms, even if only on a temporary basis (WIR 2010). To overcome initial hurdles, economic incentives are required to compete with existing technologies that are more advanced in their lifecycle. As production costs of new pathways decrease over time and new products become attractive to more people, the need to support emerging markets declines and could be ultimately abandoned.

To realise the social and environmental benefits of technologies that will need time to become commercially viable, developing countries can implement policies that combine fiscal and regulatory measures by lowering costs and stimulating demand, thus steering investments into a more desirable direction. Governments can take various measures and tools to provide incentives for investments in sustainable energy technologies and become a catalyst for establishing new markets. There is a wide range of policies in place that support renewable energy around the world, including mandates and standards, innovation policies, and others.

Governments should try to internalise external costs of climate-damaging activities as much as possible, in particular with regard to fossil fuels. The low price of fossil energy is a barrier that deters investment into renewable alternatives. Different approaches exist to “internalise” the environmental and social costs of fossil fuel use and to improve the competitiveness of cleaner energy sources (Dale 1995). Measures could include: regulations; energy or carbon taxes; emissions trading schemes; codes; standards; and removal of counterproductive subsidies (see below). Note, however, that taxes or emissions trading that create high energy end-prices are looked upon ambivalently in developing countries when poverty remains widespread. Yet, when energy-efficiency measures and appliances bring energy prices and consumer energy bills down, taxes on fossil fuel use can be implemented so as to “skim-off” net financial gains. In effect, fossil fuel costs would then remain stable while energy efficiency increases and absolute fuel use decreases.

Complementary to taxes on fossil energy, tax incentives on renewable energies could be provided. For instance, developing-country governments could impose lower withholding taxes on payments abroad for intellectual property licences to encourage the use of intellectual property for low-carbon objectives. However, since public finances are usually low, tax rebates often are not an option. Even within the EU, tax-based green electricity support-programmes based on tax incentives are only applied in Malta and Finland. In most other cases (e.g. Cyprus, the United Kingdom, and the Czech Republic), tax incentives are only used as an additional policy tool (Karakosta et al. 2010). Furthermore, such tax exemptions would increase dependance on external FDIs in the long run and would prevent a domestic renewable industry to develop soon.

Another set of measures would seek to reduce energy needs by encouraging investment in low-carbon and energy-efficient production and transport systems (e.g. fuel-efficient cars and machinery) or by accelerated depreciation of existing assets (e.g. replacement of old cars and buildings, better insulation and cooling of buildings).

Governments could revise public procurement policies in order to increase the purchase of low-carbon products and technologies by governmental as well as public institutions, thus providing new investors with the security of having a buyer for their products. For example, policies could be adopted requiring government buildings to use highly insulated windows, or requiring a certain percentage of public administration fleets to consist of electric vehicles. The setting of energy performance standards or mandatory energy labelling schemes can indirectly help create a market for new technologies.

Renewable portfolio standards have been adopted to mandate utilities to include a fixed percentage of renewable energy within their overall generation portfolio by a certain period. This approach increases investor certainty about the size and time dimensions of

a country's market for renewable energy. Developing countries such as Chile, India, and China have all successfully implemented such standards (REN21 2009).

Electricity from renewable energy sources is promoted through tendering procedures that allow governments to place a series of tenders for the supply of green electricity. The winners of the tender agree to a contractual acceptance and compensation for the non-profitable part (which the government pays as part of the tender contract), which adds to the market price for electricity. While tendering systems theoretically make optimum use of market forces, their stop-and-go nature does not contribute to stable investment conditions. Within the EU, tenders for green electricity are mainly used in France and Ireland (Karakosta et al. 2010).

Table 2: Global wind and PV capacity generated by feed-in tariffs as of 2008

	Year FiT Created	Solar PV from FiT (MW)	% of Total Global Solar Capacity (2008)*	Year FiT Created	Wind from FiT (MW)	% of Total Global Wind Capacity (2008)*
Australia*	Regional	1,1	0.01%	None	N/A	0.00%
Austria	2002	30,2	0.23%	2002	500	0.41%
Brazil	None	N/A	0.00%	2002-2008	319	0.26%
Bulgaria	2007	1,341	0.01%	2007	120	0.10%
Croatia	2007	0,048	0.00%	2007	1	0.00%
Cyprus	2003	2,089	0.02%	2003	0	0.00%
Czech Repub.	2002	54,3	0.42%	2002	150	0.12%
Denmark	None	N/A	0.00%	1993-2001	2500	2.07%
France	2001	91,155	0.70%	2002	3404	2.81%
Germany	1991	5351	41.16%	1991	23903	19.75%
Greece	1994	18,5	0.14%	1994	985	0.81%
Hungary	2003	0,45	0.00%	2003	200	0.17%
India	Regional	5	0.04%	None	N/A	0.00%
Ireland	2006	0	0.00%	2006	458,09	0.38%
Italy	1992	317,5	2.44%	None	N/A	0.00%
Kenya	2010	0	0.00%	2008	5,5	0.01%
Latvia	2008	0	0.00%	2005	23	0.02%
Lithuania	2002	0,05	0.00%	2002	65	0.05%
Luxembourg	1993	24,41	0.19%	1993	35	0.03%
Portugal	1999	67,95	0.52%	1999	2862	2.37%
Slovakia	None	N/A	0.00%	2003	5	0.00%
Slovenia	1999	2,15	0.02%	1999	0,019	0.00%
South Korea	2003	352	2.71%	2002	348	0.29%
Spain	1994	3404,76	26.19%	1994	16740	13.83%
Switzerland	1991	47,9	0.37%	1993	14	0.01%
Thailand	2006	6,2	0.05%	2006	0	0.00%
Turkey*	None	N/A	0.00%	2005	313	0.26%
Total		9,778,10	75.22%		52,950,61	43.75%

Source: GET-FiT (2010)

Under feed-in tariff (FiT) systems, domestic producers receive a market price for the green electricity they produce; on top of that, they are paid the FiT, a specific subsidy per kWh produced. These schemes have the advantages of investment security and the possibility of fine-tuning as well as promoting mid- and long-term technologies. A variant is the fixed-premium mechanism, which offers a fixed premium or environmental bonus on top of normal or spot prices for electricity generated by renewable energy technologies.

