LEVERAGING FOREIGN INVESTMENT FOR A LOW-CARBON ECONOMY

CHAPTER IV

TNCs are both major carbon emitters and low-carbon investors. They are therefore part of both the problem and the solution to climate change.

TNCs can contribute to global efforts for combating climate change by improving production processes in their operations at home and abroad, by supplying cleaner goods and services and by providing much-needed capital and cutting-edge technology.

UNCTAD estimates that in 2009 low-carbon FDI flows into three key low-carbon business areas (renewables, recycling and low-carbon technology manufacturing) alone amounted to $90 billion. In its totality such investment is much larger, taking into account embedded low-carbon investments in other industries and TNC participation through non-equity forms. Already large, the potential for cross-border low-carbon investment is enormous as the world transitions to a low-carbon economy.

For developing countries, low-carbon foreign investment by TNCs can facilitate the expansion and upgrading of their productive capacities and export competitiveness, while helping their transition to a low-carbon economy. However, this investment also carries economic and social risks.

“Carbon leakage” has implications for both global emission reduction efforts and economic development. However, the extent of this phenomenon and its implications are hard to assess. Instead of addressing the issue at the border (as discussed in the current debate), it could be addressed at its source, working through corporate governance mechanisms, such as improved environmental reporting and monitoring.

Policy needs to maximize benefits and minimize risks related to low-carbon investment, based on individual countries’ social and economic conditions. UNCTAD suggests a global partnership to synergize investment promotion and climate change mitigation and to galvanize low-carbon investment for sustainable growth and development. This partnership should include establishing clean-investment promotion strategies; enabling the dissemination of clean technology; securing IIAs’ contribution to climate change mitigation; harmonizing corporate greenhouse gas emissions disclosure; and setting up an international low-carbon technical assistance centre.

A. Setting the context

Foreign investment can play a significant role in meeting the challenges of climate change mitigation by contributing the needed financial and technological resources. This requires a better integration of investment policies with the climate change framework and sustainable development strategies.

The global policy debate on tackling climate change is no longer about whether to take action. Against the background of common but differentiated responsibilities and respective capacities, it is now about how much action to take and which actions need to be taken – and by whom. The fight against global climate change ranks high on global political agendas.[1] Policymakers, however, are still struggling to formulate and agree on respective international and national policy frameworks. While the future of emission targets, the nature of institutions, concrete policy mechanisms and sources/disbursement of funding continue to be unclear, a set of broader observations can be made:

- It has become clear that the negotiation process has gone beyond environmental issues, and extends to discussions on economic development taking place under environmental constraints. Business is seen as a part of both the problem and the solution; international and domestic climate change policies must therefore encourage business to make a more positive contribution. This requires, among others, incorporating guiding principles on TNCs and foreign investment into climate regime policies, i.e. integrating international investment policies into the climate change framework.
- International governance mechanisms need to support and enhance domestic actions, including governments' efforts to harness markets and firms for low-carbon[2] development, i.e. to integrate climate change considerations with investment policies.
- International climate policy-making is, for the present, placing more emphasis on actions in the domestic arena – as demonstrated by country pledges, submitted to the United Nations Framework Convention on Climate Change (UNFCCC) after the Copenhagen summit, in line with domestic legislation. To combat climate change (box IV.1), low-carbon policies including measures targeting TNCs and foreign investment must therefore be incorporated into national economic and sustainable development strategies.
- Developing countries are confronted with two major challenges in responding to climate change and the move to a low-carbon economy: (a) financing and implementing investment in appropriate activities; and (b) the generation, diffusion and dissemination of relevant technology.

Taken together, this implies that TNCs can make valuable contributions to climate change mitigation, including in developing countries. At present, however, policy elements to harness TNC contributions (e.g. investment and technology) remain largely absent from climate change policies. Similarly, climate change aspects are essentially absent from investment policies. There is therefore a need to synergize these two areas of policy-making, with a view to galvanizing low-carbon investment for climate change mitigation – hence the focus of the *Report*.

So far, the main international policy effort has been the Kyoto Protocol, which was signed in 1997 and entered into force in 2005. The Protocol commits industrialized (known as Annex I) countries to reducing GHG emissions by an average of 5.2 per cent from 1990

Box IV.1. Mitigation and adaptation in a climate change context

Mitigation: "In the context of climate change, a human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power, improving the insulation of buildings, and expanding forests and other "sinks" to remove greater amounts of carbon dioxide from the atmosphere."[a]

Adaptation: "Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities."[b] Adaptation not only covers actions undertaken to reduce the adverse consequences of climate change, but also those harnessing the beneficial opportunities it generates. In terms of corporate activities, adaptation covers company actions to adapt to the direct physical impacts of climate change, but it does not include mitigation measures by companies in response to climate policies.

The stronger mitigation actions are and the earlier they are undertaken, the smaller the costs from adaptation are likely to be. Yet even strong and immediate mitigation does not obviate the need to adapt to changing climate conditions triggered by emissions that have already occurred or cannot be stopped immediately.

Source: UNCTAD, based on UNFCCC information.

[a] UNFCCC Glossary website at: http://unfccc.int/essential_background/glossary/items/3666.php (accessed 25 June 2010).

[b] Ibid.

levels until the period 2008–2012 (United Nations, 1998). In line with the UNFCCC (1992), which determined that countries have to act or be supported according to their "common but differentiated responsibilities and capabilities", the Kyoto Protocol acknowledges that developing countries have the right to develop their economies as developed nations did in the past, and thus does not assign them binding GHG reduction targets. This does not preclude them from exploring options in the context of the global battle against climate change. In addition, some developed countries did not ratify the Protocol. The Protocol's lack of coverage and of participation by a number of countries has been criticized, together with its short-term nature, lack of stringency and lack of compliance incentives (Aldy and Stavins, 2007). At the same time, the Kyoto Protocol has been applauded for allowing Annex I countries to reach their targets cost-efficiently through the establishment of flexible mechanisms: Emission Trading, Joint Implementation (JI) and the Clean Development Mechanism (CDM).

Emission trading is based on the distribution to Annex I countries of emission allowances, also called assigned amount units (AAUs), which correspond to their agreed targets. These countries can then decide whether it is cheaper to reduce emissions domestically or to acquire instead AAUs from other Annex I countries. Further, Annex I countries can decide to generate additional project-based emission allowances by investing in GHG-reducing projects in other Annex I countries (JI) or other countries (CDM) (Grubb, Vrolijk and Brack, 1999). Of these last two mechanisms, the CDM was implemented much earlier, has a larger market size and is more politically significant, as it is the only mechanism seeking to lower emissions in developing countries (box IV.2).

While having a set of global agreements and emission reduction targets – albeit incomplete – for developed countries seems to have triggered some innovation activities (Johnstone, Haščič and Popp, 2010), these mechanisms are mainly designed for compliance at the country-level and thus do not directly create incentives at the firm level. As a result, it is left to national (or supranational) governments or institutions to decide how to involve different economic actors. For example, the European Union (EU) member States passed

Box IV.2. The Clean Development Mechanism – some headway, but not enough

The Clean Development Mechanism (CDM) allows developed country investors to acquire credits for GHG emission reductions that result from climate mitigation projects in developing (host) countries. The purpose is to help (a) developed countries comply with their emission commitments under the Protocol; and (b) host countries develop in a sustainable fashion and contribute to the ultimate objective of the UNFCCC. To date, over 2,250 projects in 68 countries have been registered, and over 420 million credits have been issued.

Criticisms of the current CDM setup have arisen on several grounds. First, it has generated mixed benefits for many host countries, including with respect to expected cross-border investment and technology flows. While several studies find that the CDM contributes to technology transfer in around 40 per cent of projects, this process depends strongly on project size, technology type and host country characteristics (Seres, Haites and Murphy, 2009; UNCTAD, 2009i). Second, it is struggling to cope with the unexpectedly high demand for registering projects and issuing credits, particularly in guaranteeing additionality[a]; and the governance of the CDM Executive Board has also attracted criticism. Third, projects have been unequally distributed geographically: countries combining market attractiveness, robust overall institutional frameworks and well-functioning CDM institutions have dominated CDM activities, with African countries, as well as LDCs and other structurally weak economies, being largely left out. It has to be kept in mind, however, that many developing countries are not large GHG emitters in the first instance, thereby limiting the potential for reducing emissions.

With respect to FDI, results have been varied. Although initial estimates forecast much less FDI involved in CDM projects than first expected (Arquit Niederberger and Saner, 2005), it is now estimated that CDM projects entering the pipeline since 2002 represent an estimated $150 billion in clean energy investments if they all come to fruition (UNEP Risoe, 2010), including many FDI projects. Project sponsors from developing countries have sometimes financed their own projects, especially in major emerging economies (Seres and Haites, 2008; Lütken and Michaelowa, 2008). In these cases, the sale of certified emission reductions (CERs) – while reducing emissions and contributing to less carbon intensive development options – does not constitute low-carbon foreign investment (or FDI in general). Further obstacles to FDI include weak institutional frameworks – an issue that UNCTAD and other partners under the UNFCCC Nairobi framework have sought to address through technical cooperation and Regional Carbon Business Fora.

At the Copenhagen summit in December 2009, Parties to the Kyoto Protocol overwhelmingly called for the reform and strengthening of the CDM. In addition, Parties discussed the possibility of creating new instruments to complement and to go beyond the scope of the CDM in an attempt to deliver emission reductions and FDI on a larger scale. Such moves give hope that mechanisms engaging the market are likely to be part of the new emerging climate regime.

Source: UNCTAD, Partly based on input from UNFCCC.

[a] Additionality is a key criterion in the registration of projects. It is meant to avoid free-riding on the process, i.e. to not allocate credits to projects that would have happened in any case in the absence of the CDM.

down part of their emission reduction obligations to industry, and together launched the EU emission trading scheme (EU ETS) to help firms comply. Similar "cap-and-trade" schemes were debated and/or established in other countries, such as the United States and Australia.

While representing a first step towards investment-related policies – and especially those pertaining to TNCs and foreign investment – for moving towards a low-carbon economy, the existing climate change regime exhibits a number of shortcomings vis-à-vis private sector investment. First, the Kyoto Protocol and its flexible mechanisms are, in the first instance, targeted at the country-level. Accordingly, each government must decide how to bring in the private sector, which results in a lack of common metrics

and policies and can lead to very fragmented markets, thereby reducing demand for low-carbon investment. The country level focus of the Kyoto Protocol also results in a situation where the current international regime does not contain adequate and effective provisions related to investment. Secondly, although the CDM and JI were expected to generate foreign investment and technology flows, in the main this expectation has not been met. Finally, the current international climate regime – which remains in a state of flux – lacks what the private sector needs most to reorient its strategies: a "loud, long and legal" international and national commitment by governments (WBCSD, 2005). Uncertainties about the post-Kyoto framework weaken the private sector's ability and willingness to make decisions in the area of climate change.

Developing countries in particular are grappling with the need to create a policy framework that effectively leverages foreign and domestic private investment for climate change mitigation and development; and underlying this difficulty is the more fundamental question of the priority they give to low-carbon strategies (UNCTAD, 2009f) and, in that context, to foreign investment. Many developing countries have limited resources and capabilities, including requisite technologies and skills for investment in appropriate activities; and, moreover, the costs of access to necessary low-carbon know-how are high. As a result, focussing on moving towards a low-carbon economy holds the danger of slowing much needed growth. At the same time, there are first-mover and other advantages that could be derived from such a move. TNCs can make particularly strong contributions to the technological aspects of the move towards a low-carbon economy, as well as to the financing and investment challenge it poses – if leveraged by supportive policies. However, in this context, current policy regimes – at the national and international levels – are perceived as falling short of effectively harnessing (foreign) private sector investment.

B. The characteristics and scope of low-carbon foreign investment

1. Low-carbon foreign investment and the value chain

TNCs can lower global GHG emissions through foreign investments that upgrade technologies and processes in their operations and value chains. They can also supply low-carbon products and services.

Low-carbon foreign investment[3] can be defined as the transfer of technologies, practices or products by TNCs to host countries – through equity (FDI) and non-equity forms of participation – such that their own and related operations, as well as use of their products and services, generate significantly lower GHG emissions[4] than would otherwise prevail in the industry under business-as-usual (BAU) circumstances (box IV.3).[5] Low-carbon foreign investment also includes FDI undertaken to access low-carbon technologies, processes and products.

Low-carbon foreign investment can potentially reduce GHG emissions in host countries in two ways:

- TNCs' operational processes and those of related firms along their global value chains can be upgraded (fig. IV.1) by introducing ***low-carbon processes*** that reduce GHG emissions. Although this type of investment usually requires R&D in both hard and soft technologies when undertaken in home countries, it often involves only the dissemination of technology to the host economy when

Box IV.3. The business-as-usual scenario

Business-as-usual (BAU) scenarios for anthropogenic GHG emissions are counterfactual assessments of the level or change in these emissions (in different contexts) over a period of time, based on the assumption that no (additional) actions to mitigate GHGs are taken by governments, companies or individuals. For example, McKinsey & Company, by drawing on widely acknowledged sources, calculate a BAU scenario as a basis for their "Global Greenhouse Gas Abatement Cost Curve". They project that GHG emissions in the BAU case will increase by around 55 per cent in the period from 2005 to 2030 (from 46 to 70 $GtCO_2e$ (giga tons of CO_2 equivalent) per year).

Key assumptions in this particular BAU case are:

- An annual GDP growth of 2.1 per cent in developed countries and 5.5 per cent in developing countries;
- Global population growth of 0.9 per cent per annum, with 0.2 per cent in developed countries and 1.1 per cent in the developing countries; and
- An oil price of $60 per barrel.

A further assumption is made regarding the amount of GDP produced per unit of CO_2e emitted. The BAU scenario factors in that, over the period 2005–2030, the carbon content of GDP will be reduced by 1.2 per cent annually, which is broadly in line with historic improvements of this measure. This "decarbonization" is largely due to energy efficiency improvements most likely to happen as a by-product of economic development, in the past characterized particularly by structural change. Behavioral change is not factored into the BAU scenario, e.g. in the transport sector by people switching from private vehicles to using public transportation.

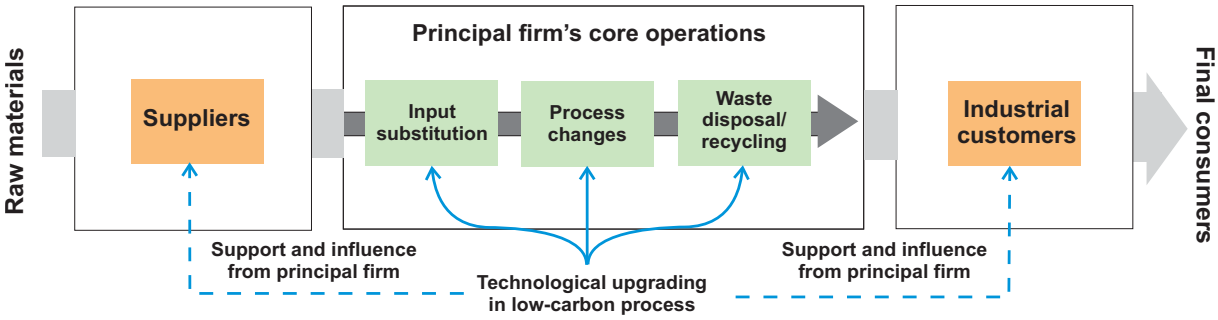
The assumptions made for the estimate by McKinsey hold substantial uncertainty, mainly due to underlying uncertainties about future GDP and population growth, as well as country choices defining the carbon-intensity of their development paths. Hence BAU scenarios can differ considerably based on the assumptions made.

Source: UNCTAD, based on McKinsey & Company, 2009; IEA, 2007.

Note: McKinsey & Company took most assumptions from the International Energy Agency's (IEA) *World Energy Outlook* for 2007 (IEA, 2007).

undertaken abroad.[6] Foreign investment in low-carbon processes occurs through the upgrading of existing TNC operations as well as new investments. Firstly, companies in all industries and sectors can, in principle, switch to *inputs with lower GHG emissions* (input substitution in the figure). In the case of power utilities, for example, this might involve a shift from fossil fuels towards biomass, renewable resources or nuclear energy[7] for electricity generation.[8] Secondly, a company can change processes in order to *consume less* of a particular input (i.e. increasing material- or resource-efficiency). Thirdly, a company can change processes so as reduce related emissions (e.g. increasing efficiency in power supply by installing more efficient fossil fuel power plants, or improving process automation in order to use less energy). Finally, a company can attempt to recycle or dispose of wastes originating from its operations in a low-carbon manner. In the power sector, carbon capture and storage (CCS) is the prime example: companies continue with a high-carbon technology, such as coal power plants, but capture the CO_2 at the end of the process and sequester it underground. Along its value chain or in its other networks, a firm can also require suppliers, industrial customers or other partners also to upgrade to low-carbon processes as part of its objective to switch to lower-carbon inputs. In such cases, companies can also offer partners technological support, guidance or alliances in creating new technologies. For

Figure IV.1. Introduction of low-carbon processes leading to GHG emissions reductions along a typical value chain



Source: UNCTAD.
Note: The value chain depicted in this figure is "typical" for the manufacturing sector. Analogous activities in other value chain or network activities, e.g. in financial services or utilities, can also be depicted.

example, TNCs in agribusiness can influence their suppliers to change towards more sustainable, low-carbon farming practices (e.g. through contract farming arrangements).[9]

- TNCs can create or promote products and services that are low carbon in how they are used (not simply in how they are made). Such ***low-carbon products and services*** include, for instance, electric cars (which have lower GHG emissions than conventional cars), "power-saving" electronics and light bulbs, renewable energy equipment or integrated mass transport systems. Most low-carbon products and services require a change in behaviour and demand patterns on the part of users, however. Whereas market demand is a significant incentive for such investments in home countries, demand for such products is unlikely to be the same in different economies. In the case of export-orientated foreign investment in tradable products, the investment can be considered low-carbon, even if 100 per cent of the output is exported, because GHG emissions are reduced at the global level.

A special case of the second type consists in TNCs providing *low-carbon technology services* by reengineering GHG emitting processes in independent local companies and other organizations in host countries. This enables firms to upgrade their own operations and businesses to repackage their knowledge and reach new markets. Such foreign investment in low-carbon technology services may not be large yet, especially in developing countries, but firms are increasingly offering such services. For example, in view of the rise of the clean energy market, Ricardo Consulting Engineers (United Kingdom) – which started designing and building motor car engines in 1915 – has repackaged its technology into a series of new businesses focusing on low-carbon technology services. Ricardo has become active in markets with alternative uses for its technology, such as renewable energy, power generation and transportation and infrastructure.[10] This has led to various new spin-out businesses, such as product and process development services for wind, solar and tidal energy systems and energy storage systems in Asia, Europe and North America.[11]

Establishing the scale and scope of low-carbon foreign investment carries some complications, however. Firstly, the identification and measurement of low-carbon foreign investment is not straightforward, given the lack of an absolute measure, the different types of such investment and the context specificity (section B.3). Secondly,

the above typology of low-carbon foreign investment applies equally well, with appropriate modifications, to both equity and non-equity forms of TNC participation. For example, the notion of technological upgrading of operations to reduce GHG emissions can be readily applied to build-operate-transfer (BOT) projects.[12]

Thirdly, while a TNC can reduce GHG emissions in facilities it owns or runs, it can also influence emissions along its value chain (fig. IV.1). Suppliers in a host country, for instance, can be persuaded or supported to switch to low-carbon technologies in order to reduce GHG emissions associated with the TNCs' inputs. TNCs can also work to help reduce GHG emissions in their customers' operations. They usually are in a better position to provide technological support to their suppliers and customers than local companies, and – in the context of international value chains – may also be more likely to do so in order to meet demands for low-carbon products from their final customers in developed countries. Moreover, TNCs may be more advanced in reducing GHG emissions than their local suppliers and customers, which may result in these local partners modifying their technology accordingly.