Feed-in tariffs, and similar performance-based incentives, have proven to be effective and efficient mechanisms for creating investor security and driving rapid renewable energy growth. By 2008, FiTs supported 75 per cent of PV capacity and 45 per cent of wind capacity worldwide (see Table 2) (GET-FIT 2010). The large majority of this capacity is concentrated in developed countries, and particularly in Europe, but about 27 developing countries have successfully adopted feed-in tariffs, including Thailand, Uganda, Kenya and South Africa (REN21 2009).

The designs and effectiveness of feed-in tariffs vary widely, and some countries lack the financial strength, grid infrastructure, and/or regulatory frameworks for full policy implementation. There were proposed and legislated revisions to tariffs in 2010 to reflect falling technology costs and the continued adoption of feed-in tariffs in new regions. With costs falling rapidly for solar PV, adaptive out-of-cycle tariff adjustments to degressions and policy flexibility are realised. A number of organisations proposed global feed-in tariff funds and programmes (see Table 3) in preparation for the 2009 UN climate conference in Copenhagen. Most of these proposals recommended providing long-term premium feed-in tariff payments. Reviewing these proposals, the public-private partnership “GET FiT” developed a high-level concept to financially support policy structures that appropriately adapt best practices to national contexts as part of broader, low-carbon development strategies (e.g. NAMAs, Nationally Appropriate Mitigation Action).

As an alternative to feed-in tariffs, a green certificate system could be installed. In addition to the electricity market price, an extra price is paid for each certificate issued as a proof of origin for the power produced. As compensation, end-users or power producers of fossil fuel-based technologies must purchase certificates from green electricity producers. Currently, in Sweden, the United Kingdom, Italy, Belgium, and Poland, a green certificate system is operational, which also has the aim to compensate green electricity producers for the difference between the costs of production and the market price for electricity (the non-profitable part). Unlike feed-in tariffs, utilities could generate these certificates by switching from fossil fuels to renewable energy sources in their own electricity production, but they could also buy such certificates from green electricity producers. End-users can be also asked to submit green certificates by the end of the year, showing that they have purchased the required amount of green electricity during that year. In cases where a utility or end-user is not able to submit the required amount of certificates by the end of year, a penalty must be paid for non-compliance. These penalty revenues are generally either used for research and development of renewable technologies, or transferred to the general government budget. Technologies with a long-term sustainable energy potential, but which require higher initial costs, are not easily developed under such schemes (Karakosta et al. 2010).

Table 3: Overview of proposed feed-in tariff funds

Name and organisation	Capitalisation	Management structure	Services provided	Proposed screening criteria
Feed-in Tariff Fund Emissions Trading model (FFET) EREC/Greenpeace International	• OECD/Annex I emissions regime revenues • Auctioning allowances • Taxes on cap and trade • CO_2 trading revenues	• Multilateral and regional banks • Existing Kyoto mechanisms	• Pays premium • Technology differentiation • 20-year contracts • Paid based on actual generation • Environmental standards (e.g. CDM)	• Guaranteed grid access • Feed-in law • Transparent data access • Clear planning and licensing procedures
Scaling-up Climate Financing Project Catalyst	• ETS auction revenues • Concessional debt and government guarantees • Developed country contributions • International maritime and aviation levies • Assigned Amount Unit (AAU) auctions	• Bi- or multilateral Climate Partnerships Agreements • National trust funds • Global green fund targeting public goods (pre-commercial tech, market coordination, regulatory standards, strengthen safety nets) • Fast-start fund to finance capacity-building • Global oversight body	• Pays premium • In conjunction with debt guarantees and equity investment guarantees or co-financing	• Low-carbon growth plans (NAMA and NAPA plans), commitment of financial resources, and need for additional support • Monitoring, reporting, and verification (MRV) • Move from project-based to programmatic/ sectoral schemes (broader vision and strategy)
Renewable Energy Regulated Purchase Tariff (RPT) EC Joint research centre	• National budgets • Multilateral banks	• Varies by ownership/ regulatory structure: • Rural energy service company • Independent power producers (IPP) model • Concession model	• Pays premium	• Fair grid access • Feed-in law • Renewable energy policy • Clear planning and licensing procedures
Renewable Energy Policy Fund World Future Council	• IMF SDR or • Existing funds: Emissions auctions, carbon tax proceeds, international transport levies • International Renewable Energy Policy Fund and state budget/ CDM tax	• Global Environment Facility trust fund or • World Bank Climate Technology Fund or • National Renewable Energy Policy Fund	• Pays premium • Can also be extended to mini-grids	• Sufficient and steady fund source • Separation of fund from state budget

Table 3 (cont.): Overview of proposed feed-in tariff funds

Name and organisation	Capitalisation	Management structure	Services provided	Proposed screening criteria
Global FIT-Programme Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) Global Renewable Energy Investment fund World Wind Energy Association (WWEA)/ International Renewable Energy alliance	• Obligatory annual contributions from the Annex I countries	• N/A	• Pays premium • Large-scaled micro-credit and soft loan for off-grid and non-electrical systems • Alternative integration into NAMA	• Avoid additionality and baseline
Global feed-in tariff fund UN DESA	• Emissions auctions • REDD • Levy on carbon market transactions • Reallocation of revenues from fossil fuel subsidies to renewable energies • Country contributions based on criteria	• N/A	• Guaranteed purchase prices for existing generation units; lower rate for new projects • Yearly payments based on actual generation • KWh subsidy reduction linked to scale and learning economies	• Appropriate legal and regulatory framework • FiT scheme coordinated with grid/off-grid expansion and targeted subsidies for the poor

Source: GET-FiT (2010)

Engaging the banking sector and regulating financial markets

To overcome the lack of financing for technology transfer in developing countries (Manas 1990), governments could take action to demand that banks and other lending institutions finance environmentally sound technologies and projects. The banking system plays a dominant role in the allocation of capital, and its health determines whether a country will be able to exploit any benefits from financial services, including access to and transfer of technology. To address some of the problems of the banking sector, such as poor capitalisation, risk aversion, inadequate regulations, preference for investment, and corporate financing vs. project financing, macroeconomic policies would aim to reform the sector, for example through increased reserve requirements and/or adoption of different risk-weighted capital requirements (Friends of the Earth Europe et al. 2011). Innovative financing mechanisms and alternative banking practices would reduce the risks to lenders to allow for profitable investments in environmentally sound technologies for greater energy efficiency in developing countries (Pachauri and Bhandari 1994) (CRBM 2011).