2. The demand for low-carbon foreign investment by sector

An effective way of leveraging the contribution of TNCs to lower GHG emissions is to channel low-carbon foreign investment into key sectors with high mitigation potential.

The climate change debate is framed in terms of sectors,[13] such as power, transportation, buildings and agriculture, which are deemed significant in achieving GHG emission reductions. These sectors offer a concrete framework within which low-carbon investments – domestic and foreign – are defined and required to meet GHG emission challenges; and host countries, including those who themselves are not large emitters of GHGs, can use this as a basis to assess the likely impact and net benefits of foreign investment relative to other options.

The main sectors which dominate GHG emissions – and hence require the attention of policy-makers in order to reduce these emissions – are sectors where TNCs play a strong role as emitters (i.e. power and industry), sectors where emissions largely result from consumption and public use (i.e. transport, buildings and waste management) and sectors where emissions are due to changes in land-use such as deforestation and land degradation (i.e. forestry and agriculture). These sectors – which represent areas of GHG emissions rather than economic areas – are based on the classification used by the Intergovernmental Panel on Climate Change (IPCC) in their Fourth Assessment Report (IPCC, 2007).

Emissions vary substantially across these sectors, and their relative weight will continue evolving over time. Estimated annual global emissions by sector in 2030, using the business-as-usual scenario described in box IV.3,[14] are presented in table IV.1. The mitigation potential in each sector is estimated taking into account existing technologies and emitting entities, and the additional investment needed to achieve this potential is then calculated. Some sectors, such as power, are projected to be among the largest emitters of GHGs in 2030, but their impact can potentially be mitigated more cost effectively than in other sectors, such as transport.

The types of low-carbon foreign investment described in the previous section carry varying relevance across emission sectors. Much of the potential demand for foreign investment focusing on low-carbon *processes*, for example, lies in sectors where TNCs themselves are major emitters relative to other entities, essentially power and industry

(manufacturing and heavy industry). The demand for foreign investment focusing on low-carbon *products and services* – including technology services – is spread more evenly across sectors (as indicated in the right column of table IV.1).

In terms of direct and indirect GHG emissions, as well as mitigation potential using available technology, the ***power*** sector is the cornerstone of any global effort to reduce GHG emissions. TNCs can play a significant role in these efforts, both through process and product/services low-carbon foreign investment. There is plenty of scope for TNCs in the power industry, whose foreign expansion has accelerated since the early 1990s, to improve their processes in host countries (*WIR08*). CEZ Group (Czech Republic), for example, is investing $1.62 billion in a wind park in Romania to offset emissions from dirtier coal-fired power plants it owns in the country.[15]

Yet local private and state-owned enterprises (SOEs) still dominate the power sector in most countries and are therefore a significant source of potential demand for foreign investment in low-carbon products/services. While established TNCs are still the main suppliers of goods and services in traditional power technologies, new TNCs – mostly from developed countries, but also from some developing countries (section B.3) – are emerging in renewable energy, including manufacturing power generation equipment (see also Kirkegaard, Haneman and Weischer, 2009). An example showing how foreign investment in low-carbon product/services is set to burgeon is the case of SPX (United States) in India. The company has announced a joint venture with Thermax – an Indian company specializing in energy and environmental engineering based in Pune – to make emissions-control equipment for large power plants.[16]

Many companies in the ***industry*** sector are major emitters of GHGs, in particular those involved in oil & gas, cement, iron & steel, and chemicals. TNCs, which are major global industrial players, are in a prime position to diffuse cleaner technologies and processes in their own operations overseas, as well as via their value chains (section B.1). Cemex (Mexico), for example, is upgrading its cement plant in the city of Sant Feliu de Llobregat (Spain), in particular the electro-filter system, in order to guarantee that GHG emission levels are a fifth of the maximum level set by existing legislation.[17] Beyond these improvements to their own processes, TNCs in industries such as machinery, electronics and energy services can potentially provide the equipment, appliances and know-how for emission mitigation in all sectors worldwide.

The ***transport*** sector is forecast to be responsible for roughly one sixth of global emissions by 2030, over 60 per cent of which will originate from passenger cars and small commercial vehicles. Key mitigation actions, such as the introduction of more fuel-efficient, electric, hybrid or simply lighter vehicles, depend on companies, many of which are TNCs, developing and disseminating these technologies. Nissan Motors (Japan/France), for example, is progressively moving the production of its subcompact car, the Micra, from Japan to Thailand for sale both locally and in export markets; the Government of Thailand is keen for the Micra to be the first in a series of "eco-cars" to be manufactured in the country.[18] Beyond technological solutions, there is a need to induce behavioural changes among consumers which might, for example, underpin a shift towards mass transport systems such as urban railways. Providers of such products/services also include TNCs, many of which are already active in rising urban centres. In Nigeria, for instance, the China Civil Engineering Construction Company (CCECC) has started work on the Lagos Rail Mass Transit project;[19] similarly, a joint venture between Odebrecht (Brazil) and

Table IV.1. Mitigation potential and TNC involvement in sectors of emission

Sectors of emission Projected annual emissions in 2030 ($GtCO_2e$)[d] Mitigation potential in 2030 ($GtCO_2e$)[d] Additional annual investment needs (over existing levels of investment in these areas, in Euro billions)[a]	Sector definition[b] and relevant emitting entities	Key mitigation technologies and practices currently commercially available[c]	Demand for low-carbon foreign investment	
			Low-carbon *process* foreign investment (i.e. impacts on TNCs' own operations or their value chain) (examples)	Low-carbon *product/services* foreign investment (i.e. TNCs supplying products and services to entities in sector) (examples)
Sectors with TNCs playing a strong role as emitters				
Power 18.7 $GtCO_2$ 10 $GtCO_2$ 148 €	Direct emissions from the combustion of fossil fuels or biomass for the production of electricity and heat. Emitting entities: utilities; operators of standalone power plants	Improved supply and distribution efficiency; fuel switching from coal to gas; nuclear power; renewable heat and power (hydropower, solar, wind, geothermal and bioenergy); combined heat and power; early applications of carbon capture and storage (CCS) (e.g. storage of removed CO_2 from natural gas)	Input switching • Use renewable/low-carbon energy sources Input reducing • Increase efficiency of existing facilities Enhanced recycling • Capture heat for other uses • CCS	• Power machinery and infrastructure manufacturers • Energy Services Companies (ESCOs) • Grid optimizing firms • Engineering / environmental consulting firms
Industry 29.1 $GtCO_2$ 7.3 $GtCO_2$ 113 €	Direct emissions from the combustion of fossil fuels and industrial processes (for example, from chemicals, aluminum and cement), and indirect emissions from electricity and heat consumption. Emitting entities: all manufacturing and heavy industry companies, including petroleum & gas, cement, iron & steel, and chemicals.	More efficient end-use electrical equipment; heat and power recovery; material recycling and substitution; control of non-CO_2 gas emissions; and a wide array of process-specific technologies CCS	Input switching • Source low-carbon energy • More use of biomass Input reducing • Process improvements • Increase efficiency of existing facilities Enhanced recycling • Reduce or eliminate flaring from oil and gas production and refining • CCS Value chain – upstream • Support to and influence on suppliers	• Equipment manufacturers • Engineering / environmental consulting firms
Sectors with emissions largely by consumers and public use				
Transport 11.4 $GtCO_2$ 3.2 $GtCO_2$ 300 €	Direct emissions from the combustion of fossil fuels for transportation activities and services (air, rail etc.), This sector does not include emissions pertaining to the manufacture of motor vehicles or other transport equipment, which are included in the industry sector. Emitting entities: governments, households (61 per cent of emissions originate from passenger cars and small commercial vehicles), companies	More fuel efficient vehicles; hybrid vehicles; cleaner diesel vehicles; biofuels; modal shifts from road transport to rail and public transport systems and reduced transport needs (e.g. through telecommuting / behavioural change); non-motorised transport (cycling, walking); land-use and transport planning	Input switching • Use biofuels Input reducing • Make use of more efficient vehicles, planes etc. • Make use of non-emitting vehicles	• Transportation equipment manufacturers (car, air, rail etc.) • Systems providers (e.g. mass transit railways) • Biofuel producers • Engineering / environmental consulting firms

Table IV.1. Mitigation potential and TNC involvement in sectors of emission

Sectors of emission Projected annual emissions in 2030 ($GtCO_2e$)[d] Mitigation potential in 2030 ($GtCO_2e$)[d] Additional annual investment needs (over existing levels of investment in these areas, in Euro billions)[a]	Sector definition[b] and relevant emitting entities	Key mitigation technologies and practices currently commercially available[c]	Demand for low-carbon foreign investment	
			Low-carbon *process* foreign investment (i.e. impacts on TNCs' own operations or their value chain) (examples)	Low-carbon *product/services* foreign investment (i.e. TNCs supplying products and services to entities in sector) (examples)
Buildings 12.6 $GtCO_2$ 3.5 $GtCO_2$ 198 €	Direct emissions from the combustion of fossil fuels and indirect emissions attributable to public heat and electricity consumption in residential, commercial, and public buildings. Emitting entities: households (62 per cent of emissions), companies, governments	Efficient lighting and daylighting; more efficient electrical appliances and heating and cooling devices; improved cook stoves; improved insulation; passive and active solar design for heating and cooling; alternative refrigeration fluids, recovery and recycle of fluorinated gases	Input switching • Source low-carbon energy Input reducing • Make use of more energy efficient appliances, lighting etc. • Improve insulation of facilities to reduce emissions due to heating/cooling	• Appliance manufacturers • Building materials manufacturers • Heating/cooling manufacturers • Lighting manufacturers • Architecture services • ESCOs
Waste management 1.7 $GtCO_2$ 1.5 $GtCO_2$ 8 €	Direct emissions from landfills, wastewater treatment, human sewage, and others. Emitting entities: landfill operators (private & public), wastewater treatment facilities (private & public)	Landfill methane recovery; waste incineration with energy recovery; composting of organic waste; controlled wastewater treatment; recycling and waste minimization	Enhanced recycling • Capture and use methane emissions	• Waste management services firms • Engineering / environmental consulting firms
Sectors largely with emissions from changes in land use				
Forestry 7.2 $GtCO_2$ 7.8 $GtCO_2$ 43 €	Direct emissions due to deforestation, decay and peat. Emitting entities: forestry companies, private forest owners, governments	Afforestation; reforestation; forest management; reduced deforestation; harvested wood product management; use of forestry products for bioenergy to replace fossil fuel use	Enhanced recycling • Use bio waste Value chain – upstream • Wood and wood product manufacturers supporting and influencing their suppliers in the sector	• Technology services companies • Environmental services companies
Agriculture 7.9 $GtCO_2$ 4.6 $GtCO_2$ 0 €	Direct emissions from livestock, manure, cultivation of crops, soil management, and others. Emitting entities: households (farmers), governments, plantation companies and other agribusiness	Sustainable agricultural practices, such as improved crop and grazing land management to increase soil carbon storage; restoration of cultivated peaty soils and degraded lands; improved rice cultivation techniques and livestock and manure management to reduce CH_4 emissions; improved nitrogen fertilizer application techniques to reduce N_2O emissions; dedicated energy crops to replace fossil fuel use; improved energy efficiency	Input switching • Less use or improved types of fertilizer Enhanced recycling • Use bio waste Value chain – upstream • Food & beverage manufacturers, food retailers (supermarkets) supporting and influencing their suppliers (farmers, plantations) in the sector	• Seed companies • Fertilizer producers • Technology services

Source: UNCTAD, partly based on IPCC, 2007; McKinsey & Company, 2009.

[a] Projected emissions in 2030, mitigation potential in 2030 and additional investment needs are taken from McKinsey & Company, 2009.
[b] Sector definitions are based on IPCC, 2007; and Baumert, Herzog and Pershing, 2005, but differ slightly, thus the mitigation potential and investment needs are also slightly different from IPCC's.
[c] Key mitigation technologies are taken from IPCC, 2007.
[d] $GtCO_2$ stands for gigatons of CO2 equivalents.

Graña y Montero (Peru) has recently won a competitive bid to finish a line of Lima's integrated urban bus system, also known as the COSAC 1 project.[20]

Low-carbon process foreign investment can also occur in transport for example foreign-owned transport companies can shift to alternative fuels such as biodiesel; or, in a similar vein, car rental companies can alter their vehicle ranges towards more efficient or battery-powered ones.

The ***buildings*** sector is expected to generate the third highest level of projected GHG emissions in 2030, 62 per cent of which originate from households. Along with industry, it is the sector most responsible for indirect emissions from electricity consumption related to heating, cooling and lighting. As well as using less energy in their own buildings – which involves TNCs' investment in low-carbon processes – investment by TNCs in low-carbon product/services, especially from the industry sector, can substantially improve efficiency in buildings, even in relatively poor regions. For instance, Philips (Netherlands) has established a manufacturing facility of energy-efficient compact fluorescent lamps (CFL) in Lesotho, including a CFL recycling plant alongside – the first in Africa. Much of the facility's output will be exported across Southern Africa, where demand for energy-efficient lamps is increasing. This demand is partly driven by the large role played by CFLs in regional power utility Eskom's (South Africa) programme to reduce electricity consumption in South Africa and neighbouring countries where it operates.[21] TNCs offering building-related services, such as property developers and hotels, can also contribute to emission reduction in the sector. For instance, hotel companies are increasingly integrating a range of products and technologies which allow them to reduce GHG emissions in a traditionally high-emission industry. Examples of such products and technologies include energy-saving technologies, such as air-conditioning and ventilation systems that include heat recovery systems, LED lighting technology, but also rain harvesting techniques and a wide-spread use of recycled of products, from plastic bottles to beds.[22] Thus changing patterns in one industry affect demand patterns in many other industries.

In comparison to transport and buildings, the ***waste management*** sector[23] – mainly landfills and wastewater treatment – is forecast to account for relatively few emissions in 2030, and almost all of these can be reduced at a relatively low cost (table IV.1). The abatement potential lies to a very large extent in landfill methane recovery. While this sector is often dominated by the public sector, TNCs can invest in low-carbon technology services such as waste management and consultancy services. Veolia (France) is active in waste management across the globe, including in developing countries (*WIR08*). As a mixed example of foreign investment in low-carbon process and product, Anmol Group (India) has recently invested in a large paper making plant in Ethiopia using waste paper which would normally be incinerated.[24] TNCs are also increasingly involved in establishing waste treatment facilities alongside their other operations, often as services to external users as well as for their own processes.

Of the two land-related sectors, ***agriculture*** is projected to have the higher level of GHG emissions in 2030; ***forestry,*** however, has the higher abatement potential – indeed one greater than its emissions – due to potential afforestation[25] and reforestation. Though there are large TNCs involved in agriculture and forestry, overall, TNCs are little involved in these sectors' direct GHG emissions. However, in the context of global value chains, they can potentially help diffuse more climate-friendly (e.g. organic) farming and other sustainable practices across the globe through their suppliers or customers (*WIR09*). Supermarket chain

Tesco Plc (United Kingdom), for instance, is working with its global suppliers – along its value chain – to reduce the carbon intensity of the products it sells,[26] or to reduce the number of miles their farm-produce trucks travel every year.

3. Low-carbon FDI is significant and its potential huge

In three key low-carbon business areas alone, FDI flows are estimated to have amounted to $90 billion in 2009. Low-carbon foreign investment is growing rapidly and new players are emerging, including from the South.

The estimated costs of climate change mitigation vary considerably. UNFCCC (2007) projected that an additional global investment of $200–210 billion per year would be required just to maintain the current levels of GHG emissions in 2030. Taking a different methodological approach in terms of assumptions and targets to be achieved, Stern's (2009) estimate goes as high as $1.2 trillion, while McKinsey & Company (2009) arrive at €810 billion – used for a sectoral picture in section B.2 (see UN-DESA, 2009 for an overview). As global FDI flows equal roughly 15 per cent of total gross domestic fixed capital formation today, low-carbon foreign investment will constitute a significant proportion of the total, whichever figure is chosen.

Identifying low-carbon foreign investment is not straight forward in practice; for instance it is not feasible to scrutinize each individual FDI case to separate out those which are definitively low carbon from a total numbering some 22,000[27] in 2009 alone. The analysis below therefore attempts to obtain an estimate by examining FDI in greenfield projects and cross-border M&As data that UNCTAD collects regularly,[28] bearing in mind other forms of foreign investment.

In the database on greenfield investments[29] identifiable low-carbon FDI projects are primarily found in alternative/renewable energy (which accounts for the bulk of cases), recycling activities and environmental technology manufacturing. During 2003–2009, there were 1,725 such projects. To these projects can be added 281 cross-border M&A operations in renewable electricity generation concluded during the same time period (the number and value of these combined deals amounts to 2006 and $344 billion, respectively) (table IV.2).

In 2009 low-carbon FDI in these activities alone amounted to roughly $90 billion (fig. IV.2). This is a conservative, lower-end estimate since there are also some low-carbon foreign investments in other industries and activities. However, renewables, recycling and environmental technology manufacturing form the core of initial new low-carbon business opportunities. In addition to FDI, low-carbon foreign investment also prevails in non-equity forms of TNC participation, such as build-operate-transfer

Table IV.2. FDI in three low-carbon business areas, cumulative, 2003–2009

(a) Number

Partner (host regions)	Reporting (investing) regions			
	World	Developed economies	Developing economies	South-East Europe and the CIS
World	2 006	1 741	226	21
Developed economies	1 244	1 172	56	7
Developing economies	684	503	166	6
South-East Europe and CIS	78	66	4	8

(b) Value ($ million)[a]

Partner (host regions)	Reporting (investing) regions			
	World	Developed economies	Developing economies	South-East Europe and the CIS
World	344 057	304 469	35 601	3 890
Developed economies	194 618	188 995	5 377	242
Developing economies	135 840	104 991	28 988	1 768
South-East Europe and CIS	13 599	10 482	1 237	1 880

Source: UNCTAD, based on data from the Financial Times, the FDiIntelligence database (fdiintelligence.com) and the UNCTAD FDI/TNC database.

[a] Includes announced project values for some 930 projects only.