In this context, consideration should be given to the establishment of public "green development banks" (WIR 2010). These could open credit markets, motivate business to invest, and enable clean-energy technologies to be deployed on a large scale and become commercially viable (Podestra and Kornblum 2009). Compared to existing incentives, such as public loan guarantees or tax rebates, a green development bank would have the advantage of being more flexible in addressing critical barriers to investment. It would allow for tailor-made solutions as opposed to the more rigid tax regulations and other official government programmes. Another approach that may be considered is the creation of "green" funds, which provide funding to local firms at concessionary rates. For example, Kenya has announced the creation of a green energy fund to help firms and other institutions to generate clean energy and manufacture energy-efficient light bulbs and other appliances (WIR 2010).

Beyond this, it is necessary partly to regulate financial markets, in particular to build shock absorbers into the financial system and develop mechanisms to respond to instability. A variety of measures have already been considered and partially implemented in response to the economic crisis. These include restraints on high-risk ventures; taxes on international financial transactions; building international reserves at levels that are adequate to the variation of capital; fiscal flexibility to respond to rapid changes; building cushions into the banking system using periods of credit booms to increase bank capitalisation.

More broadly, a reintroduction of capital controls – as of yet implemented only by a few emerging economies – could be a powerful tool, not just to enhance financial stability (IMF 2011) but also to equip national governments in selecting inbound FDIs by rewarding low-carbon investments.

Deepening linkages, networks, and partnerships

To what degree and at what speed domestic companies acquire technology through foreign investors depends on the type, scale, and quality of the interface that exists between them. The type of interface may involve joint venture partners, competitors, suppliers, and public-private partnerships (WIR 2010). Some governments are keen to promote joint ventures, since this interface between transnational corporations and domestic companies can often result in effective transmission/acquisition of technologies: Both parties have reciprocal knowledge and assets to share (e.g. transnational corporations may possess low-carbon technology, while its domestic partner has the tacit know-how about local industrial customers). However, joint ventures require high levels of mutual trust between partners, as well as transfer/absorption capabilities (Demirbag and Mirza 2000).

Other approaches that are less driven by projects initiated – or even driven by transnational corporations – utilise a more bottom-up, collaborative process in which all relevant stakeholders are engaged to jointly determine the technology selection and implementation path consistent with that country's/region's sustainable development goals for one or more sectors. In this approach, domestic companies and governments could enhance initiatives for collaborative research, development, demonstration, and deployment. These could include bilateral or multilateral collaborations between countries and companies in order to share lessons learnt from experience with new low-

carbon technologies. One such activity being conducted on a bilateral basis by the United States has been the Technology Cooperation Agreement Pilot Project, which was established in 1997 to enhance climate change technology cooperation with developing and transition countries. Until it was abandoned, the Technology Cooperation Agreement Pilot Project facilitated voluntary partnerships of Brazil, China, Kazakhstan, Mexico, and the Philippines with the United States and other OECD countries, international donors, and the private sector. Established in 1995, the Climate Technology Initiative is a multilateral approach pursued by 23 developed country Parties and the European Commission in support of the UNFCCC. The Climate Technology Initiative maintains a network of partnerships with non-governmental organisations, international organisations, and the private sector.

Moreover, developing countries can enhance technological cooperation amongst themselves, for example in their geographic regions. A promising opportunity is the establishment of Regional Technology Synergy Centres to formulate and coordinate a coherent programme responding to the demands, opportunities, and options in low-carbon technologies in developing countries. A regional basis to these centres recognises that many issues (e.g. low-carbon electrification, transport infrastructure, and housing for burgeoning rural and urban populations) are common features across developing countries and have regional ramifications; although Regional Technology Synergy Centres will also have national windows and be allied internationally (including with existing R&D centres as well as with other Regional Technology Synergy Centres). With the participation of both domestic firms and foreign affiliates, local technological and industrial clusters can help enhance the exchange of knowledge and manpower and the establishment of joint ventures between local and international companies, which serve as incubators for the development of low-carbon industries and capabilities, as highlighted in the case of the Binhai New Area in China (WIR 2010).

Public-private partnerships (PPPs) can be a helpful mechanism to facilitate the development and deployment of new environmentally-friendly technologies and to adapt them to local circumstances. However, while PPPs in theory can offer some avenues for cooperation, a substantial rethinking of the business and contract models are needed to ensure that they move into the right direction in the future. PPPs were at the centre of negotiations at the Johannesburg Summit on Sustainable Development in 2002, but 10 years after, relatively few successful cases can be reported. Among other things, PPPs have been criticised for their failure to help benefit the poor and for not being economically sustainable in the long-run – given the too often relevant losses they dumped on public finances. Therefore, the success of PPPs would depend on “coherent PPP policies providing clear directions to investors and donor countries, a coherent legal and regulatory framework, transparent public decisions and selection of partners, and a commitment to sustainable development. Investors’ legal rights and the rights of the public in case of investment disputes also need to be protected.” (WIR 2010: 63) Investment contracts can lay the foundation for PPPs related to the development and deployment of low-carbon technologies, such as large-scale renewables-based power generation or joint research activities. This would require legally balancing investors’ rights and public interest rights.

6. Policies for the North: Reforming Export Support

Foreign direct investment from advanced economies – and increasingly from emerging economies – strongly benefits from the support of national export credit agencies, which by financing and guaranteeing exports and insuring long-term investments significantly reduces commercial and political risks for investors and companies. In the last decade, the role of these agencies has been increasingly scrutinised by governments and civil society as a possible mechanism to deliver climate financing and, more generally, as a source of action for climate protection and sustainable development. Therefore, it is crucial to analyse whether these agencies could be reformed according to this perspective and, eventually, which alternatives and more effective mechanisms could be established for the same purpose.

Export credit agencies are quasi-governmental institutions, export-promoting instruments, and an integral part of many national governments' industrial, foreign aid, trade, and investment promotion strategies. They are national agencies offering either direct credit or financial cover (through insurances and guarantees) to national companies involved in international trade transactions or foreign direct investments. Their prime objective is to eliminate risk for exporters and investors. This risk is borne by the ECAs and ultimately by their governments. As leading players in project financing (in particular, large infrastructural and industrial projects), ECAs, by and large, provide guarantees for financing the trade and investment of commercial banks. At the same time, ECAs hedge their risk by requesting counter-guarantees from developing countries' governments, which in case of default could be activated to transfer a new debt into their public finances.

Export credit agencies play an important role in supporting about 10 per cent of all global trade flow each year. At present, there are more than 80 countries with some kind of ECA, with the OECD representing 33 of them. Some countries (e.g. Indonesia, Ukraine, and Kenya) recently took steps to launch their own export-import banks. The 51 members of the Berne Union[2] covered more than $1.5 trillion worth of business in 2008; the total volume of export credit guarantees provided in the period 2004–2009 by the ECAs of the EU Member States was €468 billion (Fern 2010a). Following the financial and economic crisis after 2009, G20 governments even strengthened the role of export credit agencies in order to help the global recovery. They committed $250 billion in support of trade financing – regarded as short-term trade transactions up to two years. In comparison, with the Cancun Agreement of 2010, all industrialised countries announced an increase in climate finances on the order of $100 billion per year by 2020.[3]

Promotion of national exports through export credit support is sometimes legitimised on the grounds that it is essential to counter export credit support using other governments, thus to compete on an equal footing with foreign exporters (self-defence instrument). However, export support is also legitimised with reference to market failures in the private trade finance sector. It should be pointed out that, in any case, export credit agencies are the only institutions able to cover political risk – something that private

[2] The Berne Union is the International association for the export credit and investment insurance industry.
[3] http://www.climatesfundupdate.org.

insurance markets cannot intrinsically do. As such, ECAs offer support for export transactions that would not be offered – or not at affordable prices – by the private sector. This is due, among other things, to the fact that the private capital market lacks sufficient information to properly assess the risks and opportunities of the transaction. Is this not the exact problem as when new, or not-yet-profitable, climate-friendly technologies enter new markets and aim to reach profitable levels and broad-scale application?

It is clear that export support is a kind of subsidy using a broad definition, regardless of how much such support distorts market functioning. Therefore, the subsidy dimension could be appealing for those willing to use existing national financial institutions to generate climate financing, in particular by leveraging private capital markets. Indeed, export credit agencies have been mentioned as a possible mechanism to generate climate financing in the context of climate negotiations. Given the still unclear definition of climate financing – in particular as concerning its relation vis-à-vis overseas development assistance and other public commercial funding – few governments, among them the United States and Japan, mentioned in their schedule for "fast start" financing for climate change some possible contributions from their export credit agencies. European governments, by contrast, have not yet announced plans to advance the use of ECAs for climate financing purposes (Fern 2010b).

To be sure, this paper does not suggest that export support is a prime means to implement international climate financing commitments. Neither does it assume that ECAs in their current institutional state are by and large ready to enhance the transfer of low-carbon, sustainable technologies. This paper rather starts from a different position: As long as large amounts of public money – funds that are significantly higher than what is currently envisioned as climate financing – continue to support international investments and the kinds of technology transfers that are not particularly climate-friendly, or that are even climate-damaging, it will remain difficult to achieve multilateral climate protection goals. The key question therefore is: Can public export support be transformed and used in a way that it serves as one instrument among others to promote low-carbon technology transfer?

Limits of export credit agencies in supporting sustainable development

Given that no country can unilaterally decide to stop subsidising export credits without its exporters losing sales, there exists an important incentive for drafting multilateral disciplines. In 1978, negotiations finally resulted in the Arrangement on Guidelines for Officially Supported Export Credits (OECD Arrangement), which seeks to foster a level playing field for officially supported export credits. Moreover, export credits have to be WTO-compatible. In particular, the WTO's Agreement on Subsidies and Countervailing Measures regulates and disciplines the use of subsidies in international trade, and includes officially supported export credits to some extent. The agreement prohibits a broad selection of export subsidies for non-agricultural products.[4]

[4] The two relevant items from the "Illustrative List of Export Subsidies" are: Item (j) which refers to the provision of export credit guarantees or insurance at "premium rates which are inadequate to cover the

The recent complaint formally made at the request of the US steelworkers' union by the US government to the WTO against the Chinese government on the alleged distortion of trade practices to support China's domestic wind power industry is quite paradigmatic of all challenges related to the possible use of ECAs to support climate mitigation actions. In short, US workers and companies claim that "China has utilized hundreds of billions of dollars in subsidies, performance requirements, preferential practices and other trade-illegal activities to advance its domination of the sector"[5] and this translates into overly favourable terms for the Chinese renewables industry in its export to the United States. To date, consultations on the dispute at the WTO between all parties – including the EU and Japan, who joined the complainants – are pending. At first, climate campaigners were shocked by such a complaint against an environmentally-friendly, large-scale move by Chinese authorities, after a decade of attacks against the Chinese government for its bad environmental, social, and labour records and dumping practices within the global economy. Furthermore, this complaint contradicts the strong push – within the current Doha Round trade negotiations – by Northern governments for liberalising trade in environmental goods and services in order to reduce tariff and non-tariff barriers for climate and environmentally-friendly products worldwide. But once the dust has settled, the case raises key questions about the functioning of the global economy and the sustainability challenges faced by those participating in it.

Regardless of what the WTO dispute settlement mechanism will decide in the end, this case reminds us that ECAs provide quite important subsidies that can help develop new industries by making them more competitive nationally and on global markets. Secondly, technology transfer is no longer an issue just for Northern industries, despite that they are still leading in industrial innovation; emerging economies can also play a role in this regard, in particular towards poorer developing countries through "South-South cooperation". Thirdly, the green economy will become a more competitive territory for industries, and not just at the national level, but globally. Competition according to existing trade and investment rules will not necessarily help to promote the growth of low-carbon international investments. Therefore, it is legitimate to wonder whether an exemption from the current global trade regime is needed for some investment and trade transactions dealing with climate-friendly operations and technologies.

Indeed it is vital that ECAs are subject to consistent and effective scrutiny and control. They are an increasingly important tool for government intervention in the economy, and in practice, they have demonstrated a significant potential for social and environmental harm. However, it is evident that much of this activity goes unreported, or unobserved by those who have responsibility for the oversight. Very little information is publicly available about the decision-making processes for projects supported by ECAs. As a consequence, it remains difficult for parliamentarians and the wider public, both domestically and in host states, to monitor ECA operations. Information is hardly available regarding critical decision-making and oversight functions including: ECA project categorisation; how ECAs assess the social, environmental, and human rights

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long term operating costs and losses of the programmes"; Item (k), which refers to the provision of export credits "at rates below those which they actually have to pay for the funds so employed … or the payment by them of all or part of the costs incurred by exporters or financial institutions in obtaining credits" is a prohibited export subsidy, "insofar as they are used to secure a material advantage in the field of export credit terms."