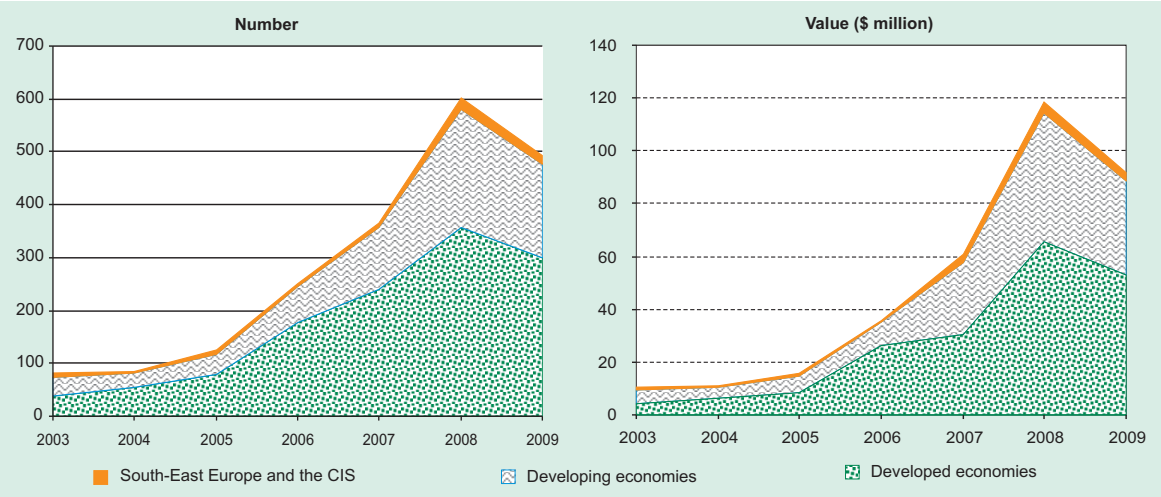
(BOT) arrangements. Moreover, over time, low-carbon investment will permeate all industries, for example, as TNCs introduce *processes* to reduce GHG emissions.

Apart from the huge number of cases of FDI to be considered, there are other problems hampering estimation of the overall level of low-carbon foreign investment. In most cases, the data do not specify the production processes involved (i.e. does the new investment utilize low-carbon processes) or the specific output being produced (i.e. are they energy saving products, such as compact fluorescent lamps). Low-carbon foreign investment is a relative concept based on a business-as-usual scenario, which further complicates measurement (section B.1). Low-carbon investments also occur in industries other than those considered here, as the examples by sector in section B.2 indicate – but data on those industries are not yet systematically available. There is also the question of non-equity forms of low-carbon foreign investment that are not captured in traditional data sources on FDI.

Further evidence of low-carbon FDI's growing prominence comes from UNCTAD's *World Investment Prospects Survey 2010–2012*, which highlights the involvement of the largest TNCs – including their climate-change related plans – from a range of industries (box IV.4; UNCTAD, forthcoming a).

Returning to identifiable cases only, the pattern of low-carbon FDI is diverse in terms of geography and the types of TNCs' involvement. Greenfield investments in ***alternative/renewable power generation*** (728 in total during 2003–2009), for example, have generally been on the rise since 2003, except for a recent dip in developed and transition economies due to the financial and economic crisis. The majority of these investments were in developed economies, but over a quarter were in developing economies; with countries such as Brazil, Chile, China, India, Indonesia, Morocco, Pakistan, Peru, Philippines, South Africa, Tunisia, Turkey, Viet Nam and Zambia among the recipients. Cross-border M&A operations in renewables, on the other hand, are concentrated in a handful of countries (primarily in Brazil, China, India and Turkey). This is due to the dearth

Figure IV.2. FDI in three low-carbon business areas, by group of economies, 2003–2009



Sources: UNCTAD, based on data from the Financial Times, the FDiIntelligence database (fdiintelligence.com) and the UNCTAD FDI/TNC database.

Note: The three business areas are alternative/renewable energy, recycling and manufacturing of environmental technology.

Box IV.4. TNCs' climate change-induced investments, 2009

UNCTAD annually carries out a survey of the largest TNCs and the investment plans they hold for the two years to come. The 2010–2012 survey results, based on some 240 TNCs, give some insights into climate change-induced investments. Although the findings should be treated as illustrative rather than conclusive since the survey was not primarily concerned with climate change issues, there are some interesting results. For example, 45 per cent of respondent TNCs across all industries indicated that host countries' GHG emissions reduction needs and policies were taken into consideration in their plans; 31 per cent had made cross-border acquisitions to obtain technologies and other created assets related to emission reductions; and 32 per cent exploit their own technologies, know-how and skills pertinent to GHG emission reductions in their foreign investments. These findings differ somewhat by industry. For instance, 37 per cent of respondent TNCs in chemicals and chemical products have a limited (5–10 per cent of total FDI), significant (10–20 per cent) and very significant (more than 20 per cent) share of climate change induced investments in their total foreign investments, compared to an average level of 30 per cent for manufacturing as a whole. The equivalent share for TNCs in transport, storage and communications was 40 per cent, compared to 32 per cent in all services.

Box table IV.4.1. Share of climate-change induced investments in TNCs' foreign investments

Sector/industry	Nil	Limited (up to 10%)	Significant (10% to 20%)	Important (more than 20%)	Unknown	Number of responses
Primary	..	..	..	..	..	**7**
Manufacturing	**18**	**45**	**11**	**5**	**21**	**106**
Chemicals and chemical products	16	42	21	-	21	19
Electrical and electronic equipment	11	53	11	5	21	19
Services	**27**	**40**	**5**	**8**	**19**	**62**
Trade	40	40	-	5	15	20
Transport, storage and communications	27	40	13	7	13	15
Total	**21**	**46**	**9**	**6**	**19**	**175**

Source: UNCTAD, forthcoming a.
Note: Based on 175 responses.

Source: UNCTAD.

of companies with advanced technologies in renewable electricity generation in many of these economies.

Established power utilities top the list of the TNCs most actively investing in renewables (table IV.3), suggesting that low-carbon process investments dominate. The emergence of new players, either new companies or established ones crossing over from other sectors, indicates growing competition in this field. So does the nearly 10 per cent share of investment projects, in number, held by TNCs from developing countries, the bulk of which are South-South (table IV.3); these investments are concentrated among a small number of TNCs, which are primarily utilities or conglomerates.[30]

Judging from greenfield investment data, low-carbon FDI in ***recycling*** has been more modest (a total of 191 cases during 2003–2009), but this small number may be more apparent than real because such activities are often not reported separately. As in renewable/alternative power generation, about two thirds of projects are in developed countries. Investors range across a large number of industries, mostly manufacturing, suggesting that most of these projects focus on reducing emissions in these TNCs' own operations or along their value chain. The presence of TNCs such as Veolia (France) and Norsk Hydro (Norway), however, suggests that some may be investing in host countries to offer low-carbon technology services

Table IV.3. Top 20 investors of greenfield investments in alternative/renewable electricity generation, 2003–2009

TNC name	World	Developed economies	Developing economies	South-East Europe and CIS
Iberdrola (Spain)	33	29	4	-
Electricite de France (EDF) (France)	21	18	3	-
E.On (Germany)	21	21	-	-
Acciona (Spain)	16	10	6	-
Enel (Italy)	16	13	3	-
RWE (Germany)	14	13	-	1
OPDE (Spain)	12	12	-	-
Energias de Portugal (EDP) (Portugal)	12	12	-	-
Endesa (Spain)	11	4	7	-
Econcern (Netherlands)	10	8	2	-
Vattenfall (Sweden)	9	9	-	-
BP (United Kingdom)	9	9	-	-
Enex (Iceland)	8	7	1	-
National Toll Roads (NTR) (Ireland)	8	8	-	-
Mainstream Renewable Power(Ireland)	8	2	6	-
Fersa (Spain)	7	3	4	-
NeoElectra (France/Spain)	7	7	-	-
Gamesa (Spain)	7	5	2	-
AES Corporation (AES) (US)	7	2	4	1
Sowitec (Germany)	7	3	4	-

Source: UNCTAD, based on data from the Financial Times, the FDiIntelligence database (fdiintelligence.com).

to local enterprises (see also *WIR08*). Apart from Sembcorp (Singapore) and Chuang Tieh (Taiwan Province of China), very few developing country TNCs appear to be investing in recycling.

Greenfield investments in the ***manufacturing of environmental-technology products*** (806 in total during 2003–2009) – such as wind turbines, solar panels and biodiesel plants, as well as associated parts – has expanded rapidly since 2003. Developing economies are becoming increasingly popular investment destinations in this industry, attracting more projects than developed economies over the past two years. Nearly half of the 806 reported investments over 2003–2009 are in developing countries, over 85 per cent of which involved developed country TNCs. Investments are occurring in a number of developing countries, with Algeria, Argentina, Brazil, China, India, Indonesia, Libyan Arab Jamahiriya, Malaysia, Mexico, Mozambique, Philippines, Singapore, South Africa, United Republic of Tanzania and Viet Nam, among the largest or key recipients. These investments focus on low-carbon products, mostly with businesses as customers. Very few of the TNCs mentioned in table IV.4 – apart from the likes of General Electric (United States) and Siemens (Germany) – are established players in this field,

Table IV.4. Top 20 investors of greenfield investments in environmental technologies manufacturing, 2003–2009

TNC name	World	Developed economies	Developing economies	South-East Europe and CIS
Vestas Wind Systems (Denmark)	21	13	8	-
Siemens (Germany)	13	7	5	1
General Electric (GE) (United States)	13	3	10	-
Abengoa (Spain)	12	10	2	-
BP (United Kingdom)	12	10	2	-
LM GlasFiber (Denmark)	11	7	4	-
Areva Group (France)	10	6	4	-
SW Umwelttechnik Stoiser & Wolschner (Austria)	10	10	-	-
Sanyo Electric (Japan)	9	6	3	-
Alstom (France)	8	-	8	-
Kyocera (Japan)	8	2	6	-
BioDiesel International (BDI) (Austria)	7	7	-	-
Hyflux (Singapore)	7	-	7	-
Bronzeoak (United Kingdom)	6	-	6	-
Archer Daniels Midland (United States)	5	1	4	-
First Solar (United States)	5	2	3	-
D1 Oils (United Kingdom)	5	-	5	-
EVN (Austria)	5	1	1	3
Owens Corning (United States)	5	-	5	-
Carl-Zeiss-Stiftung (Germany)	5	5	-	-

Source: UNCTAD, based on data from the Financial Times, the FDiIntelligence database (fdiintelligence.com).

mostly because the market is relatively new. Some of these new players in the industry began as start-ups, growing with the technologies they created, while others – such as Kyocera (Japan) and several conglomerates from developing countries[31] – crossed over from other industries.

C. Drivers and determinants of low-carbon foreign investment

Drivers are factors that push companies to invest abroad, while locational determinants influence where they choose to invest. Although TNC strategies are also affected by firm-specific factors such as physical assets, knowledge[32] or senior management beliefs and ideologies, effective policies to harness low-carbon foreign investment cannot be devised without first understanding the drivers and locational determinants.

1. Drivers

Government policies, market conditions, costs of production and business conditions all influence TNC decisions to invest abroad. This includes climate change-specific factors, such as green branding strategies, regulations and pressure from consumers and investors.

Four main categories of drivers (push factors) – mostly home-country[33] related – influence companies' decisions to invest abroad. Although these drivers can affect foreign investment in general, some aspects are specific to climate change (table IV.5).

Home market and trade conditions. For firms operating in a limited home market (whether due to overall scale, narrow market niche, competition or other factors), foreign markets represent additional sources of revenue. In the climate change context, this means opportunities to sell new low-carbon products and services designed in the home jurisdiction in foreign markets.[34]

TNCs may also seek out new customer segments which may not (or only partially) be found in the home country. For example, while small-scale low-carbon electricity alternatives may not make much sense in a country with a good, dependable electricity grid, there may be viable markets in countries with poorly developed, remote rural areas. Trade barriers restricting access to a potential foreign market, or the lack of trade agreements, are examples of a host (rather than home) country driver, which can result in "tariff-jumping FDI" (section C.2).

In the climate change context, brand strategies that put explicit emphasis on being "green" or "low-carbon" can induce low-carbon foreign investment, for example to be consistent throughout the value chain or across different countries, or to capture new customers. The existence of a carbon market and supply mechanisms for emission-rights can also, in principle, create incentives to invest abroad (as discussed in the context of the JI and CDM in section A).

Home government policies and regulations. Low-carbon foreign investment is contingent upon technological capabilities developed by companies, partly in response to domestic policies in their home countries. Home-country policies and regulations related to energy and the environment, for instance, promote low-carbon technologies and practices,[35] which TNCs spread throughout their international network of operations, thus inducing foreign investment in low-carbon

Table IV.5. General and climate change-specific foreign investment drivers

Drivers category	General factors	Climate change-specific factors
Home market and trade conditions	• Limited home market in terms of scale and opportunities to expand • Availability of new products/services from parent company or TNC network • Opportunities in new customer segments • Need to circumvent trade barriers	• Green/low-carbon brand strategies • Carbon market trading
Home government policies	• Government tax policies or incentives • Governments' general trade policies and trade promotion efforts (export credits) • Government foreign investment guarantees / insurance; ODA	• Specific trade policy changes such as border measures • Specific environmental regulations
Costs of production	• Scarcity of resources or factor inputs • Rising labour costs	• Cheaper low-carbon energy • Operational and energy-efficiency improvements • Optimization of carbon tax exposure
Business conditions	• Global company reputation • Conformity to industry best practice • NGO / consumer demand patterns and conditions • Investor requirements	• Conformity to industry best practice in the area of environmental management systems (e.g. ISO 14000) and sustainability reporting (e.g. GRI "G3") • Consumer pressure leveraged through environmental labelling schemes (e.g. FSC certified wood) • Investor demands (e.g. PRI) and access to finance issues (e.g. UNEP FI)

Source: UNCTAD, based on *WIR06*; Ernst & Young, 2009.

processes.[36] Some home countries also encourage their firms to export (low-carbon) technologies and products or to expand overseas through export credits, export sales guarantees and investment guarantees, thereby building on capabilities developed at home and benefiting from economies of scale. In addition, some developed countries have developed technical cooperation programmes with developing countries in order to promote low-carbon development and create additional export and investment opportunities for their firms in areas such as rural electrification through renewable energy. In developing home countries (and some developed ones) low-carbon development strategies, policies and regulations might also support their TNCs' outward foreign investment to obtain assets in low-carbon know-how (section C.2; section D for a more detailed treatment).

Costs of production. Companies' constant need to reduce costs also drives foreign investment. Some energy-generation technologies – solar technology being a typical example – are best used in countries other than where they were developed because the costs of production are prohibitive in the home country. The DESERTEC project, for instance, aims to supply electricity from solar power plants from Northern Africa (where costs of production are lower) to Europe (where the technology was developed). Operational and energy efficiency improvements (including cost reductions resulting from material, resource and energy savings) may also spread out across global TNC operations as low-carbon foreign investment, thus contributing to lowering emissions in locations where the respective technologies or practices were not developed in the first place. Costs of production also relate to carbon leakage (section D.6), as TNCs try to optimize their exposure to carbon taxes.

Business conditions. Business trends, investor pressure and stakeholder expectations have become a significant driver of low-carbon foreign investment. Low-carbon investment can be influenced by the "court of public opinion"; and civil society organizations (CSOs) have put pressure on some companies in this regard. The Royal Bank of Scotland and BP (both United Kingdom), for example, started facing strong opposition (including from shareholders) regarding the oil sands development in Canada, even

before recent developments in the Gulf of Mexico;[37] and Greenpeace has stirred Nestlé (Switzerland), Unilever (Netherlands and United Kingdom) and Cargill (United States) to reconsider their operations and suppliers by issuing a damning report on oil-palm plantations in Indonesia.[38] To fend off CSO pressure, an increasing number of companies have strengthened their environmental reporting or adopted carbon and environmental labelling, as well as environmental management systems (like ISO 14000) that include emission-related aspects (section D.7). Companies in sectors such as industry, transport, waste management, agriculture and forestry are particularly sensitive to civil society pressure and international environmental standards, hence their increasing engagement in low-carbon activities.

Shareholders are also increasingly calling for greater transparency in the disclosure of climate change risks and opportunities facing publicly-held companies. This emerging trend, part of the broader responsible investment movement,[39] is already relatively common among large institutional investors. A recent UNCTAD study of the world's largest 100 pension funds found that nearly half of them report that they are incorporating environmental, social and governance (ESG) issues into their investment processes.[40] Approximately a third of these funds are reporting active ownership policies and are promoting responsible investment practices among their peers within the investment industry.

2. Locational determinants

Tailored policy frameworks and business facilitation, building on countries' economic conditions, are essential to attract low-carbon foreign investment.

Locational determinants (pull factors) are host country-specific factors that influence TNCs' decision on where to set up operations; a broad framework is presented in table IV.6, detailing determinants related to (a) the general policy framework; (b) economic factors; and (c) business facilitation.[41]

Specific policies that exercise a significant pull on low-carbon foreign investment are countries' environmental, industrial, public procurement, energy and trade policies – with nationally appropriate mitigation actions (NAMAs) and national adaptation programmes of action (NAPAs) cutting across them (section D.2). Such market-creating or -defining policies can foster demand for new low-carbon products and services, particularly in the energy, transport, buildings and industry sectors (section B.2); renewable energy markets, for instance, are almost entirely created by policy. A stable and enabling regulatory environment is a key element in the locational determinants of low-carbon investment, reflecting the concern of the business sector for national policies that are enabling but not overly regulating, so as to trigger an optimal response by private-sector actors (section A; WBCSD, 2005).

Low-carbon foreign investment follows, by-and-large, the same types of ***economic determinants*** as foreign investment in general. Foreign investment has traditionally been categorized into four types of TNC motives for setting up operations abroad: (a) market seeking (accessing new markets by investing in production and distribution in the host country); (b) natural-resource seeking (gaining access to particular raw materials); (c) efficiency seeking (splitting the value chain and locating various functions/activities in different locations to exploit differential factor advantages between countries); and (d) strategic-asset *seeking* (acquisition of enterprises or shares of enterprises abroad or participation in alliances to access new technology, skills or infrastructure – or thwart competition) (table IV.6).