5 http://www.greentechmedia.com/articles/read/wto-wind-industry-throwdown-u.s.-vs-china1/

risks associated with projects; how ECAs gauge ongoing project compliance; the results of post-approval monitoring activities; and any sanctions that ECAs apply for non-compliance.

Commercial projects that ECAs have supported quite often posed the substantial risk of negative impacts on human rights. The political risks against which ECAs insure companies include: civil war, social unrest, political coups, or the sudden changes in government contexts often associated with increased risks to human rights. ECAs also frequently support industries of a particularly invasive nature, such as oil, gas, and mining, which are often associated with environmental damage and a degradation of human rights, through violence; the forced displacement of people; violations of the rights of indigenous peoples; and denial of access to basic services.

More specifically, ECAs adopted in 2003 the OECD Common Approaches on Export Credits and the Environment, which require ECAs to perform an environmental and social due diligence by screening projects ex-ante, disclose some information about expected impacts and mitigation actions, and reference some international standards regarding project implementation. So far implementation of the Common Approaches has been controversial and, according to civil society and other analysts, has failed to establish a level playing field among different ECAs, both in terms of disclosure and standards applied. Furthermore, Common Approaches still fail to include relevant international standards, lack adequate and independent monitoring, and have a non-binding status, which strongly limits their full implementation (ECA-Watch 2011).

At the September 2009 G20 summit in Pittsburgh, governments committed to end fossil fuel subsidies. However, ECA-supported transactions remain a frequent and substantial source of support for the exploration, processing, and combustion of fossil fuels. ECA financing for these activities has grown tremendously over the last 15 years (Fern 2010c) and now exceeds fossil fuel financing by all multilateral financial institutions combined. Yet, despite the Pittsburgh decision, during the days of the Copenhagen Climate Summit in December 2009, the governments of the United States, Italy, and Australia agreed to provide $18 billion through their respective ECAs to build the gigantic and highly controversial Papua New Guinea Liquefied Natural Gas project.[6]

Can export credit agencies have a role in fighting climate change?

Despite this controversial carbon record of ECAs, some governments – the United States and Japan (Fern 2010b) – have decided to count some ECA support as "climate finance" according to "fast start" commitments made in Copenhagen at the end of 2009 regarding the three year period 2010–2012. So far none of the European governments have made a similar commitment.[7]

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6 "U.S. Ex-Im Bank Undermines U.S. Credibility at Copenhagen by Confirming $3 Billion in Financing for ExxonMobil Fossil Fuel Project," press release, Pacific Environment, Oil Change International, 9 December 2010, available at: http://www.pacificenvironment.org/article.php?id=3190.

7 See also http://www.germanclimatefinance.de.

At the same time, since 2008 negotiations have been ongoing at the OECD to include "climate-friendly technologies" in the existing annex to the arrangement, which was agreed in 2004, in order to give enhanced terms for the official support of renewables and water projects (OECD 2011). At the moment, the different requests by governments are ongoing in the negotiations about which technologies should be eligible under the new annex.

Today's controversy about the definition of the new annex to the OECD Arrangement on "renewable energy, climate change mitigation and water projects" (ECA-Watch, 2011) shows that ECAs have structural limitations for becoming "climate finance institutions" and their transformation would imply a fundamental revisiting of assumptions about their structure and functioning, thus making it impossible, as argued below. However, in the current review of the OECD Common Approaches on Export Credits and the Environment – which define non-binding environmental and social safeguard policies for ECAs – several governments showed a strong interest for including an ex-ante accounting of projected greenhouse gas emissions associated with operations financed by ECAs, in order to improve ECAs' carbon portfolios.

Still it seems questionable whether ECAs are adequate institutions to promote low-carbon FDIs. ECAs are national agencies that strongly respond to national interests. Their mandate is very clear in this regard. Even before the 2008 recession, their mandate in some countries was reviewed to allow ECAs to support operations that did not involve any national exporter, even though it was regarded as strategic for the national interest (such as an oil or gas pipeline contributing to the energy security of the ECA's country); nearly the totality of ECA support is aimed at supporting national industries competing globally – both in terms of trade and FDIs. This rigid set-up clashes with the overall approach of climate financing, as currently being discussed in climate talks. This is aimed at backing climate mitigation and adaptation interventions, regardless of which country the companies are from.

Furthermore, concerning technology transfer, it is widely acknowledge that in the long-run, beneficiary countries should develop their own industry of climate-friendly technologies. This would require financial support for joint ventures between companies from developed and developing countries as well as for new established economic actors of developing countries. Current rules on "local content" for ECA operations – under the OECD Arrangement – limits the percentage of official support benefiting local providers or sponsors to 30 per cent.[8] Similarly, only few countries have substantially lifted limitations for the so-called foreign content – that means the involvement in ECA-backed operations of beneficiary companies from a third country that is not the ECA's country or one of the project host's countries.

It should be added that ECAs do not – and realistically will never be able to – have a development mandate, contrary to other bilateral and multilateral financial institutions

[8] The OECD arrangement on export credits requires a minimum 15 per cent down payment on supported sales of goods and services, limits the covered percentage to 85 per cent of the related export contract value (exclusive of local content), and allows for support of local costs associated with the export (up to 30 per cent of the value of the export contract, with prior notification to other OECD countries if such support for local content exceeds 15 per cent of the export contract value).

that have an expressively stated mandate with several implications. In particular, if we were to apply the aid-effectiveness principles[9] to ECAs, it would soon be evident that ECAs do not operate according to a development rationale or internationally agreed upon development goals, regardless of whether some operations supported by them might contribute to these indirectly or without any intended scope.

It is particularly important to focus on the ownership principles, which require that aid recipients should forge their own national development strategies with their parliaments and electorates, without any substantial interference according to donors' own national interests.

It is clear that this could not be the case for ECAs. If we look at them from a governance and decision-making perspective, it is clear that decisions are taken only by the home country, at the request of the exporter, and without informing the host countries – apart from when agreements about the sovereign counter-guarantee requested to this should be finalised.

It is important to point out an additional structural limitation of ECAs. These agencies, despite the significant public cover they offer, tend to follow market dynamics – they assess whether to support specific operations only when national exporters or investors approach them. In short, ECAs have no interest in shaping markets and could only offer enhanced terms for some specific types of operations in a few cases, such as with some renewable energy projects.

This limitation has emerged very clearly on several occasions when – at the national level – governments have committed to supporting more small and medium enterprises after different actors criticised ECAs for their primary focus being on backing large corporations in international trade and investments. Despite several commitments from ECAs to dedicate ad hoc instruments to improve their performance in this regard – including the agreement of framework guarantees for major private banks, which could then act as intermediaries in covering small and medium enterprises' exports – little has been achieved as compared with the importance that small and medium enterprises have played in several advanced economies. This lack is mainly due to the structural inadequacy of ECAs in having a proactive stand in scoping for specific companies and operations to be supported, given their passive stand towards market functioning and the obligation not to distort international trade beyond what was agreed under the OECD Arrangement and WTO agreements. At the same time, ECAs operate more and more as market entities and they are interested in minimising their transaction costs in order to break even, as requested by international regulations. This implies that ECAs have substantial problems in engaging most of their portfolios into a large number of small

[9] The Paris Declaration and Accra Agenda for Action are founded on five core principles, born out of decades of experience of what works for development, and what does not. These principles have gained support across the development community, changing aid practice for the better. It is now the norm for aid recipients to forge their own national development strategies with their parliaments and electorates (ownership); for donors to support these strategies (alignment) and work to streamline their efforts in-country (harmonisation); for development policies to be directed to achieving clear goals and for progress towards these goals to be monitored (results); and for donors and recipients alike to be jointly responsible for achieving these goals (mutual accountability).

operations, which is often what is required to support small and medium enterprises or some industrial sectors, such as renewable energy.

ECAs also have structural limitations, as concerns the possibility of supporting climate adaptation interventions. As a matter of fact, developing countries request financing for such operations to be based on grants or highly concessional lending, although this issue is not sufficiently clarified in the UNFCCC and its implementing Kyoto Protocol; it has also not been clarified in the recent Copenhagen Accord and Cancun decisions. It could be argued that many adaptation measures require infrastructure building, which is a kind of activity often supported by ECAs. However, ECAs lend or offer a cover at "quasi-commercial" terms, far away from concessional financing.

Above all, probably the bigger limitation for ECAs in playing a role in climate financing derives from the letter and the spirit of international agreements that govern their functioning. As said above, ECAs should abide by the WTO regime, which is centred on an overarching non-discrimination principle for guaranteeing free trade outside the realm of an international community's commitments on any other public interest matter, as defined within the United Nations system. It is evident that climate stability and the fight against climate change must take into account the public's interests. This limitation repeatedly emerges in the context of the Doha Round negotiations at the WTO. Here, the relationship between multilateral environmental agreements and trade agreements are discussed, and similarly measures to foster international trade of so-called environment goods and services are negotiated.[10] In both cases, after 10 years of negotiation very little progress has been achieved. In the case of environmental good and services, the key instrument discussed is the improvement of market access, including the reduction and elimination of non-tariff barriers, which, however, are not able to reward this sub-sector more than others – assuming that WTO negotiations progressively aim to slash tariffs and barriers in all sectors sooner or later – in particular through additional financial support, or subsidy mechanisms, which are strongly opposed, according to WTO logic.

Looking at the OECD Arrangement, current negotiations around the Annex on renewables and climate-friendly technologies – and parallel discussions at the G20 about the extension of the operationalisation of the G20 commitment to phase out public support for fossil fuels, including ECAs – show how the overall rationale that generated these agreements is not compatible with a significant boost for public support for international climate action. In fact, the OECD Arrangement is centred on the logic of not penalising any technology and simply considers under which limited circumstances could better financial terms be given to some sub-sectors. In the history of the Arrangement, this has led to better terms – longer repayment periods, lower interest rates – for different kinds of technologies, mainly on the basis of economic reasons. Under the existing provisions in the Arrangement, this is the case for large-scale fossil fuel power plants and even more for nuclear power plants. However, the Arrangement has never penalised any other technology on environmental, social, or human rights grounds. According to producers and exporters of environmentally sustainable and low-

[10] These negotiations deal with the reduction or elimination of tariff and non-tariff barriers to environmental goods and services – for example catalytic converters, air filters, or consultancy services on wastewater management.

carbon technologies, subsidising these is often not enough if public support and subsidies are present also for high-carbon and high-impacts technologies (EREC 2003). In some cases, where new technologies are already mature, just slashing subsidies for the old and more damaging technologies would be sufficient to generate new market dynamics. This applies also to national legislation that still includes support for high-carbon technologies and fossil fuels.

Therefore, according to a "do no harm" approach and in the spirit of the G20 commitment on phasing out subsidies for fossil fuels, it is still worth pushing ECAs to curb subsidies they give for high-carbon technologies and projects, for instance by phasing out ECA support for fossil fuels. This would open more opportunities for low-carbon technologies, regardless whether these would benefit from ECAs or other public support.

However, on the basis of what has been explained above, ECAs cannot be reformed to be instruments of climate financing, nor as new mechanisms to promote low-carbon FDIs. It is then legitimate to wonder whether other or new public institutions would be appropriate and effective in supporting international investments in climate mitigation.

Principles for fair and effective support

Notwithstanding these structural problems in reforming export credit agencies, and given the deficits of the current intellectual property rights regime, public support remains a key tool for fostering foreign direct investments for climate-friendly technology transfer. Indeed, public intervention is needed also for promoting a new effective framework approach on this matter. What are key principles for such a new framework to foster low-carbon and sustainable foreign investments?[11]

First, participatory governance that is at least based on North-South parity is a pre-condition for giving strong legitimacy to new institutions. At the same time, it is important that relevant stakeholders sit in advisory boards that can regularly inform and interact with decision-makers. Beyond just some private-sector representation, it is crucial to give voice to social actors representing the sectors of society most impacted by climate change and by mitigation and adaptation measures.

Second, in order to avoid that any new financial support to developing countries generates new debt – which would be on top of the existing financial debt – no counter-guarantees to developing countries should be required to distribute risks associated with sovereign lending from industrialised countries. As a result, advanced economies will take greater risks than beneficiary countries, given their historic climate debt.[12] This, however, is in line with the obligations of industrialised countries to afford the "incremental costs" that developing countries face when applying climate-friendly technologies.

[11] Key principles for climate finance have, among others, been developed by Schalatek (2011).
[12] http://www.climatedebt.org.