Table IV.6. Locational determinants of low-carbon foreign investment

General policy framework	
General policies	**Climate change-specific policies**
• Economic, political and social stability • Good governance • Policies on functioning and structure of markets (esp. competition, M&A and simple, transparent reporting standards in line with common international practise) • Protection of property rights (including intellectual property) • Industrial and regional policies; development of competitive clusters • Trade policy (tariffs and non-tariff barriers) and stable exchange rates • International investment agreements (IIAs)	• Nationally Appropriate Mitigation Actions (NAMA) • National Adaptation Programmes of Action (NAPA) • Environmental policy (environmental standards, carbon taxes, cap-and-trade schemes for greenhouse gas reductions) • Industrial policy (incl. energy efficiency standards) • Public procurement of energy efficient products • Energy policy (e.g. requirements of renewable/low-carbon energy shares in energy mix of utilities, feed-in tariffs, subsidies and incentives for low-carbon investments) • International/domestic financial mechanisms (carbon markets, public/private finance mechanisms) • National JI or CDM policy framework • Technology policy (related to generation, dissemination and diffusion of low-carbon know-how) • Trade policy adjustments for low-carbon activities (e.g. tariff reductions for capital goods/inputs for low-carbon activities, tariff policy of the home country with respect to potential host countries – for export activities of TNCs)

Economic determinants			
General		**Climate change-specific**	
TNC motive	Economic determinants	Specific economic determinants	Relevant TNCs
Market-seeking	• Per capita income • Market size • Market growth • Access to regional/global markets	New or expanding, often policy-created (see above), markets for: • Low-carbon products (in general) • Low-carbon energy • Energy efficiency/carbon market services	• Power utilities • Energy efficiency or process improvement technology services • Producers of low-carbon goods (e.g. carmakers, appliance manufacturers)
Natural resource-seeking	• Access to raw materials	• Access to sun, wind, water, natural gas or nuclear fuel/precious metals • Access to precious metals, e.g. for solar batteries	• Utilities and independent power producers • Energy services companies
Efficiency-seeking	• Different comparative advantages of countries • Better deployment of global resources	• Technology upgrades of existing foreign affiliates to gain advantage/or remain in local market	• Manufacturers • Power utilities
Strategic asset-seeking	• Access to new competitive advantages • Availability of and access to skilled labour • Strategic infrastructure (e.g. oil pipelines, power grids)	• Access to low-carbon know-how/project pipelines • Leveraging of existing industrial know-how for low-carbon goods • Local R&D into low-carbon technologies • Participation in low-carbon "clusters" (agglomeration effects facilitating rapid learning and uptake of new technologies)	• TNCs seeking to fill knowledge and skills gaps in their product/service lines specific to low-carbon technologies • TNCs seeking to enter new markets beyond their traditional activities • TNCs desiring to "follow" developments in a key market • Manufacturers of low-carbon goods to gain access to local knowledge

Business facilitation	
General measures	**Climate change-specific measures**
• Investment promotion • Investment incentives • Reduction of hassle costs • Availability of one-stop shop services • Provision of social amenities • Provision of after-investment services	• Incentives for manufacturers of low-carbon goods and/or providers of energy efficiency or process improvement services (e.g. tax benefits, subsidies, concessionary loans, export guarantee insurance) • Support for JI, CDM or other carbon market operations

Source: UNCTAD, based on *WIR98*: chapter IV.

For each type of motive there are climate-change specifities which affect the pattern of low-carbon foreign investment (table IV.6). For *market-seeking* foreign investment, host country policies can play a significant role, e.g. for renewable energy, where the connection to the electricity grid and pressure to move from carbon-intensive technology frequently requires legislation. Another example concerns producers of low-carbon consumer goods, which seek markets with consumers particularly aware of (and responsive to) the company's "green" credentials. *Natural resource-seeking* low-carbon investors may seek a windy location, a tidal bay or precious metals for solar batteries. However, because of the definitions of low-carbon and business-as-usual, even natural gas may for instance be eligible if its use replaces a higher emission source, such as coal. The *efficiency-seeking* motive can induce TNCs to shift large shares of their operations to the most advantageous site, which for some technologies – as in the case of renewable electricity generation – is linked to natural resources. However, capturing comparative advantages might also involve seeking jurisdictions with laxer environmental standards (section D.6). *Strategic-asset-seeking*[42] foreign investors can either acquire or gain access to existing created assets such as low-carbon technologies or expertise held by companies in the host country: As with any dynamic developing technology, consolidation by M&A activity occurs in the low-carbon arena; and investors may also seek to participate in industry or technology clusters to gain from agglomeration and related effects.

Business facilitation (section D.2) policies favouring low-carbon investments can contribute to creating viable markets (table IV.6). These business-facilitation determinants may largely involve refocusing practices already in general use in the field, e.g. investment promotion activities such as providing one-stop shop services to better inform prospective investors about environmental and related investment policies; facilitating clearance procedures to reduce hassle costs; and providing better social amenities and aftercare services. Incentives will also play a major role in inducing low-carbon investments. In this context support for potential JI and CDM investors can be seen as facilitating access to an incentive provided by external sources.

D. Strategies for low-carbon foreign investment: policy options

1. Weighing the pros and cons of promoting low-carbon foreign investment

Low-carbon foreign investment can facilitate the expansion and upgrading of developing countries' productive capacities and export competitiveness, while helping their transition to a low-carbon economy. However, such investment also carries economic and social risks.

Developing countries are faced with two major challenges in responding to climate change and moving towards a low-carbon economy: first, the mobilization of needed finance and investment; and, secondly, the acquisition, generation and dissemination of relevant technology. Both are areas where foreign investment can make valuable contributions – hence the discussion below focuses on the implications of low-carbon foreign investment and not on those of moving towards a low-carbon economy in general.

Nevertheless, while the future international climate change regime – including specific carbon reduction commitments and financial and technological support for developing countries – is still to be agreed upon, countries need to examine whether it is in their interest to facilitate low-carbon foreign investment. When adopted, such strategies are likely to help improve production processes and the emergence of new technologies (including enhancing their energy-, material- and resource-efficiency) and industries. Other advantages for early adopters include, among others, leapfrogging to new clean and environmentally friendly technologies and gaining first-mover advantages giving them an edge over competitors and attendant export opportunities in key industries.

In addition, a number of co-benefits may arise from moving towards a low-carbon economy, including specific sectoral benefits such as rural electrification; safety and security offered by stricter building codes; energy security through diversification of energy sources and energy efficiency improvements; positive effects on the local natural environment; and opportunities arising from international funding and resources for moving into a low-carbon economy.

On the demand side of the global economy, a growing pool of responsible consumers and the rise of a sustainability-oriented civil society shaping consumer preferences, suggest that there will be an increasing market for low-carbon products and services. These changes in global demand patterns could be seized as export opportunities by developing countries by encouraging low-carbon foreign investment. Reasons for developing countries to encourage low-carbon investment, including through TNC involvement, are discussed in a recent study. The study identified three key "poles of clean growth": energy efficiency, sustainable agriculture and renewable energies (UNCTAD, 2010c).

A number of possible disadvantages or concerns must be weighed against the above benefits, however, in pursuing low-carbon foreign investments. Equipped with cutting-edge technology and implementing more efficient production processes, TNCs may effectively crowd-out domestic companies in developing countries, particularly those who are still operating at an (overall) lower level of efficiency, output and quality. Among other consequences, this can lead to reduced competition in host country markets and thereby to the potential for market dominance and restrictive business practices. With their nascent regulatory and institutional structures,

their small markets and their emerging indigenous firms, developing countries are particularly vulnerable to large TNCs and their potential for anti-competitive practices. A related danger is developing countries' heightened risk of dependence on TNCs' technology[43] and the goods and services they sell.[44]

Taken together, the above factors can result in important social costs, ranging from job losses to the reduced affordability of essential services, and/or reduced tax bases. These consequences are likely to hit LDCs and other vulnerable countries the hardest. When promoting low-carbon foreign investment policy makers have to weigh the advantages and disadvantages, both in terms of economic growth on the one hand, and environment, human health and sustainable development on the other.

It must be emphasized that the Kyoto Protocol does not impose obligations with regard to climate change policies on developing countries. Developing countries are free to choose whether they want to move towards a low-carbon economy, and if so, to what extent. Countries may adopt different views about the necessity and urgency of such a policy shift, the policies to be applied, and their potential for effectively using low-carbon technologies. Governments may therefore arrive at diverging conclusions concerning the potential impact of low-carbon foreign investment in their countries, and the desirability of promoting it. It also needs to be emphasized that choosing to implement low-carbon policies is not an either/or choice but rather a continuum of options with varying implications, development benefits and costs. There is no one-size-fits-all solution. In all of this, consideration has to be given to the fact that, to a large extent, much low-carbon foreign investment is evolutionary rather than revolutionary in the sense that by adopting more efficient production methods, foreign investors become low-carbon by making an improvement relative to the business-as-usual scenario.[45]

When choosing to promote low-carbon foreign investment, countries need to put in place policies to minimize its potential negative effects, while maximizing its positive impact. A number of policy options are highlighted in the discussion below, which countries can choose to implement to varying degrees, based on their specific circumstances, in order to: (a) avail themselves of new business development opportunities, including in terms of exports; (b) increase productive capacities; (c) reduce the carbon footprint of traditional forms of foreign investment by encouraging the adoption of more climate friendly modes of production; and particularly (d) foster progress towards other development objectives.

2. Strategizing national clean investment promotion

Effective strategies to attract low-carbon foreign investment require a coherent policy framework, promotion programmes aimed at targeting and clustering activities in key low-carbon areas, as well as a proficient IPA.

a. Mainstreaming foreign investment into low-carbon development strategies

Developing countries have accumulated decades of experience in foreign investment promotion strategies and policies, from the early stages of opening up to foreign investment to proactive promotion efforts through the establishment of investment promotion agencies, sectoral liberalization and selective targeting of TNCs and facilitation of their investments. Through targeting strategies, they have, among others, sought to attract investments that suit their needs and are most likely to make the strongest contribution to the achievement of their national development goals.

Over the past decades, more and more developing countries have paid increasing attention to the issue of sustainable development. Many TNCs have also attempted to integrate sustainable development issues into their strategies. As of end-2009, more than 5200 corporations had signed up to the United Nations Global Compact, including almost 170 from the *Financial Times* list of 500 of the world's largest companies. To a large extent, this has resulted from pressure from consumers and advocacy groups.

This combination of factors is an opportunity for developing countries to integrate "green and responsible" elements in their foreign investment promotion strategies. The role that TNCs can play in achieving sustainable development – of which a low-carbon economy is an integral part – deserves to be fully taken into account. New market opportunities arising from changes in consumer behaviour in the main developed country markets should also be tapped, including for bio food, goods produced under responsible practices (fair trade, no child labour, fair treatment of workers), and low-carbon products. Appropriate policies can help protect and promote a host country's economic, social and other interests.

Current national strategies and policies for low-carbon investment differ significantly, ranging from comprehensive approaches to the practical absence of such policies. For example, in many instances, investment promotion strategies are only beginning to target new opportunities in low-carbon investment, and few consider the carbon intensity of traditional forms of foreign investment. The potential contribution of foreign investment to achieving climate change related objectives, including NAMAs, is generally overlooked. Nevertheless, various approaches, such as for example low-carbon special economic zones (SEZs) are being developed (box IV.5).

UNCTAD's recent survey of investment promotion agencies (IPAs)[46] illustrates the existence of varying national strategies for low-carbon foreign investment. More than half of the respondents indicated that both climate change adaptation and mitigation have an important impact on their policies and have resulted in concrete action to attract low-carbon investments. For some agencies the main concern is the potential impact on climate sensitive sectors such as agriculture and tourism. Others are trying to catch up with global developments, for instance to develop or support value added production or create a green energy sector.

Most IPAs seek to attract foreign investment into renewable energy, although other sectors,

Box IV.5. Low-carbon (Green) Special Economic Zones

SEZs have played an important role in advancing industrial development, attracting foreign investment and creating jobs in developing countries for the last thirty years; and governments, developers, and companies are increasingly considering SEZs' potential contribution to environmental sustainability and lowering GHG emissions.

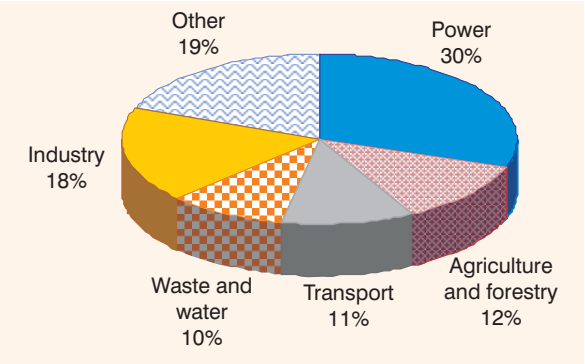
Low-carbon (Green) SEZs can be defined as SEZs that are designed, developed and operated in a low-carbon, sustainable way. They go beyond simple environmental compliance and management and aim at more energy/resource efficient practices, a low-carbon footprint, and GHG mitigation actions. Core elements for low-carbon SEZs include a GHG mitigation target, sustainable infrastructure, a smart incentives/policy regulatory framework, and carbon finance.

This new trend towards Low-carbon (Green) SEZs is being explored by China, India, and the Republic of Korea, as well as many other developing and developed countries. These countries hope to use Low-carbon (Green) SEZs to leverage and promote investment in low-carbon development efforts in a more concrete and effective ways.

Source: Investment Climate Advisory Service, World Bank Group.

are also well represented among their targets for such investment (fig. IV.3). IPAs also indicated that they target naturally low-carbon sectors such as services, e.g. ICT services and investments related to energy efficiency.

Figure IV.3. Sectors that IPAs target with respect to attracting low-carbon foreign investment
(Percentage of responses)



Source: UNCTAD, forthcoming f.

Note: In the sector classification in section B.2 oil & gas is considered to be part of industry. In addition this figure has "other" as a category, as IPAs listed industries that in general have limited emissions, particularly services.

Despite the fact that more than half of the IPAs promote low-carbon foreign investments, only 17 per cent of the respondents indicated that they have some supporting policy or strategy document. One important step forward would therefore be to integrate the potential role of low-carbon foreign investment into NAMAs and other climate change mitigation strategies of developing countries. This emerging framework for establishing sectoral low-carbon policies in developing countries was initiated by the Copenhagen Accord which encouraged non-Annex I Parties (i.e. developing and transition economies) to the UNFCCC to submit policy proposals for climate change mitigation – the NAMAs. By 30 June 2010 40 countries had submitted NAMAs to the UNFCCC (fig. IV.4); and more countries are expected to follow.

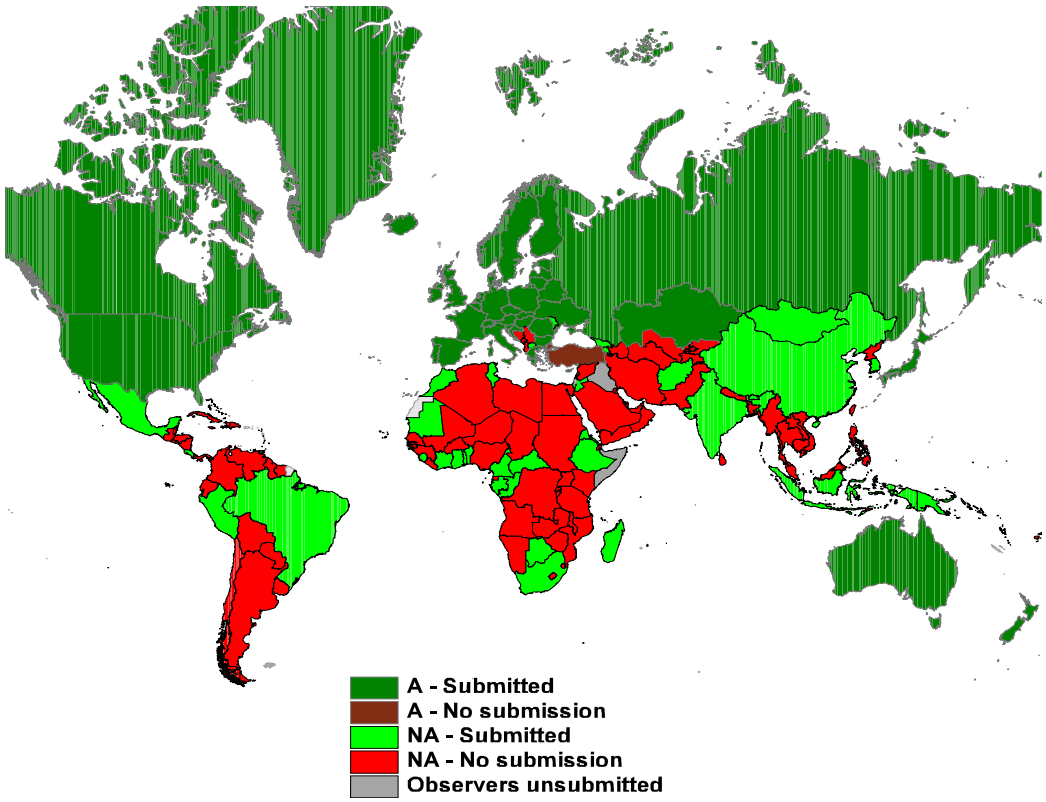
As indicated above, attracting low-carbon foreign investment is not only about new and emerging business opportunities, but also about encouraging foreign investments in traditional sectors, with a view to improving their energy-, material- or resource-efficiency. The contribution of such investments to the reduction in the carbon intensity of production in developing country could be very significant. Putting in place policies to reduce the carbon intensity in traditional industries through foreign investment could thus go a long way in helping developing countries achieve a low-carbon economy without compromising growth and development objectives. Adopted by developing countries, such policies could also partly address the concern of carbon leakage (section D.6).

It should be noted that developing low-carbon economies will require more than changes to investment policies. Most elements of national development policies, including energy, technology, industry, transport, construction, urban development, as well as environmental policies, will have to be involved. The goal should be to create synergies and ensure a mutually supportive relationship between different areas of policy-making. Similarly, changes to consumers' behaviour will be required. The effectiveness and success of investment policies to steer traditional investment towards lower carbon content and to attract new forms of low-carbon investments will thus hinge upon integrating climate change issues into a wide range of strategic choices.

b. Creating an enabling policy framework

The regulatory framework for investment is a key determinant of foreign investment, and one that governments can shape and tailor to their needs. While there is no single "right" regulatory framework, some elements are essential in order to promote investment in general and foreign investment in particular. Inasmuch as certain forms of low-carbon foreign investment respond to

Figure IV.4. National mitigation action documents submitted to the UNFCCC



Source: UNCTAD, based on submissions to UNFCCC.

Notes: A = Annex I country; NA = Non-Annex I country; Annex I countries were required to provide such plans under the UNFCCC. Figure contains information on submissions up to 30 June 2010.

specific determinants (section C.2), it is important for countries to also address these issues from a regulatory perspective. To the extent that investors that use state-of-the-art technologies or production processes are likely to have the most positive impact, they are also the most sought after. Attracting "quality" and low-carbon foreign investment thus implies that host countries also offer a high-quality regulatory framework: quality attracts quality.

(i) Foreign investment entry, treatment and protection

The majority of countries in the world have adopted a relatively open attitude towards foreign investment, and many proactively seek to attract TNCs in a wide range of sectors. However, in some cases regulations may prevent TNC entry into important sectors from a low-carbon perspective. For example, various countries keep the energy sector under state ownership or control, or consider it as being of strategic importance and restrict or prohibit foreign investment in the sector (*WIR08*). Countries may thus wish to review their entry regulations for foreign investment in energy, weighing the pros and cons of preserving the strategic nature of the sector against the potential benefits arising from attracting low-carbon foreign investment.