Third, given the highly competitive environment at the global level, it would be best for new agencies to have a multilateral set up, or at least a regional set up – for instance, as a new European Agency for Technology Transfer – in order not to be liable under WTO agreements for distorting global markets. If an overall multilateral legal framework for establishing new institutions for "technology development and transfer" were agreed at climate talks, such agencies could play a prominent role in this framework. Yet it is not very likely, and may not be recommendable, that discussions about establishing new agencies should be negotiated under the almost "more than full" UNFCCC agenda. What could be feasible, however, is that UNFCCC negotiations take note of such agencies being set up, and acknowledge their necessity to achieve climate policy goals.

Fourth, new institutions should operate with a selective approach, both in terms of technology development and types of projects they support, sectors they operate in, and, most importantly, in terms of financial instruments they use and related investments they promote. According to what has been discussed previously in this paper, new institutions should contribute to enhance mechanisms for capital control (both outward from home country and inward in host country) and the tracking of investments throughout their implementation, while promoting selected flows in support to verifiable low-carbon investments. As a matter of fact, we are already facing speculative investment in low-carbon technology sectors – with renewable energy and wind power in particular – which are short-term-oriented and not related at all to the ultimate goal of promoting a long-term shift towards a low-carbon economy.[13]

Finally, the new agencies should be public in terms of their governance, legal set-up, and the way they gather and administer financial resources. Furthermore, agencies should act in the public interest at all stages of their operations, so that all collective interests in society are taken into full account. In this regard, it is advisable that national parliaments – and in the case of the EU, the European Parliament – give formal oversight power in the statutes and procedures of the new agencies, including accounts and budget approval and the definition of strategic directions each year.

On the basis of these five key principles, it is worth concentrating on how a multilateral agency for technology transfer could operate, starting from the governance dimension and the eventual regional remit and scope of operation.

The case for a European Agency for Low-Carbon Technology Transfer

At the climate summit in Cancun in December 2010, in order to strengthen technology development and transfer, governments decided to establish a Technology Mechanism, which should be fully operational in 2012. The mechanism includes a Technology Executive Committee, which will strengthen the development and deployment of new technologies, as well as strive to increase public and private investment in technology development and transfer. The Technology Executive Committee will also assist in providing an overview of needs for the development and transfer of technologies for

[13] Add example of wind power in India and institutional investors, IPOs, etc.

mitigation and adaptation. Additionally, it will recommend policies and actions to boost technology cooperation.

The Technology Mechanism also includes a Climate Technology Centre and Network to facilitate national, regional, sectoral, and international technology networks, organisations, and initiatives. The Climate Technology Centre and Network will aim to mobilise and enhance global clean technology capabilities, provide direct assistance to developing countries, and facilitate prompt action on the deployment of existing technologies.

Within the spirit of these commitments and the new Climate Technology Centre and Network, European governments could advance an innovative proposal of establishing a ground-breaking regional agency for fair and equitable low-carbon technology transfer. How could such a specific European agency work in practice, both financially and in terms of identifying specific investments to be supported?

The adoption of a fair and representative governance structure would necessarily require the establishment of a new institution as trustee and administrator of the funds. In the case of the European Union, this could happen by setting up subsidiaries of existing institutions whose 50 per cent of capital and ownership would be given to developing countries. The Lisbon treaty would allow for the establishment, for instance, of subsidiaries of the European Investment Bank, with the participation of other entities.

A new regional agency for low-carbon technology transfer could raise resources on financial markets through the issuance of sovereign bonds fully guaranteed by industrialised countries. Specific EU climate bonds would be issued under the sovereign guarantee of Member States – and eventually by the governments of Switzerland, Norway, and Iceland. Resources raised would be allocated specifically to the agency, which would be given a banking mandate as a financial agency. Bonds would be accessible for institutional investors, governments, as well as for citizens at the retail level. In order to incentivise bond purchases and long-term commitments, a specific public certification could be given to those investors significantly investing in these “climate bonds”.

The agency can lend to public and private entities as well as concede guarantees and insurances against commercial and political risks associated with specific investments. Resources from budgets of the EU Member States and other governments would contribute to the agency in order to subsidise interest rates or lower premiums. The operations of the agency, as in the case of multilateral development banks, would not be requested to comply with the OECD Arrangement on export credits or other limitations imposed by the OECD and the WTO. In short, these multilateral or regional agencies would operate under a general exception from the WTO regime, comparable to the one enjoyed by ECAs.

In short, this mechanism would resemble what the European Investment Bank does today, with the addition that a structural blending of government resources and funding raised on the markets would take place. The fact that no sovereign counter-guarantee is requested for beneficiary countries would be an incentive for carrying out an adequate due diligence for investments. It would represent a contribution to the repayment of climate debt in the case of possible defaults and the eventual need to replenish the

agency's coffers to honour debt contracted on the financial markets. According to the same principle, it would be up to industrialised countries to contribute, if needed, to pay full interest to agency bondholders.

The agency would focus on both the innovation as well as the access and dissemination of low-carbon technologies, balancing between these two main areas of operation. Concerning technology innovation, the agency would support investment in research and development on a specific and targeted list of technologies. As the agency acts with public money, it could request from companies that the outcome of the research be patented by the agency under a Creative Commons-type of licence, through which no licensing costs would be applied to developing countries that use them properly.[23] At the same time, the agency would sign a protocol with each company/institution financed for research and development investment, defining under which conditions – including capping the price for access to the new technology to be developed – the licence could be used in the framework of private commercial investments.

In the case of access to existing low-carbon technologies, the agency will adopt compulsory licences – that means shareholding governments will force the holder of a patent, copyright, or other exclusive right to grant use to the state or others. The holder will receive royalties determined through some form of arbitration on a case by case basis and will be financed with grant contributions from budgets of the EU Member States and other governments. This is possible under the safeguards included in the WTO TRIPS agreement if it is proved that the threat posed by climate change to national security triggers a "defense of necessity". Once the patent is "acquired" by the agency, it would be handled similarly to new patents developed through investment backed for innovation under the Creative Commons regime.

The agency would support primarily research and development and access to technologies for small-scale alternative interventions benefiting local communities. In the case of technology related to individual large-scale investments and projects, these should fall both within national development and climate plans and strategies, and be eligible under a selected and limited list of technologies to be regularly reviewed and updated by the advisory board and then adopted by the board of the agency.

Country action plans detailing priority technology developments and interventions should be developed by national governments. They should have the full involvement of local administrations and all stakeholders, in line with multilateral guidelines approved and regularly reviewed by the agency board.

Each investment shall undergo a due diligence by the agency staff, including ex-ante disclosure of information in a timely manner and the consultation of any interested or affected actors in the investment. The host country could exert a veto on the project, upon the condition that adequate justification would be provided as to why the project conflicts with national plans. A fair and transparent dispute resolution mechanism between the host country and the agency board should be available for settling eventual disagreements and facilitating conciliation, including third-party involvement.

Both in the home and host countries, it is vital to put in place from the very beginning transparent, independent, easily accessible, and effective accountability mechanisms for directly affected communities and organisations representing the diffuse interests in

home and host countries that are willing to redress decisions by the agency board on specific projects, programmes, and policies. However, these mechanisms would not replace existing law remedies but complement them.

In the case of a European agency, the European Ombudsman, which is elected by the European Parliament, could be tasked with this specific role. A similar accountability unit could be established in developing countries – under the premises of national parliaments – as country offices of the accountability mechanism. However, the European Ombudsman should be directly accessible by individuals and organisations from developing countries as well.

7. Conclusions: Towards a Global Green New Deal

Preventing climate change and sustainable development on a global scale will require radical technological, economic, and societal changes in both developed and developing countries. Economic development is most rapid in developing countries, but it will not be sustainable if these countries follow the historic emission trends of developed countries. Although most new carbon abatement technologies are being developed in industrialised countries and most of the mitigation action is located there, much potential for low-carbon energy production and emission reductions is located in developing countries, too. Renewable energy investments in the developing world sometimes deliver lower abatement costs than in the developed world, while also achieving a broad range of additional social, economic, and environmental co-benefits. Thus, a sustainable transition of global energy and industrial systems to lower carbon emissions depends upon a much intensified North-South collaboration (Ipsen et al. 2001) and the successful transfer to – and absorption of – low-carbon technologies within developing countries (Mallett et al. 2009).

In responding to climate change and moving towards a low-carbon economy, developing countries are facing two major challenges: first, the mobilisation of needed financing and investment; and, secondly, the acquisition, generation, and dissemination of relevant technology (WIR 2010). In both areas, foreign investment can make valuable contributions. While the future international climate change regime – including specific emission-reduction commitments and obligations for financial and technological support to developing countries – is still to be agreed upon, countries need to examine whether and how to facilitate low-carbon foreign investment. First of all, this will include technology transfer from North to South, but the transfer from and within the South as well as South-North should be considered.

The core idea of this study is to build public support to unleash private capital for foreign investments in the global North while establishing sustainable framework conditions to maximise the mitigation and development potential of these investments in the global South. In this context, foreign investments can be a valuable tool to support the transfer of technology and related know-how and capacities, if an enabling environment is established. Private investments must be attracted by new opportunities to overcome limited demand or market size while companies' financial risks must be reduced by public money and new regulation and standards to make foreign investments work for climate protection. To operationalise such a "virtuous cycle", different steps are required by the North and South, affecting both the public and private sectors. A summary of proposals prepared by this study is given in Table 4.

Table 4: Summary of actions and incentives for the public and private sectors in the North and South

	Public sector	Private sector
North (Investing country)	• Reduce the role of current export credit agencies. • Build new institutional mechanisms that promote foreign investments to make them work for climate protection and sustainable development that will. • Raise public money to support and leverage climate-friendly foreign investments so as to insure investments against financial and market instabilities, incentivise investments into markets with limited demand, and thus make investments attractive, even where returns on investments are expected to be low.	• Support should be offered to companies, e.g. renewable energy companies that aim to invest in countries with low production capacities. • The level of support should significantly raise companies' interests to go abroad. • Only those investments should be supported that conform to the highest standards at home. • Both public and private money raised may be used by countries to fulfil their international climate finance obligations
South (Recipient country)	• Implement strong, stable, transparent, coherent, credible, and ambitious long-term enabling environments. • Develop domestic technology roadmaps that identify countries' nationally appropriate mitigation actions. • Establish investment policies to effectively govern foreign investment inflows. • Design these policies in a way to maximise foreign investments' mitigation potentials as well as economic diversification and sustainable development.	• Setting the stage for sustained economic growth as "green growth" and "energy autonomy" through domestic renewable energies have more long-term prospects than "fossil growth". • Provide opportunities for economic diversification by catalysing foreign capital to climate-friendly sectors. • Foster ownership and competitive strength of domestic/local companies in the global market by demanding foreign investors engage in joint ventures and purchase local goods.

Weaving together the complementary challenges of investment support in the North and investment governance in the South could be seen as a "Global Green New Deal" in global climate policy. According to the United Nations Environment Programme, such a Global Green New Deal aims for "reviving the global economy and boosting employment, while simultaneously accelerating the fight against climate change, environmental degradation and poverty."[14] While the UN approach suggests a globally coordinated effort to address these challenges, measures on a national level could be either used to support this goal well before global agreements have been achieved, or to implement obligations arising from new agreements.

While the merits of such an integrated approach can best be realised if ambitious mandatory emission-reduction obligations are set and implemented, they do not

[14] See http://www.unep.org/greeneconomy/GlobalGreenNewDeal.

necessarily depend on a global agreement. Note that neither investment support nor investment governance will be managed by a global fund or facilitation, but will take place at the national level between countries. This bilateral investment support and investment governance approach intends to give each country's national policies – which set up the framework conditions for technology transfer – as much authority as possible. Global top-down decisions and one-size-fits-all prescriptions on the kind of technologies best supported can be avoided. Moreover, the approach suggested in this paper favours bottom-up approaches and fosters the bilateral and regional collaboration in the fight against climate change.

In any case, increased cooperation for low-carbon technology transfer will bring about major benefits for all sides. For the climate crises cannot be solved unless developing countries – and in particular the dynamic ones – immediately start to follow a low-carbon development path, avoiding further lock-in in carbon-intensive infrastructures and technologies. At the same time, the pace of action to curb emissions in developed countries needs to increase if the requirements of climate science are to be met. Public support for those domestic companies and initiatives that foster low-carbon technologies is absolutely key. Providing new forms of support for low-carbon foreign investments will achieve two goals at the same time: It fosters the sustainable energy transition at home and takes on the responsibility of co-financing low-carbon development in the rest of the world.

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