Foreign investors are particularly sensitive to the standard of treatment and protection that they are accorded. A good general standard is essential to attract quality investors, including those most prone to using low-carbon modes of production. To the extent that TNCs operate in low-carbon industries where the pertinent policy framework in many developing countries is still at a rudimentary stage, sufficient investment protection is

particularly important, including through guarantees of fair and non-discriminatory treatment (section D.5).

With respect to major foreign investment projects direct investment contracts between foreign investors and the host country are another policy option to provide legal certainty. Such contractual arrangements also present host countries with the possibility to negotiate specific aspects with foreign investors, for instance with regard to the transfer of know-how (box IV.8). Investment contracts can also lay the foundation for public-private partnerships related to the development and deployment of low-carbon technologies, such as large-scale renewables-based power generation (e.g. hydroelectricity) or joint research activities.

(ii) Market access and regional integration

Many developing countries have internal markets that are of insufficient size to justify the local production of goods by TNCs. This holds true for all types of foreign investments, and may even more be the case in low-carbon foreign investment to the extent that they make use of more modern technologies. For instance, the upgrading of local plants in developing regions may be justifiable from a cost perspective only to the extent that there are sound growth perspectives. However, in addition to the growth of host country markets, constraints created by limited domestic markets can be overcome through, for example, encouraging efficiency-seeking low-carbon foreign investment (section C.2) focused on home-country or global markets; or through widening the local market by regional integration.

Indeed, in order to overcome the constraint of market size, most developing countries have entered into regional economic and/or trade agreements. The degree and scope of integration varies widely from region to region. Some agreements are strictly limited to tariff reduction or elimination, while others go as far as customs unions and cover a wide range of economic issues, including investment. Cooperation in the energy sector in Southern Africa provides a good example of how regional integration mechanisms and the policy processes they entail can help promote low-carbon foreign investment (box IV.6).

In the regional context, there may also be scope for international cooperation between Governments in targeting and promoting low-carbon investment opportunities. For example, two countries could jointly promote investment in a large biomass generator that could supply energy cross-border, rather than engaging in a "bidding war" to attract a smaller one that does not realize sufficient economies of scale.

(iii) Incentivizing low-carbon investment

While taking advantage of new markets (or creating them) can be costly and difficult to manage (section C), it is within the capacity of most developing countries to put in place a limited mix of fiscal and regulatory measures (including incentives to the extent appropriate) in order to promote low-carbon forms of foreign investment in "traditional" host industries. Various tools can be established, for example to promote the use of more energy efficient modes of production and machinery. Allowing the accelerated depreciation of assets put in place to reduce energy needs (e.g. more efficient trucks, machinery, better insulation or cooling of buildings) can encourage investment in low-carbon production of any good or service (from garments to electronics to hotels). Similarly, developing countries could impose lower withholding taxes on payments abroad for intellectual property licences, to encourage the use of intellectual property for low-carbon objectives. Facilitating the importation of inputs needed by low-carbon investors can also play a positive role.

Box IV.6. Investing in energy efficiency: the Southern African Power Pool

Hence, regional integration deserves to be strengthened and deepened, building on liberalizing, institution-building and regulatory functions in order to provide a more attractive environment for low-carbon foreign investment. In addition, developing countries need to continue to push for better market access to major developed countries, particularly if they wish to be in a position to foster export-oriented low-carbon foreign investment.

The Southern African Power Pool (SAPP) was created in 1995 to provide a reliable and economic electricity supply across the Southern African Development Community (SADC), consistent with a reasonable utilization of natural resources and the effect on the environment. As the increasing requirement for power in the region has become a critical challenge, SAPP has embarked on a regional energy efficiency programme which has created opportunities for firms to do business across SADC.

For instance, the market for energy-saving lighting in South Africa – SAPPs largest market – is growing rapidly and is expected to accelerate even further as the Government implements its energy saving policies (with a stated intention of replacing 80 per cent of all incandescent light bulbs within the next four to six years).

Against this background, Philips (Netherlands) entered into a joint venture with the Central Energy Fund (South Africa) and Karebo Systems (South Africa), and in March 2009 opened a new plant in Lesotho to produce energy-saving light bulbs, with the bulk of the plant's output to date (more than one-million bulbs) being sold to the South African power utility Eskom. as part of a tender by the latter. Sales are also growing to other parts of the region.

Sources: UNCTAD, based on the SAPP website, available at: http://www.sapp.co.zw (accessed 18 June 2010), and "Lesotho plant supplies first million CFLs to Eskom", Engineering News, 10 May 2010, available at: http://www.engineeringnews.co.za/article/lesotho-jv-supplies-first-million-cfls-to-eskom-2010-05-10 (accessed 9 June 2010).

c. Policies to build on new business opportunities

The move to low-carbon economies around the world and the push to establish new modes of production and technologies imply that a number of new business opportunities are emerging. These include power generation through renewable and low-carbon resources and associated products and technologies, fuel-efficient or alternative-fuel modes of transport and new building materials, among others. Of course, as production costs decrease over time and low-carbon products become affordable to broader parts of a country's population, the need to support emerging markets becomes less important.

Tapping into new business opportunities is likely to require specific policies to complement the measures highlighted above, which focus on steering "traditional" investments towards a lower carbon content. Key among these measures is policies for *market creation*. Because of the high costs involved, 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. These can take various forms, from internalizing the externality costs of carbon emissions (e.g. a fuel tax establishing a market for fuel-efficient cars) through mandated standards (e.g. legally required fuel-efficiency standards) or direct government support (e.g. subsidies for households to install solar panels).

Such market-creation mechanisms have been used predominantly in developed countries and emerging economies so far. For instance, several countries offer incentives to their domestic industries to facilitate the shift to low-carbon technologies and production methods, which in some cases also extend to foreign investors. These incentives are granted either directly to the industries concerned or indirectly through the granting

of subsidies to the buyers of the low-carbon products.[47]

Developed countries and the largest emerging markets will continue to take the lead in putting in place market-creation mechanisms. This will generate new opportunities for export-oriented developing countries. At the same time, however, developing countries may wish to adopt market-creation policies in order to build local markets for certain low-carbon products and services. This could support their own export-capacity, and facilitate the introduction of technologies adapted to their development needs, such as rural electrification using renewable energy sources.

Most developing countries, however, have limited financial means to set up market creation programmes to match those of developed economies, which puts them in a disadvantageous position concerning the attraction of low-carbon foreign investment; it is therefore imperative for more advanced countries to take care not to undermine efforts being made in poorer countries' transition towards a low-carbon economy. Further, home countries can assist by actively promoting outward low-carbon foreign investment and by avoiding distortions of market mechanisms (section D.8).

Policy instruments to create a market vary by sector. For instance, in the case of the market for renewable energy, there are two main approaches: feed-in tariffs, when a preferential price is guaranteed for a certain period of time, or green certificates, when in addition to the electricity market price an additional price is paid for each certificate issued as a proof of origin for the power produced. Experience shows that the system of feed-in tariffs is easier and more attractive. A number of developing countries have enacted feed-in tariffs, including Thailand, Uganda, Kenya and South Africa (REN21, 2009).

Another approach is the adoption of renewable portfolio standards. These standards 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 (box IV.7; REN21, 2009).

Similarly, countries wishing to create markets for biofuels can do so by setting blending mandates. These requirements mandate fuel wholesalers in the country to blend a certain percentage of biofuels into their products by a given period. The adoption of such a requirement serves to create demand within the country for biofuel products. Blending mandates have helped to secure biofuel foreign investment projects in a number of developing and transition economies.[48]

Box IV.7. Creating demand for renewable electricity in Chile

Chile's 2008 Renewable Energy Law required that at least 5 per cent of electricity must come from renewable sources by 2010. This percentage must increase by 0.5 per cent each year to reach an overall goal of 10 per cent in 2024. The Government of Chile is promoting renewable energy development by supporting private initiatives through: guaranteed access to the grid for renewable energy projects, a reduction of the toll fee for renewable energy projects whose capacity is under 20 MW, entitlement to sell energy at marginal (spot) or stabilized (node) prices, new promotion instruments for transmission lines to enable renewable energy projects to reach the grid and overcome specific barriers, and credit lines available for non-conventional renewable energy (NCRE) projects with preferential condition, up to $15 million, including guarantees for loans. This new framework has created a surge in renewable energy projects, including those from TNCs such as Seawind (United Kingdom), GDF Suez (France), and ENEL (Italy).

Source: UNCTAD.

With regard to attracting foreign investment that increases energy efficiency, the setting of energy performance standards or mandatory energy labelling schemes can indirectly help to create a market for new technologies. This can induce a shift towards more low-carbon investment in this area (box IV.8).

Public procurement of low-carbon products and technologies can also play an important role as a catalyst for low-carbon investment. For example, policies could be adopted requiring government buildings to use highly insulated windows, or a certain percentage of public administration fleets to consist of electric vehicles. Public procurement can provide new investors with the security of having a buyer for their products.

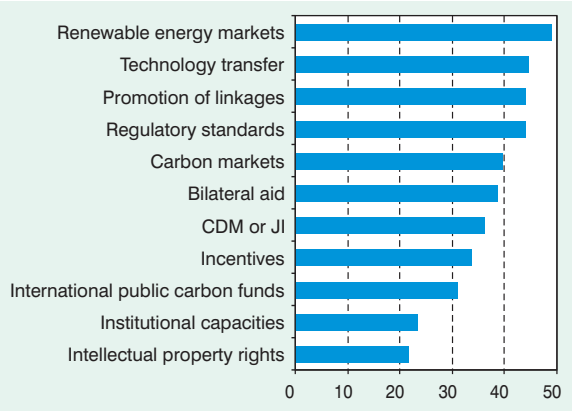
According to UNCTAD's Survey of IPAs (UNCTAD, forthcoming f), IPAs consider the creation of a market for renewable energy to be the most important supporting policy for attracting low-carbon foreign investment (fig. IV.5). Other policies playing a very significant role include to the same end, inter alia, promoting technology dissemination and creating linkages with domestic investors.

Setting up the "right" policy framework to support the creation of markets and take advantage of business opportunities is a complex task, and a particular challenge for developing countries with little or no experience in attracting low-carbon foreign investment and with scarce financial resources to promote it. Different categories of low-carbon foreign investments (including export-orientated investments) require different enabling frameworks, including regarding the issue of how to balance investment incentives with investment regulations. Effective implementation and monitoring of the enabling framework create additional significant challenges for local capacities. This includes keeping an eye on the risk of crowding out (sections D.1 and D.4).

d. Promoting low-carbon foreign investment

Developing countries need to give consideration to how they enhance the

Figure IV.5. Importance of regulatory and institutional frameworks for attracting low-carbon foreign investments
(High importance; percentage of respondents)



Source: UNCTAD, forthcoming f.

Box IV.8. Stimulating demand for high-efficiency home appliances in Ghana

The Government of Ghana recently adopted a number of policies in recognition of the fact that the low efficiency of home appliances, such as air conditioners and refrigerators, represents a huge cost to the national economy (Van Buskirk et al., 2007).

For instance, in order to implement the transformation of the refrigerator market, the Government is entering into a public-private partnership (PPP) with the Bosch and Siemens Home Appliances Group. The PPP will support the process of creating a market low-carbon in refrigerators in a number of ways, including assisting in the establishment of appropriate metrics to assess efficiency improvements in refrigerators in use, and developing CO_2 offset possibilities by sharing knowledge and expertise of refrigerator programmes under the CDM. Essentially, this is a PPP to support institutional capacity building, as well as create pathways for future foreign investment.

Source: UNCTAD.

role of national IPAs in the attraction of low-carbon foreign investment. IPAs can identify opportunities for such investment and promote policies to encourage it. Investor targeting, aftercare and policy advocacy are key functions that IPAs should use to this end.

Investor targeting. It is important to consider that few economies can offer an internationally competitive environment for all types of low-carbon foreign investment. Country IPAs should therefore carefully review and identify the specific economic activities where they see a potential to develop low-carbon activities or growth poles. On this basis, they can then design investment promotion packages in these areas, positioning the country as a location for particular low-carbon foreign investment and proactively target relevant TNCs. This review required to put these actions into place could include assessing:

- The nature of the global market for relevant low-carbon foreign investment;
- The country's current circumstances as a location for low-carbon foreign investment, taking into consideration development objectives and related policies;
- Comparative and competitive advantages in specific areas of low-carbon investment;
- Specific investment opportunities, relevant TNCs, and how these could be matched;
- Key success factors for attracting foreign investment and for the implementation of relevant measures required.

Several measures can be taken to facilitate the entry and establishment of low-carbon foreign investors. One such measure would be to set up CleanTech parks. Initiatives of this kind are taking place in several countries, including for example Denmark and Singapore. Such parks accommodate clusters of businesses that are involved in research, innovation and the commercialization of clean technologies, relating to renewable energies or aiming, more generally, to increase the energy-, material- or resource-efficiency of relevant processes. They are also designed to be eco-friendly and are often located close to universities and research centres to promote the exchange of knowledge.

Aftercare. IPAs can also help build networks and connect low-carbon investors with local entrepreneurs, innovators and researchers. When IPAs engage in matchmaking, they should look for complementarities with local firms. Even if these firms do not have a low-carbon profile, they may possess skills and technologies that could be used for low-carbon projects. Examples include skills and technologies in the field of electronic components, computer software, and various biological processes that could be used in the production of biofuels. Furthermore, IPAs can encourage partnerships among foreign investors, governments and research institutions for the development of low-carbon technologies and products. The agency could also facilitate investor access to test and demonstration facilities for new low-carbon products.

Policy advocacy. As highlighted above, only a relatively small number of developing countries have adopted explicit low-carbon development strategies so far. However, specific policy measures are necessary in order both to evolve towards low-carbon economies and to attract low-carbon foreign investment. Among the key measures and issues to be considered are market-creation mechanisms, foreign investment entry and treatment and specific incentives for low-carbon investments. In order to ensure that such issues are given due consideration by governments and that they are in a position to proactively market the country as a low-carbon investment destination, IPAs need to pay particular attention to their advocacy function. IPAs can be more up to date on

the latest trends in foreign investment flows and serve as the primary interface between TNCs and government. Their role in making policy makers aware of regulatory needs to promote low-carbon investment are thus be crucial.

3. Building an effective interface for low-carbon technology dissemination

Sustainable cross-border technology dissemination calls for technology targeting, conducive frameworks, effective linkages and domestic enterprises with enhanced absorptive capacities.

Over 80 per cent of global R&D is conducted in just 10 countries,[49] the majority share of which is directly undertaken by TNCs, including in technologies required for climate change mitigation (National Science Board, 2010; Tomlinson, Zorla and Langley, 2008). With a vast pool of technology and know-how, TNCs can play a major role in diffusing low-carbon technologies to developing countries. Proactively involving them in the dissemination process, so as to maximize the supportive role they play can be useful – if not necessary.

Technology dissemination is a complex process (box IV.9) and many developing countries face difficulties in establishing effective policies. Among the key issues to be considered are: targeting and prioritizing low-carbon foreign investments where technology diffusion to local firms is most favourable; creating an environment conducive to technology flows from parent companies to affiliates or domestic firms in the host countries; establishing a basis for interaction between TNCs and domestic firms to maximize chances of diffusion; and, finally, fostering absorptive and adaptive capacities enabling domestic firms to build on and develop further the knowledge they have acquired.

Box IV.9. International technology dissemination

International technology dissemination entails the acquisition, mastery, diffusion and indigenization of knowledge, technology and skills in a host country. Importantly, the knowledge is 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). "Indigenization" of technology is a long-term concept, implying that the technology has become part of the national knowledge and innovation system, including diffusion to other enterprises and further research, development and innovation in the host country.

Technology includes a range of both hard and soft elements, e.g. intellectual property; production and organizational knowledge and skills; managerial, engineering and other skills; even corporate culture, values, norms and standards. Complexity is one reason that makes it difficult to disseminate technology. In addition, there are proprietary/appropriability issues; i.e. firms which possess the knowledge create barriers to easy dissemination.

Direct flows of technology to host country firms take various forms, including licensing, transfers to partners (including joint venture partners/alliance members), or support given to suppliers. Indirect flows are unintended spillovers or externalities, such as staff turnover, or knowledge transferred to partners "leaking" to other host country firms.

In order to maximize technology dissemination, it is imperative for governments to establish and implement policies enhancing the absorptive and adaptive capacities of local firms, as well as to create a framework providing opportunities for them to access and acquire the know-how in the first place.

Source: UNCTAD.

a. Technology targeting

A number of factors might affect host government's prioritization and targeting of foreign investment to boost prospects for technology dissemination. For instance, a government may identify targets for promotion efforts by comparing potential growth sectors with an assessment of the country's natural resources and created assets. For example, Morocco has chosen to enter into renewables power generation and environmental technologies manufacturing for a number of reasons,[50] including 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.

In specific segments of industries and value chains, where absorptive capacities of domestic companies are high, but low-carbon technology and know-how is lacking, governments can target specific foreign investors in order to acquire the necessary know-how. The approach of the Republic of Korea demonstrates a selective, targeted policy approach that can help a country enter rapidly into high-end, low-carbon industries (Shim et al., 2009; box IV.10). Similarly, in the area of clean transport equipment, the Government of Malaysia adjusted its National Automotive Policy, which has opened up opportunities for foreign automakers to invest in the production of hybrid and electric vehicles.

Box IV.10. Promotion of low-carbon foreign investment in the Republic of Korea: a selective approach

Green growth is a top policy priority of the Republic of Korea. In August 2008, the Government set "low-carbon, green growth" as the new national vision, in response to the growing threats of climate change and the depletion of natural resources. In 2009, it announced a comprehensive five-year plan to spend 107 trillion won (approximately 2 per cent of its GDP) to support green growth between 2009 and 2013 – double the proportion recommended by the United Nations. In the same year, it announced its GHG emissions reduction goal of 30 per cent from the business-as-usual level by 2020. The *Framework Act on Low-Carbon, Green Growth* attained bipartisan support in the National Assembly, passed in December 2009 and took effect in April 2010.

At present, the Republic of Korea relies on foreign countries for low-carbon technologies, as its green industries are still at the fledgling stage. For example, imports account for approximately 70 per cent of all products and components used in solar energy facilities and approximately 96 per cent of those used to generate wind power.

Against this background, the Government is actively promoting foreign investments into "green industries." The Government believes that foreign investments in green industries are essential to develop them as new national growth engines. To this end, the Government has designated key sectors, including smart grids and LED panels, as targets of investment in green technology-related R&D projects

Moreover, the Government has introduced numerous incentives such as cash grants and corporate tax breaks for companies that develop cutting-edge green technologies. Examples of TNCs that are taking advantage of the incentives include the photovoltaic module manufacturer Solarworld (Germany), the wind power company Acciona Energia (Spain), and Robert Bosch (Germany), manufacturer of Li-Ion batteries. According to the Industrial Bank of Korea, investment in green technology by the top 350 companies in the Republic of Korea rose by 34 per cent in 2009 compared to 2008.

Considering the Government's strong commitment to green growth and the public funding for related R&D, its green industries appear to have a great potential to grow up rapidly. For example, the Republic of Korea is proud that some domestic companies already excel in the fields of LED display panels and rechargeable batteries.

Source: UNCTAD, partly based on information supplied by the Ministry of Knowledge Economy, Republic of Korea.

b. Creating a conducive framework for cross-border flows of technology

Elements of a conducive framework specific to cross-border flows of low-carbon technology include the availability of requisite skills, appropriate infrastructure (e.g. some countries are setting up low-carbon special economic zones (box IV.5)), measures to define and create markets in low-carbon technology products (section 2), targeted incentives (e.g. to invest in the necessary R&D or technology adaptation) and a strengthened legal system. How these issues play out varies between economies.

As one example, some developing countries possess or have the resources to bolster education and training in the necessary skills; for instance, Malaysia has a significant scientific workforce in electronics which companies such as Osram (Germany) and Philips (Netherlands) are using to produce goods, such as LEDs, with lower GHG emissions for export.[51] However, many countries still suffer from skills shortages, and TNCs may need to rely on expatriate personnel for key functions, particularly when they operate in sectors with high-technology content. Being able to recruit expatriate personnel – and to train local staff – can be important in securing the cross-border flow of technology. In some cases, because of this, incentives are given to TNCs or local companies to invest in the requisite training of the local workforce.

Another important issue for cross-border flows of technology, e.g. transmission of know-how from parent TNCs to affiliates, is intellectual property (IP) rights protection in host countries. Many TNCs perceive strong IP protection and enforcement as a precondition for their transmission of technologies to host countries. At the same time, from a host country perspective, the IP regime needs to be shaped and enforced in a manner that guarantees wide access to appropriate technologies (UNCTAD and ICTSD, 2003). Evidence on the implications of IP protection for cross-border dissemination of clean technologies is still inconclusive (ICTSD, 2008). Some preliminary evidence from renewable energy sectors indicates that strong IP protection may in some cases have facilitated the dissemination of technologies to relatively advanced developing countries where there were large number of competitors in the market, such as China and India (Barton, 2007; Abbott, 2009).

In the area of the CDM, some host-country governments use the screening and approval process to influence the content and extent of cross-border technology flow and dissemination, even though the CDM does not have an explicit technology dissemination mandate. All CDM projects need to be approved by the host country government and countries such as China, India and the Republic of Korea have included technology dissemination requirements in the eligibility criteria for CDM project approval.[53] For most other developing countries, however, the major challenge is still how to establish basic administrative capabilities in order to attract CDM projects.

c. Promoting transmission of technology through linkages

Whether domestic companies acquire technology from TNCs, to what degree and at what speed, 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 or public-private partnerships; and all have pros and cons (*WIR01*). Some governments are keen to promote joint ventures (JVs) since this interface between TNCs and domestic companies can often result in effective transmission/acquisition of technologies: both parties have reciprocal knowledge and assets to share (e.g. the TNC may possess low-carbon technology, while its domestic partner has the tacit know-how about local industrial customers). However, JVs require high levels of mutual trust between partners,

as well as transfer/absorption capabilities (Demirbag and Mirza, 2000).

Linkages between TNCs and domestic firms are also among the key channels of transmission of know-how and technology. They can be major contributors to the development of low-carbon economies in developing countries. Inasmuch as domestic firms are often linked into TNC's domestic and global value chains, there are good reasons for technology transmission to host country firms to occur (for instance, to meet product specifications and quality standards). However, linkages do not necessarily occur in and of themselves and frequently require supportive policies in order to fully materialize (*WIR05*; Liu, Wang and Wei, 2010). UNCTAD's programme on business linkages actively promotes the establishment of such connections between TNCs and SMEs in a number of developing countries.[54]

According to the IPA survey (UNCTAD, forthcoming f), the development of linkages between low-carbon foreign investment and domestic companies is among the key policy objectives when promoting such investment. There are different models for creating linkages between low-carbon foreign investment and the domestic economy. One option is to promote the establishment of local technological and industrial clusters. With the participation of both domestic firms and foreign affiliates, these clusters can help enhance the exchange of knowledge and manpower and the establishment of joint ventures between local and international companies. They therefore serve as incubators for the development of low-carbon industries and capabilities, as highlighted in the case of the Binhai New Area in China (box IV.11).

Some significant low-carbon technologies such as power, waste management and industrial cogeneration projects are well suited for public-private partnerships (PPPs). These complex project financing structures involve creating a special purpose vehicle (typically a company or partnership), funding using principally private sources, acquiring the assets to generate a cash flow stream and then entering into contracts to secure the cash flow stream for the payment of the product or service. The contract can be a concession or an explicit commitment by a public entity, such as the electricity grid provider. It is possible to structure PPPs as, for instance, build-operate-transfer (BOT) arrangements with TNCs, whereby technology is disseminated to local partners; such arrangements would normally involve training and transfer of the facility or plant to the local enterprise(s) after an agreed period. As with other interfaces, the effectiveness of PPPs/BOTs depends on a number of factors, including the quality of the negotiations/contractual arrangements (see also *WIR08*).

d. Boosting the absorptive capacities of domestic enterprises

As mentioned earlier, whether technologies are acquired and mastered by local firms depends not only on the quality of the interfaces between TNCs and local firms, but also on the absorptive capacities of the latter. Host developing countries should thus put in place a strategy to develop domestic capacities to absorb technology and know-how. As part of such strategies, government-driven R&D in cutting-edge "green" technologies can play an important role, because private investors tend to under-invest in public goods, such as the environment. Public-private partnerships to facilitate the development and deployment of new environmentally-friendly technologies and to adapt them to local circumstances can also be helpful. Particularly valuable would be the establishment of Regional Technology Synergy Centres (RTSCs) to formulate and coordinate a coherent programme responding to the demands, opportunities and options in low-carbon technologies in developing countries.

Box IV.11. Foreign investment and formation of a low-carbon cluster – the case of China

In late 2009, the Chinese Government announced its commitment to reduce the country's carbon dioxide emissions per unit of GDP within the next 10 years by at least 40 per cent compared to 2005 levels. To reach these targets, the Government has allocated significant financial resources to support the development of a range of renewable energy technologies. This has resulted in the emergence of a number of regional green energy clusters, bringing together manufacturers, suppliers and research and development centres. The latest example is the Binhai New Area located within the confines of the north-eastern port city of Tianjin.

The Municipal Government of Tianjin has committed RMB200 million (about $14.6 million) annually to support companies engaged in the development and manufacturing of wind and solar technology as well as rechargeable batteries. In addition, the city offers prospective investors a variety of discount loans, tax rebates, and rent subsidies.

Tianjin's favourable conditions have proven attractive to both domestic and foreign energy companies. Within only a few years, Binhai has become China's largest wind power manufacturing centre, bringing together a range of internationally leading turbine manufacturers and component suppliers. As a result, Binhai's wind power companies account for 40 per cent of all wind power installations in China.[a] In addition, Binhai has attracted a growing number of leading foreign suppliers of key components.[b] The concentration of top-level transnational wind power companies in the Binhai area has attracted a growing number of domestic firms specializing in components, parts, and supporting services to complete the supply chain. The Binhai New Area is also becoming a major centre for China's solar industry, particularly with respect to research and development.

Source: UNCTAD, based on www.peopledaily.com, www.greencarcongress.com and www.g24i.com.

[a] Topping the list is the Danish investor Vestas. Since 2005 the company has invested more than $370 million in what is today Vestas' largest integrated production facility worldwide.

[b] Including Hansen Transmissions – a major gearbox design and manufacturing company from Belgium, with a total investment in Tianjin amounting to about €200 million.

A regional basis to these centres recognizes that many issues (e.g. low-carbon electrification, transport infrastructure or housing for burgeoning rural and urban populations) are common features across developing countries and have regional ramifications; although RTSCs will also have national windows and be allied internationally (including with existing R&D centres, as well as other RTSCs). The synergy arises from a careful matching, harmonization and utilization of all salient technological resources, be these from TNCs, the local private sector or public sources (including universities); and mechanisms will need to be put in place to adapt technologies to local needs, or generate new ones if necessary (especially in and for LDCs). However, the possibility of local or regional low-carbon technology generation depends very much on administrative, scientific, industrial and enterprise-level capabilities. Thus much of the early work of RTSCs will entail boosting these capabilities, among them absorptive capacities in key technologies and industries, with the help of development partners – including TNCs, ODA and others – supplying financial and technological assistance.

Promoting technology dissemination may also necessitate the strengthening of the financial capacities of local firms. One possibility is to select financial investors who are willing to accept a higher than usual degree of risk, for example venture capital firms. Host countries could further encourage financial institutions to develop evaluation criteria and special financial tools for supporting local entrepreneurship in the area of low-carbon investment. In this context, consideration could be given to the establishment of "green development banks". This could open credit markets, motivate business to invest and enable clean-energy technologies to be deployed on a large scale and become commercially viable.[55] 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 so-called "green" funds that 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.[56]

4. Addressing the negative effects of low-carbon foreign investment

Industrial, competition and social policies need to be put in place to overcome potentially negative effects of low-carbon foreign investment.

Developing countries can experience adjustment costs when transitioning to a low-carbon economy with the help of low-carbon foreign investment. The challenges are many, particularly in the short term (section D.1). The most important challenge is how to support countries' transition to a low-carbon economy and use of low-carbon foreign investment in this process, without sacrificing or unduly constraining access to essential resources, productivity and growth that can pull people out of poverty. Proper assessment of the issues, with a view to improving a common understanding of the opportunities and threats from low-carbon strategies supported by low-carbon foreign investment, is an essential first step. This assessment can also help devise viable regulatory and institutional responses.

Effective industrial and competition policies are central to tackling the challenge of crowding out and attendant dependency on foreign low-carbon technology suppliers. Industrial policies, for example, can help strengthen indigenous capacities so as to reduce undue dependence on foreign companies and technologies and, at the same time, allow domestic firms to seize opportunities for low-carbon growth (UNCTAD, 2010c). This issue becomes particularly acute in the face of market entry by technologically advanced TNCs. To the extent that developing countries have the financial means to do so, they may wish to consider subsidies to domestic firms as a support for low-carbon alternatives during their start up phase. An effective competition policy framework could help control the emergence of monopolies and prevent the abuse of a dominant market position by low-carbon investors.

In the short run, social policies can also help cushion employment impacts and social consequences. For instance, re-skilling measures can help workers adjust to new professional requirement or facilitate their move to emerging industries. In the mid to long term, new fields of economic growth need to be opened, often requiring a differently and more skilled workforce, which has implications for the education systems and related policies.

There is no one-size-fits-all model for the transition to a low-carbon economy. It is particularly important for developing countries that they are granted the necessary policy space and flexibility to identify and implement domestic strategies that best fit their particular contexts. The paradigm of sustainable development, and the concept of common but differentiated responsibilities, requires respect for the policy space of each country to define its own path towards a low-carbon economy, in accordance with their own circumstances and priorities. Avoiding top-down and encouraging bottom-up solutions may prove beneficial in this context.

5. International investment agreements and climate change

Securing IIAs' contribution to climate change mitigation entails introducing climate-friendly provisions into future IIAs. A multilateral understanding is needed to ensure the coherence of existing IIAs with international and national policy developments related to climate change.

International investment agreements (IIAs) can support governments' endeavours to attract low-carbon FDI. However, attention has to be given to the dual-edged nature of such agreements. IIAs can be both an incentive for encouraging low-carbon foreign investment, as well as a constraint on governments' policies for transitioning towards a low-carbon economy.

a. The dual-edged nature of IIAs

As foreign investment determinants, IIAs can influence a company's decision on where to invest. While there is no – and there can never be – a mono-causal link between the conclusion of an IIA and FDI flows, there is an indirect investment promotional effect of IIAs that stems primarily from the protection that they offer to foreign investors. IIAs that combine protection with liberalization commitments and those that embed the investment issue in a broader regional trade context (section D.2.b) can also have a direct FDI promotion effect (UNCTAD, 2009d).

While the above applies to all types of FDI, IIAs might have a particular relevance for attracting low-carbon foreign investment. To the extent that low-carbon foreign investment materializes in capital-intensive sectors, such as energy, the role of IIAs in stabilizing legal regimes – a role that generally affects all investment over long periods of times – is particularly relevant. Moreover, more than in any other sector, investors in renewable energy/low-carbon activities build their business cases on incentives, government promises of support and specific regulatory frameworks (e.g. market creating climate change regulations, (section 2.c.(i)). To the extent that IIAs can strengthen investors' confidence regarding the continuity and enforceability of such enabling frameworks or promises of support, they can positively impact firm's investment-decisions (Boute, 2007; 2009; 2010). The possibility for investors to resort to international arbitration, with a view to enforcing the enabling framework that had influenced a particular investment decision, is crucial in this context.

However, these very characteristics of IIAs – i.e. their stabilizing effect with respect to host country laws, regulations and policies – have also given rise to concerns. Notably, IIAs can constrain governments' regulatory prerogatives with respect to measures that aim to facilitate a transition to a low-carbon economy. More specifically, there are fears that investors, whose investments have been hampered by climate change measures, may bring claims against host States, based on the violation of an IIA provision (Johnson, 2009; IISD, 2009). The range of climate change related policies that could be perceived to negatively impact on foreign investment is large and differs across sectors.

Two recent ISDS disputes – *Allard versus Barbados* and *Vattenfall versus Germany* – demonstrate the dual nature of IIAs with respect to general environmental policies, suggesting that similar scenarios could also occur with respect to climate-change policies. *Allard versus Barbados*[57] shows how investors whose business case relies on the enforcement of environmental laws use IIAs to induce countries to implement and enforce their environmental laws. *Vattenfall versus Germany*[58] indicates that IIAs can be used to challenge environmental laws and regulations. Under both scenarios, it is the IIA's stabilizing effect, and particularly the potential for ISDS cases to enforce this stabilizing effect, that plays a central role.

Arbitral decisions suggest that the following IIA rules merit particular attention when it comes to strengthening or challenging climate change related policies.

- ***Fair and equitable treatment (FET) and minimum standard of treatment (MST):*** IIA rules on FET and MST tend to be interpreted as protecting investors' legitimate expectations – including those expectations on which firms relied when making their investment decisions (UNCTAD, forthcoming d). These obligations could be used to challenge the refusal of expected government support, the dismantling of market-creating mechanisms or a tightening of emission standards for production processes.
- ***Expropriation:*** IIA rules on direct and indirect, expropriation (UNCTAD, forthcoming c), could be used to challenge climate-related measure that reduce the economic value of a particular investment (e.g. a prohibition of certain economic activities or operating techniques).[59]
- ***Umbrella clause:*** Some IIAs allow investors to bring ISDS claims based on the violation of specific contractual arrangements governing the relationship between the host country and a particular investor (including arrangements that require continuity in the legal regime applicable to the investor's operations). Umbrella clauses could be used to challenge governments' activities to induce a transition towards a low-carbon economy, which – their very nature – will involve changes to the regulatory regime governing economic activities.

The potential for ISDS cases must be viewed it ***in its proper context.*** It is impossible to anticipate all situations where investors might successfully rely on ISDS or where investors' claims will remain unsuccessful. Instead, this depends largely on the specific business operations, on the type of the measure challenged, on the language of the applicable IIA (including exceptions for environmental laws and regulations) and on the composition of the tribunal that is handling the case. An increasing lack of predictability regarding the outcome of ISDS cases further increases uncertainty in this context (see also chapter III).

b. Synergizing IIAs and climate change policies

Think tanks, academia and commentators have contributed their views of possible ways to achieve coherence between countries' climate change and international investment policies with a view to strengthening the positive and minimizing the negative effects that IIAs may have on climate-change related policy measures (Baumert, Dubash and Werksman, 2001; Gentry and Ronk, 2007; Boute, 2007; 2009; Miles, 2008; Johnson, 2009; Marshall, 2009). Issues related to climate change and future IIAs have also been mentioned in the context of reviewing the United States model BIT (United States Department of State, 2009: Annex B).

Harnessing the potential of IIAs to ensure positive climate change related effects. Policy makers could devise IIA language that strengthens the role of IIAs in helping attract low-carbon foreign investment and encouraging the diffusion of relevant technology.

- Options include (a) preambular language, affirming that IIAs and attendant FDI flows aim to help address the climate change challenge (inspired by e.g. Japan-Switzerland FTA (2009)); (b) provisions on "investment promotion", strengthened through a reference to home and host country activities for the promotion of low-carbon investment; (c) provisions on technology transfer, specifically referring to climate change-related technologies (inspired by e.g. Japan-Switzerland FTA (2009) or Brunei-Japan FTA (2009)); (d) provisions on "scope and definition",

amended so as to refer to investments that meet certain "climate-friendly" criteria.

Preserving policy space for climate change measures, including for regulatory and policy changes that negatively affect carbon-intensive investors. This would offer an important step towards addressing the contradiction between the stabilizing function of IIAs and the need for a dynamic legal framework that enables, and at times enforces, the transition towards sustainable patterns of production and consumption.

- Options include (a) climate change-specific exceptions (inspired by exceptions for legitimate public policies, e.g. Canada-Chile FTA (1996), Republic of Korea-United States FTA (2007), Singapore-United States FTA (2003)); (b) clarifications to obligations specifying that climate change related regulatory actions do not amount to an indirect expropriation; or (c) ISDS carve-outs for climate-change measures (inspired by carve-outs in Belgium/Luxembourg-Colombia BIT (2009)).

Increasing institutional and practical linkages between IIA and climate change policies would recognize that IIAs operate in the broader context of sustainable development objectives and help ensure that IIAs contribute – rather than undermine – climate change related objectives.

- Options include (a) permitting – or requiring – ISDS tribunals to appoint experts to report on factual issues concerning climate change (inspired by the Republic of Korea-United States FTA (2007)); (b) requiring climate change impact assessments of future IIA negotiations; or (c) specifically referring to international legal or policy documents on climate change (inspired by Canada-Chile FTA (1996) and Canada-Peru FTA (2008)).[60]

Interpretative approaches towards integrating IIAs and climate change policies. Recognizing that modifications to the IIA regime along the above lines would require a lengthy as well as time- and resource-intensive process of amending the more than 3,000 BITs and other IIAs with substantive investment obligations that were concluded between almost all countries of the world, policy makers may wish to consider cross-cutting, interpretative approaches. Even if non-binding in nature, pursuing policy integration and coherence through interpretative means could provide "interpretative guidance" to arbitral tribunals adjudicating climate change related ISDS claims and be a significant step, particularly in scenarios where ISDS tribunals have a certain margin of discretion in the interpretation of the IIA provision at issue.

- *The principle of systemic integration codified in the Vienna Convention on the Law of Treaties*[61] could open a role for environmental law principles in ISDS. For example, the polluter-pays principle – a central tenet in environmental law and policy – requires that economic operators assume the costs of internalizing their pollution (United Nations International Law Commission, 1998; United Nations Commission on Sustainable Development, 1997) – could play a role when it comes to interpreting IIA rules on expropriation and the extent to which they require States to compensate investors for increased costs arising from climate change measures (Hunter and Porter, 1999; Mann, 2001; CIEL, 2010).
- *A multilateral declaration* could help enhance coherence between the IIA and the climate change regimes. By clarifying that IIAs do not constrain climate change measures enacted in good faith, such an instrument could help ensure that the IIA framework is in line with multilaterally agreed global priorities.

6. Dealing with carbon leakage

Carbon leakage has implications for both economic development and climate change. Instead of addressing the issue at the border this can be done at its source.

One notion often referred to when discussing the regulation of emission-intensive economic activities (sections D.1 and D.4) is that of carbon leakage. Concerns have been voiced that some TNCs might pursue global production strategies with a view to avoiding increased production costs arising from carbon tax obligations and/or other climate change regulations. Particularly TNCs in energy-intensive industries are feared to relocate their emission-intensive activities to jurisdictions with laxer emission standards or to have them done for them in such places. There are fears that by "free-riding" on a particular country's effort to reduce emissions, host countries who receive "carbon-leakage" investment benefit from regulatory arbitrage and impedes global emission reduction efforts. Moreover, there are concerns that such a re-location of production may result in loss of investment related benefits, including tax revenues and employment opportunities, in the home country.

There is currently an international debate focussing on border adjustment measures as a possible tool to discourage TNCs' carbon leakage-related relocation strategies. Such border measures (e.g. tariffs, taxes or other levies) could help create a "level playing field" between domestic goods, whose producers are subject to stricter emission regulations and imported goods whose producers abroad are not confronted with extra carbon-related compliance costs.

There are open technical and legal questions arising from the implementation of border adjustment measures for high carbon imports. On the technical side, establishing the level of carbon embedded in a specific, imported product may not always be feasible or may entail high costs (Kasterine and Vanzetti, 2010). One option would therefore be to implement border measures for all products of a given category from a country or a region. On the legal side, it is unclear, which type of border adjustment measures would be consistent with WTO rules (Tamiotti and Kulaçoglu, 2009). Finally, one would also need to consider the possibility that carbon-related policies serve as a pretext for investment protectionism, particular with regard to efficiency-seeking and export-oriented outward investment. From the point of view of export-oriented developing countries such border adjustment measures would put a burden on carbon-intensive exports, and as a consequence, also act as a deterrent to export-oriented carbon-intensive investments.

Some suggest that carbon leakage is not occurring at a large scale (see for instance Reinaud, 2008). In practice, however, the extent of carbon-leakage related investment re-location and its impact on global efforts to reduce emissions is hard to quantify. For example, the difference in countries' business-as-usual scenarios makes it hard to determine the relevant parameters for determining carbon leakage. Indeed, there could be scenarios which would constitute both, carbon leakage and low-carbon foreign investment at the same time. This would be the case, for instance, if emissions of re-located TNC facilities (which moved because of tighter emission standards at home) would be lower than those of replaced domestic operations in a host country. Under such a scenario, the facility in question would emit *more* than comparable home-country production sites that had to upgrade their carbon-performance, but *less* than its host country peers that operate with less advanced technologies and production processes.

Moreover, particularly for very poor countries, who most likely are not large emitters of GHGs, but are in dire need of expanding their productive capacities, such carbon-

leakage investment could potentially generate much needed development gains, including (skilled) employment, infrastructure, export and tax revenues as well as multiplier effects and other positive externalities, particularly in the short run. In the long run, however, each country would benefit from enhancing the energy-, material- and resource-efficiency of its production processes which the move towards a low-carbon economy would entail.

Instead of addressing the issue of carbon leakage at the border, it could also be dealt with at its source. Regulatory options in this regard include building on TNCs' investment decision-making and corporate governance mechanisms, through improved environmental reporting and monitoring.

In terms of TNCs' investment decision making, it remains to be seen whether firms would ultimately engage in carbon leakage at a large scale. Notably, carbon policies are only one element of the broader industry picture, which influences TNCs' decisions about their investment locations and it may not necessarily be in the best interest of TNCs to relocate polluting facilities to developing counties with lower emission standards.

One significant factor in this respect might be the economies of scale that are created by using common global technologies and standards across countries. The cost of operating facilities in different jurisdictions with different technologies – so as to take advantage of laxer regulations in some of them – is often higher than operating one "clean" (i.e. less carbon-intensive) technology across all relevant TNC facilities. In earlier versions of the "pollution haven" discussion, efficiency savings and cost reductions resulting from the application of stricter environmental standards across the board were cited as a factor for less environmentally harmful foreign investments (*WIR99*). Consistency throughout a company's integrated production system is in line with the logic of the value chain and would also facilitate the implementation of corporate carbon policies.

Another reason that might induce TNCs to refrain from engaging in carbon-leakage type operations is the need to safeguard their corporate image in the face of increasing public concern on climate change, environmental or other public policy issues. Particularly for firms producing consumers goods, customers' perceptions about the producing company and the extent to which it operates in line with particular value sets is of utmost importance. This is particularly the case for export-oriented foreign investment. Hence, a company perceived as a "good corporate citizen" might derive economic benefits from acting in a low-carbon manner.

This raises further issues about private standards and TNCs' reporting on the carbon footprint of their activities. Improved climate reporting, particularly when undertaken in a harmonized and verifiable manner, can help ensure that a company's branding is based on solid ground, as it increases the transparency and accountability of company operations. A noteworthy example in this respect is the nearly two decade old Forest Stewardship Council, a global multi-stakeholder initiative that provides standard-setting and accreditation services to companies. Such private standard setting, especially in the context of multi-stakeholder initiatives, can be an effective tool for inducing behavioural change. Exposing carbon leakage, for example through a "Climate Stewardship Council", can help to incentivize firms to take action, with a view to meeting stakeholder expectations (section C.1). The related package of monitoring tools could include, amongst others, standardized reporting, audits, product certifications, and management system standards, which could be based on – or linked to – existing initiatives (e.g. ISO 14 000). In addition, policy makers could consider the promotion of the monitoring of and standardized reporting on (private)

standards to strengthen emission reduction efforts of TNCs (see next section).

7. Harmonizing corporate GHG emissions disclosure

There is a need for internationally harmonized corporate GHG emissions disclosure, so as to effectively strengthen the accurate monitoring of firms' GHG emissions.

The effective implementation of a number of policy options, such as "cap-and-trade" and "carbon taxes" require the standardized measurement of corporate GHG emissions. Currently, however, there is no universally applied standard to calculate and report GHG emissions. Improving the accuracy, comparability and credibility of emissions reporting would enable policy makers to develop more targeted emissions reduction strategies, help integrate climate risk information into investment decisions, and allow for improved monitoring of GHG emissions and clean-tech diffusion throughout TNCs' value chains. Thus an internationally harmonized approach to measuring and reporting climate change related emissions is an important enabler of policies to promote low-carbon economies. There are three related aspects to this:

- *Management systems* that generate internal data on environmental control systems and emissions;
- *Reporting systems* that meet internationally recognized quality characteristics (comparability, relevance and materiality, understandability, and reliability and verifiability);[62] and
- *Assurance standards*[63] that can enhance the credibility of corporate reporting.

The current state of TNC practices indicates a widespread adoption of climate related management systems and reporting frameworks. Analysis of corporate reporting for the largest 100 TNCs, for example, finds that 73 of the 100 enterprises have been certified to one of the ISO 14000 series of management system standards; 87 report at least some data on GHG emissions; and 46 include an external assurance statement in their reporting of GHG emissions.

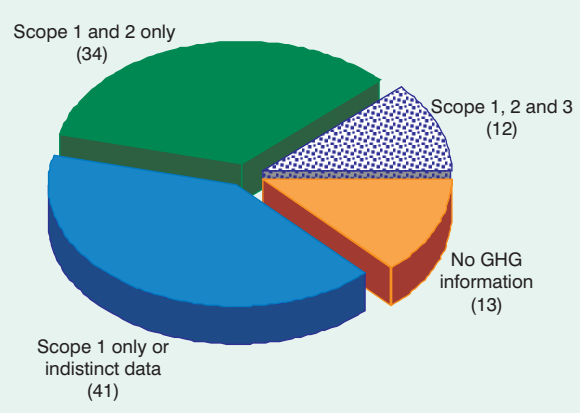
However, a closer look at the information being reported indicates a lack of harmonization, and consequently a lack of comparability and usefulness. This is made clear by an analysis of corporate reporting using as a benchmark the Greenhouse Gas Protocol,[64] which defines three "scopes" for GHG accounting and reporting purposes. Scope 1 emissions are direct GHG emissions that occur from sources that are owned or controlled by the company, e.g. gases emitted directly from a company's operations. Scope 2 emissions are indirect GHG emissions from the external generation of electricity consumed by the company. Scope 3 emissions are other (non-electricity related) indirect emissions in the value chain that are a consequence of the activities of the reporting company, like emissions from suppliers related to work done for the reporting company (such as business flights or transport). These scopes can also be identified in figure IV.1 (section B.1).[65] Figure IV.6 below shows the level of detail of GHG emissions data broken down into the three scopes in the reporting of the 87 TNCs among the top 100 TNCs that report GHG emissions.

This analysis of reporting at the level of individual scopes of emissions reveals inadequacies in the quality and comprehensiveness of TNC reporting. Nearly half of the 87 companies reporting GHG emissions data did so at scope 1, or with indistinct data, i.e. without a clear distinction as to the source of the GHG emissions. To clearly distinguish between different scopes, company reports must include information on such things as whether electricity generation or other sources of fuel are included, whether all foreign affiliates are included, whether the

emissions of the value chain are included, and how the emissions are calculated. Often missing, this information is crucial to providing investors, other stakeholders and particularly policy makers with a complete understanding of the nature of a company's emissions, and the potential impact of GHG reduction mechanisms on a company's operations.

Another weakness in current reporting practices is the lack of country specific information on GHG emissions, for example a breakdown of a TNC's global emissions by country of origin. Of the 87 TNCs reporting GHG emissions noted above, only 21 were found to report country specific information. Given the increasing number of national initiatives to curb GHG emissions, country specific data is necessary to provide policy makers and investors with information to gauge the impact of current or proposed policy on industry in specific jurisdictions. Such data will also, over time, provide crucial information to policy makers on the effectiveness of specific policies, and thus inform future policy decisions. The data are equally useful for management in evaluating investments in GHG reducing technology, and other stakeholders in monitoring trends in the GHG emissions throughout a TNCs global network.

Figure IV.6. Use of GHG Protocol "scopes" in emissions reporting
(Number of TNCs)



Source: UNCTAD, 2009e.

Hence, while the world's largest TNCs have already begun to adopt a range of voluntary practices to address issues of climate change and make related information available in their public reports, problems with the quality and consistency of reporting remain. In the absence of standardized and mandated reporting frameworks for GHG emissions, inconsistencies are likely to continue, resulting in significant obstacles for meaningful monitoring.

The disclosure of GHG emissions would benefit from an internationally harmonized approach to the way companies explain, calculate and define emissions. In the same way national tax policies benefit enormously from having a regulated accounting standard to determine income, national low-carbon strategies would benefit enormously from a mandated standard for calculating and reporting GHG emissions. Furthermore, internationally harmonized reporting would be extremely useful for further climate change policy work at the global level, as well as providing investors and other stakeholders a clear, comparable view of emissions around the world.

As a start, policy makers could encourage wider adoption of one of the existing generally accepted frameworks for emissions reporting in order to improve the transparency of calculations and the comparability between companies. Ultimately such frameworks will need to move from the testing grounds of voluntary initiatives into the world of regulatory initiatives: one policy option for this is to specify an existing GHG reporting framework and make reporting on it a listing requirement for companies listed on stock exchanges (e.g. South Africa has done something similar when requiring all listed companies to report using the sustainability guidelines of the Global Reporting Initiative).

For international harmonization purposes, the United Nations Intergovernmental Working

Group of Experts on International Standards of Accounting and Reporting (ISAR) is one vehicle through which member States could work. ISAR can serve three primary functions in this area: (a) facilitate an exchange of experiences between government regulators and various global multi-stakeholder initiatives working on standardizing climate-change related reporting (including the Climate Disclosure Standards Board and the Global Reporting Initiative); (b) engage in consensus building with a view to promoting harmonization between existing national regulatory and voluntary multi-stakeholder reporting standards; and (c) provide technical cooperation to member States to assist with implementation of best practices in the area of corporate disclosure on climate change.

8. Supporting developing countries

Home-country measures, such as investment guarantees and risk insurance, could be used to support developing countries. A multi-agency technical assistance body should be established to help developing countries to tap-into TNCs' low-carbon related financial and technological resources.

a. Home-country measures

Numerous developed countries promote low-carbon activities abroad, including foreign investment, through various means, such as investment guarantees and financial assistance (box IV.12).

As far as investment guarantees for outward investment are concerned, their granting can be made subject to an environmental impact assessment. However, this usually does not include an explicit evaluation of the potential effects of the investment on climate change. To further enhance the promotion of low-carbon outward investment, national investment guarantee agencies could take the low-carbon character of an outward investment into account when calculating the "price" of the investment guarantee. Foreign investors making a positive contribution to lowering GHG emissions in the host country could be "rewarded" by receiving more favourable guarantee terms, for instance in form of a reduced guarantee fee, a broader scope of coverage or an extended guarantee period.

Another means to promote low-carbon foreign investment in developing countries is to create a mechanism whereby the home government of a foreign investor issues credit risk guarantees. Such instruments can considerably lower the investment barriers for many investors and keep the risk associated with the investment at a reasonable level (UNEP FI, 2009).

In addition, it would be helpful if more ODA could be channelled into low-carbon growth programmes in developing countries. What is needed is a stronger re-orientation from economic assistance schemes for "traditional" industries to potential low-carbon growth poles. Under such an approach, ODA funds could become instrumental for the implantation of host country strategies that seek low-carbon growth through the involvement of foreign investment. To maximize the benefits of ODA, home-country assistance programmes should be coordinated with those of international financial institutions (see section D.8.b). There is also a need for capacity building in developed countries with regard to effectively accessing and using these funds.

At the bilateral level, cooperation between developed and developing countries have produced promising results. For instance, China and the EU have established a proactive and pragmatic climate change partnership with a strong focus on technology cooperation and the engagement of the business community. The creation of EU-China Low Carbon Technology and Investment Demonstration Zones aims at providing an

Box IV.12. Promotion of outward foreign investment and climate change

Numerous home countries, e.g. Germany, Japan and the United States, take measures to support outward low-carbon investment. This assistance can take many different forms, including subsidies, guarantees, concessional financing and equity investments.

Germany supports FDI projects with negligible environmental impacts, those that create a sustainable improvement of the environment, or those with environmental impacts that can be balanced out with other positive effects. To this end, the government has systemized its procedure to consider investment guarantee applications under environmental aspects.[a]

In Japan, the Japan Bank for International Cooperation (JBIC) has established specific guidelines in order to judge the environmental and social impacts of supported projects. It provides favourable loan terms to environmental conservation and improvement projects. Additionally, the bank established the JBIC Facility for Asia Cooperation and Environment with three objectives: (a) mobilize private capital to the maximum extent possible, through the use of equity participation measures and guarantees in JBIC's International Financial Operations; (b) support projects that contribute to mitigating climate change, e.g. projects promoting energy conservation, new energy resources, and forest conservation; and (c) promote projects in Asian countries, e.g. infrastructural development and energy projects (JBIC, 2009).

In the United States, the Overseas Private Investment Corporation (OPIC) has committed to reducing the greenhouse gas (GHG) emissions in OPIC supported projects by 30 per cent over a ten-year period and to shift investment focus to renewable and energy efficient projects.[b] To this end, OPIC offers various forms of financial and insurance support to the private sector to encourage and support renewable energy projects and projects that incorporate energy efficiency technology.

Source: UNCTAD.

[a] "Leaflet Environment", June 2001, Investment Guarantees of the Federal Republic of Germany - Direct Investment Abroad. Federal Ministry of Economics and Technology, PriceWaterhouseCoopers and Euler Hermes.

[b] "Update – Greenhouse Gas / Clean Energy Initiative", Fact sheet, 1 March 2009, Overseas Private Investment Corporation. Available at: http://www.opic.gov/sites/default/files/docs/ghg_fact-sheet_070109.pdf (accessed 17 June 2010).

innovative platform for such cooperation (box IV.13).

b. International support

While national policies can go a long way towards the creation of low-carbon economies, including through the attraction of low-carbon foreign investment, a coordinated international approach to climate change and low-carbon economies is crucial for several reasons. Climate change is a global problem that requires a global approach and solution. Most countries will remain reluctant to act forcefully unless they have assurances that others will take action as well. In addition, international and national policies should and will reinforce each other if properly coordinated. In particular, international support should be provided to developing countries to help them build low-carbon economies. What is needed is a global partnership package for supporting the move towards a low-carbon economy. As far as the encouragement of low-carbon foreign investment is concerned, this primarily translates into the need for financial support for developing countries.

Developing countries are already being hit by the effects of climate change. In the future, they are also likely to suffer more from the consequences of global warming than developed countries. Building on the well-accepted principle of common but differentiated responsibilities and capabilities, more international financial support for the poorest and most vulnerable countries is urgent to help them to: (a) be prepared to adapt to the consequences of climate change;

Box IV.13. EU-China Low Carbon Technology and Investment Demonstration Zones: an example of international low-carbon technology cooperation

Under the overall China-EU climate change partnership, the creation of EU-China Low Carbon Technology and Investment Demonstration Zones (LCTIDZs) aims to help China meet the region-specific needs for its low-carbon economic transition. LCTIDZs are building on existing high-tech zones with a strong focus on low-carbon technology cooperation. The objectives of cooperation in LCTIDZs are:

To facilitate technology upgrading and accelerate joint development of new technologies by China and the EU, thereby helping to achieve short- and long-term CO_2 emissions reduction targets.

To allow the EU and China to work with the business community to build a new "protect and share" IP regime that can facilitate rapid and large-scale diffusion of low-carbon technology and help to prevent protectionist measures.

To identify and establish innovative mechanisms/financial instruments to help both Chinese and European enterprises, in particular small and medium sized enterprises, to overcome barriers to innovation and market entry through joint EU-China public and private partnerships.

Source: UNCTAD, based on E3G.

and (b) be in a position to build low-carbon economies so as to contribute to the fight against global warming without compromising their legitimate aspiration for poverty reduction and wealth creation.

Support by international financial institutions for low-carbon growth in developing countries can have an important promotional effect on foreign investment. To the extent that financial assistance is granted to the host government, the latter can use these funds to encourage low-carbon investment projects with foreign participation. Such encouragement can also take indirect forms, for instance if the government decides to subsidise consumers buying low-carbon products or using energy efficient equipment. By increasing demand for such items, the government influences the determinants for low-carbon foreign investment. Last not least, international financial assistance can support host country policies to create linkages between low-carbon foreign investors and the domestic economy. Financial support to domestic entrepreneurs engaged in low-carbon activities increases their chances to cooperate with foreign investors, for instance with regard to the supply of low-carbon equipment, and to become integrated in international low-carbon value chains.

International financial institutions (such as the World Bank Group)[66] are actively engaged in supporting the move towards a low-carbon economy in developing countries. The same is the case for various regional development banks, including the ClimDev-Africa Special Fund (CDSF), which is managed by the African Development Bank,[67] and the Asia Pacific Carbon Fund, – an Asian Development Bank initiative supporting clean energy projects in the Asia and Pacific region.[68] Their support plays a crucial role in situations where private financial institutions shy away from financing a low-carbon investment project because they consider the credit risk as too high, or compensate for the perceived higher risk through higher interest rates and more restrictive lending conditions (UNEP, 2008).

Efforts should be made to further enhance international financial assistance for low-carbon growth in developing countries. Funding for market-creation measures in renewable energy, fuel efficient transport and low-energy buildings and equipment should be a priority.

One option is to seek an improvement in the way the CDM operates. Questions remain about the extent to which it has produced

the desired outcomes – namely promote sustainable low-carbon foreign investment in the countries that need it the most for development purposes and generating technology dissemination. Changes to the existing system are necessary in order to attract more private capital in terms of the sector (e.g. energy efficiency), region or scale (e.g. smaller project sizes, programmatic activities). In the context, UNEP has suggested an expansion of small-scale CDM as well as programmatic CDM.[69] The UNEP Finance Initiative (UNEP FI) has made some suggestions in this regard (UNEP FI, 2009).

International support is needed for developing countries to engage on low-carbon development paths and to enhance technology dissemination.[70] An international low-carbon technical assistance centre (L-TAC) could be established to support developing countries, especially LDCs, in formulating and implementing targeted and synergistic national climate change mitigation strategies and action plans, including NAMA programmes. The centre would help devise strategies, policies and programmes that allow beneficiaries to meet their development challenges and aspirations, including by benefiting from low-carbon foreign investment and associated technologies. Developing countries would benefit from such services, when aiming to integrate their climate change mitigation and economic development strategies in a coherent and sustainable way, all the while considering how to best access and utilize the requisite investment, technological and other resources. This policy challenge is a combination which calls upon multiple sources of expertise – such expertise being scarce and not readily available in many developing countries.

In this light, L-TAC would, among others, leverage expertise via existing and novel channels, including multilateral agencies such as the UNFCCC secretariat, the World Bank, United Nations Development Programme (UNDP), UNEP, UNCTAD and others. This partnering of the agencies would allow L-TAC to act as a hub in terms of, among others, providing technical assistance, acting as a repository of expertise (e.g. best practices in NAMA implementation) and being an effective conduit to specialized knowledge. With the governance and modalities of implementation of such a mechanism remaining to be determined, characteristics such as being needs based and demand driven are to be taken into consideration. L-TAC could also help developing countries build their own expertise and institutions to devise and monitor policies related to climate-change issues, including regarding to the promotion of low-carbon investment and technology dissemination.

E. Summing up: a global partnership to further low-carbon investment for sustainable development

It bears repeating that the global policy debate on tackling climate change is no longer about whether to take action. It is now about how much action to take and which actions need to be taken – and by whom. When moving towards a low-carbon economy, developing countries are faced with two major challenges (a) financing and implementing investment in appropriate activities; and (b) the generation and dissemination of relevant technology. TNCs are both major carbon emitters and low-carbon investment and technology providers. They are therefore inevitably part of both the problem and the solution to climate change.

While a large number of developing countries are not major GHG emitters, attracting low-

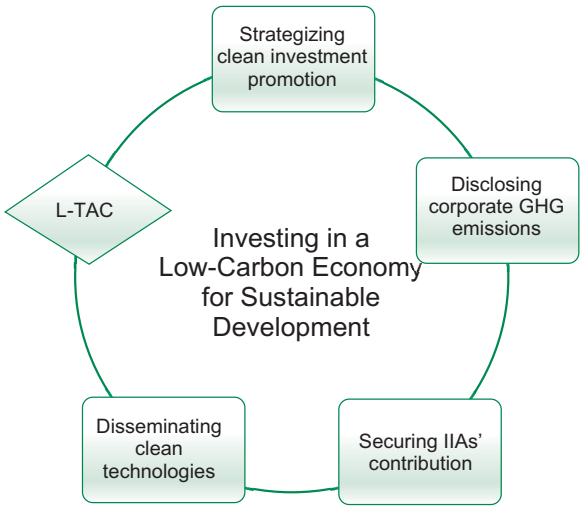
carbon foreign investment and technology can still offer opportunities for them. Benefits could include: (a) strengthened productive capacities; (b) enhanced export competitiveness; (c) a contribution to global climate change mitigation; and (d) an acceleration of developing countries' own transition to a low-carbon economy, which is inevitable in the long term.

Policy makers need to maximize the benefits and minimize the risks of low-carbon foreign investment but this is not straightforward, especially since most developing countries have little experience in this area. In addition, national strategies to promote low-carbon foreign investment and related technology dissemination need to be synergized with climate change and investment policies at the international level. However, many developing countries lack financial resources and institutional capabilities to do this effectively. An international supporting structure is thus essential.

Against this background, cognisant of the manifold challenges of climate change, and the opportunity to harness TNCs for development in the process of meeting them, UNCTAD proposes a global partnership to synergize investment and climate change policies to promote low-carbon foreign investment (fig. IV.7). The key elements of the partnership would include:

- ***Establishing clean-investment promotion strategies.*** This includes developing conducive host-country policy frameworks including market-creation mechanisms and implementing promotion programmes to attract low-carbon investment with key functions being investor targeting, fostering linkages and investment aftercare. International financial institutions and home countries need to support low-carbon investment promotion strategies, including through outward investment promotion, investment guarantees and credit risk guarantees.
- ***Enabling the dissemination of clean technology.*** This involves putting in place an enabling framework to facilitate cross-border technology flows, fostering linkages between TNCs and local firms to maximize spillover effects, enhancing local firms' capacities to be part of global value chains, strengthening developing countries' absorptive capacity for clean technology, and encouraging partnership programmes for technology generation and dissemination between countries.
- ***Securing IIAs' contribution to climate change mitigation.*** This includes introducing climate-friendly provisions (e.g. low-carbon investment promotion elements, environmental exceptions) into future IIAs, and a multilateral understanding to ensure the coherence of existing IIAs with global and national policy developments related to climate change.
- ***Harmonizing corporate GHG emissions disclosure.*** This involves creating a single global standard for corporate greenhouse gas emissions disclosure, improving the disclosure of foreign operations

Fig IV.7. Global partnership for low-carbon investment



Source: UNCTAD.

and activities within value chains, and mainstreaming best practices in emissions disclosure via existing corporate governance regulatory mechanisms (such as stock-listing requirements).

- ***Setting up an international low-carbon technical assistance centre (L-TAC).*** L-TAC could support developing countries, especially LDCs, in formulating and implementing national climate change mitigation strategies and action plans. The centre would help beneficiaries meet their development challenges and aspirations, including by benefiting from low-carbon foreign investment and associated technologies. Among others, L-TAC would leverage expertise via existing and novel channels, including multilateral agencies, and engage in capacity and institution building.

Channelling investment and technology, including from TNCs, to meet the challenge of climate change is crucial. In doing so, developing countries can look to the opportunities arising from the transition to a low-carbon economy, as well as the challenges, and take advantage of them in line with overall developmental objectives. The global partnership outlined is aimed to support these efforts.

Endnotes

1 For an introduction to the issue and particularly a macroeconomic perspective see also UNCTAD, 2009f.

2 This chapter focuses on "low-carbon" issues, which are in some cases quite different from the related notions of "green" or "sustainable". In climate-related and, more generally, environment-related public discussions, the above terms are sometimes used almost interchangeably when talking about investment, technology, growth, growth paths or development. There are substantial differences, however: (a) "low-carbon" is a concept emerging from the climate change debate and refers to a process or product that emits fewer greenhouse gases (GHGs) in its operational lifetime than traditional ones. While this includes an absolute notion, the term is also used for products/processes that still emit GHGs, but less than "business-as-usual" (BAU) options (box IV.3). For the purpose of this report, low-carbon also includes avoidance of GHGs other than CO_2; (b) the term "green" has a longer tradition and refers to technologies/activities that take into account a much larger set of environmental issues, and not just climate change; and (c) sustainable development is a broad concept that combines concern for the carrying capacity of natural systems with economic and social concerns. In addition, for the purpose of this chapter, the terms "clean" and "low-carbon" are used interchangeably.

3 The term "foreign investment" as used in this chapter excludes (foreign) portfolio investments. In addition, most of the argument in this section relates to greenfield FDI, although the analysis can be adapted for cross-border M&As. For example, an acquired host country facility may be upgraded to reduce GHG emissions.

4 Carbon intensity must be understood as a continuum. On the one end, there are zero-carbon technologies like wind power or nuclear power which emit (almost) no GHG. On the other hand, there are technologies with high carbon intensity such as technologies that rely on fossil fuels and/or are in-efficient in energy use and/or emit very potent GHGs such as methane or nitrous oxide.

5 Defining low-carbon technologies and practices relative to a BAU situation is commonplace in the climate change debate; however, it exhibits two central limitations. First, various technologies or processes emit different amounts of GHG emissions per unit of output, which complicates the establishment of thresholds to define low-carbon. Second, the term low-carbon is relative, as it is based on a comparison with BAU emissions that can be different in different countries.

6 This distinction is more applicable when considering TNCs' investments in host developing countries. In some developed hosts, relevant R&D to reduce carbon emissions is quite likely to occur. This may also be the case in some larger or more advanced developing countries especially for adaptation of technology to local conditions, and if appropriate and reliable incentive structures are in place.

7 Using nuclear energy is controversial; and other very important considerations need to be taken into account when devising national energy policies.

[8] This process also includes switching away from fossil fuels in activities other than electricity generation: for instance, from oil to biomass as a basis for plastics production; from coal to biomass for cement or iron & steel production. Examples also include switching from one fossil fuel to another that creates fewer emissions, i.e. switching from coal to gas for power production.

[9] Similarly, wood processing TNCs may influence their suppliers to adopt more sustainable practices (e.g. with respect to logging and reforestation).

[10] Within the automotive industry itself Ricardo has refocused on the development of advanced clean diesel technology, hybrid and electric vehicle systems, fuel efficient gasoline engines, efficient transmission systems and vehicle electronic systems integration.

[11] In North America, for instance, Ricardo is involved in a wind energy start-up project for wind turbine energy storage systems, as well as a concentrated solar power project aimed at reducing production costs and improving manufacturing process and system performance. The company has affiliates in the United States, Germany, Italy, the Czech Republic, India, China, Japan and the Republic of Korea. Customers in the clean energy industry include system developers, investors, utilities and government agencies. See the company website at: http://www.ricardo.com/ (accessed 15 June 2010).

[12] There are a wide variety of variations on "BOT" types of non-equity arrangements, especially in sectors and industries such as infrastructure (*WIR08*).

[13] Usage of the term sector: traditionally the economy is divided into three broad sectors: the primary (e.g. agriculture), secondary (e.g. manufacturing) and tertiary (or services) *sectors*; these are then broken down into *industries*, into which companies are grouped according to their main outputs, e.g. the financial or automotive industries. In climate change-related discussions, however, the term sector is used differently – essentially to consolidate what might be referred to as "areas of emissions" – instead of the traditional breakdown. This classification is adopted in this chapter; industry is still used in the traditional way, however, as it groups business activities that emit or provide solutions.

[14] In essence, using the business-as-usual scenario means applying some projections regarding economic growth and population growth, factoring in some technical progress reducing emission intensity of economic activity by 1.2 per cent per annum, but leaving out any specific efforts to reduce emissions or behavioural changes that might occur, be this for mitigation or other purposes. See also box IV.3.

[15] Company press release, 27 August 2008, available at: http://www.cez.cz/en/cez-group/media/press-releases/2081.html (accessed 9 June 2010). The two-stage, 600 megawatt project is being built in the Black Sea and will be one of the largest of its kind in Europe.

[16] Information retrieved from company website at: http://www.thermaxindia.com/Power-Generation/Events-and-Happenings/Thermax-SPX-Energy-Technologies.aspx (accessed 9 June 2010).

[17] Company press release, 27 July 2005, available at: http://www.cemex.es/sp/2005/sp_np_050721.html (accessed 9 June 2010).

[18] See "Nissan to shift subcompact car production to Thailand in 2010", *Intellasia News Online*, 19 January 2009, available at: http://www.intellasia.net/news/articles/regional/111255998.shtml (accessed 9 June 2010).

[19] Lagos State Governor website, available at http://www.tundefashola.com (accessed 16 June 2010).

[20] Segregated High-Capacity Corridor or COSAC by its Spanish-language acronym. "After Two Decades, Lima's Electric Train Gets Second Chance", *Dow Jones Newswire*, 29 March 2010.

[21] See "Lesotho plant supplies first million CFLs to Eskom", *Engineering News*, 10 May 2010, available at: http://www.engineeringnews.co.za/article/lesotho-jv-supplies-first-million-cfls-to-eskom-2010-05-10 (accessed 9 June 2010).

[22] For example Hotel Rafayel (United Kingdom), uses these technologies and products specifically to promote low-carbon luxury hotel services.

[23] Practices such as re-use and recycling would largely be captured in the "industry" sector.

[24] Press release of the Indian Embassy in Ethiopia, 2 August 2009, retrieved from website: http://www.indianembassy.gov.et/FINAl_800by600/press_release.htm#88 (accessed 9 June 2010).

[25] For example, Factor Consulting & Management AG – a Zurich-based firm in energy, forestry and emission trading – is investing in wood processing from sustainable forests in Argentina for export to Switzerland and Germany.

[26] Company website, available at http://www.tescoplc.com (accessed 12 May 2010).

[27] There were 13,727 greenfield investments and 8,123 cross-border M&As in 2009.

[28] CDM projects that encompass FDI are included in this data.

[29] Original data from the *Financial Times*, the FDi-Intelligence database (www.locoonline.com).

[30] Such as Eletrobras (Brazil), KEPCO (Republic of Korea), CLP Holdings (Malaysia), China Southern Power Grid (China), Allgreen Properties (Singapore) and Abu Dhabi Future Energy Company (Abu Dhabi).

[31] These conglomerates include CNOOC (China), Hyflux (Singapore) and Suzlon Energy (India).

[32] Firm-specific advantages are the basis for TNC internationalization, including for low-carbon foreign investments. As discussed in section B.1, TNCs utilise their knowledge, skills and other assets to invest in processes, products and processes host countries. Without these assets, they would not enjoy any competitive advantages over local firms. A twist to this occurs in the case of strategic asset seeking investments, where companies *without* such firm-specific advantages conduct (cross-border) acquisitions to own or access technology, skills and other resources.

[33] Although most drivers are home-country factors, some relate to host countries. A good example is a targeted investment promotion effort by a potential host country offering a package of inducements to foreign companies. Another example of a similar "host country driver" that is simultaneously a determinant is a call for tender issued by a country, e.g. for an infrastructure project. Such "host country drivers" are dealt with in more detail in section C.2, but only their locational determinant aspect is particularly emphasised.

[34] Many relevant technological developments occur in response to government policies, regulation and support, which play a role in the determination of country-level comparative advantage and firm-specific advantages.

[35] A common example is energy policy with respect to renewable power generation. A number of countries have successfully used feed-in tariffs to support renewables, thus giving incentives to invest in relevant technologies.

[36] In earlier pollution haven discussions, this was cited as a factor for less environmentally harmful foreign investments (*WIR99:* 298).

[37] See media reports, e.g. "Diggers drawn as tar sands protesters target RBS meeting", *The Independent*, 28 April 2010, available at: http://www.independent.co.uk/news/business/news/diggers-drawn-as-tar-sands-protesters-target-rbs-meeting-1956210.html (accessed 11 May 2010) and "Shareholders Try to Pull Oil Companies Out of Canadian Tar Sands", by MatteR Network, 14 April 2010, available at: http://uk.reuters.com/article/idUK269907062220100414 (accessed 11 May 2010).

[38] See media reports, e.g. "Nestle says drops palm oil supplier after report", *Reuters*, 17 March 2010, available at: http://www.reuters.com/article/idUSTRE62G3PM20100317 (accessed 11 May 2010) and "Unilever unit says Indonesia remains key palm oil supplier", Reuters, 5 May 2010, available at: http://www.reuters.com/article/idUSJAK34489520100505 (accessed 11 May 2010).

[39] Responsible investment refers to investors' efforts to incorporate environmental, social and governance (ESG) issues into investment decisions and to engage actively with their affiliates and associated companies to encourage improved ESG practices.

[40] See UNCTAD, forthcoming e.

[41] Locational determinants only include host country-specific factors, and not international frameworks that also influence the attractiveness of individual countries as investment locations. In the climate change context, these policy frameworks include, for example, the Kyoto Protocol.

[42] The *natural resource-seeking* and *strategic-asset-seeking* motives are sometimes combined under a *strategic-asset*-seeking motive (e.g. see Dunning and Lundan, 2007). However, as created assets and natural resources are distinct, it is worth considering them separately. As the global low-carbon market burgeons, it is becoming more vital for companies to possess the requisite technology and skills sets; strategic-asset-seeking foreign investment (as used in this *Report*) is likely to come more to the fore.

[43] High royalty costs associated with foreign technology licenses and fees, for example, are costly and can have negative effects on competitiveness.

[44] Other risks might also arise from knowledge asymmetries between countries and TNCs. One example is manipulative transfer-pricing**,** whereby TNCs fix the prices of goods and services in their cross-border intra-firm transactions, in order to locate profits (and thereby funds) in particular locations (*WIR99*).

[45] As a result, countries are in a position to introduce a low-carbon component in their efforts to attract traditional forms of foreign investment in all sectors. Some of the policies to attract low-carbon foreign investment are thus varia-

tions or adaptations of well-established policies to attract traditional foreign investment. In order to tap into new and specific low-carbon business opportunities such as renewable energies or energy-efficient modes of transport or construction, however, developing countries need to put in place dedicated policies. This adaptational form of low-carbon foreign investment can prove beneficial to investors and host countries alike, as it frequently entails higher energy efficiency, lower waste and a more efficient use of inputs leading to more competiveness in international markets.

46 UNCTAD forthcoming f. UNCTAD conducted this questionnaire-based survey of 238 investment promotion agencies (IPAs) from December 2009 – February 2010. A total of 116 questionnaires were completed, representing an overall response rate of 49 per cent.

47 For example, a number of countries, such as Canada, France, Germany and the United States, include major investments in household renovations to improve energy efficiency. In the automotive industry, for example, China subsidizes the development of alternative-energy vehicles for three years ($1.5 billion) and has cut the sales tax for vehicles with engines below a certain threshold (i.e. 1.6 litres). Germany stimulates the development of low-carbon engines by providing EUR0.5 billion in loans over the next two years (HSBC Global Research, 2009).

48 Some developing countries host biofuel FDI projects that are focused on serving export markets, regardless of whether local blending mandates exist or not. The issues regarding biofuel projects are dealt more fully in UNCTAD, 2009b (see also, unctad.org/climatechange (accessed 23 June 2010)).

49 The United States, Japan, China, Germany, France, the Republic of Korea, the United Kingdom, the Russian Federation, Canada and Italy. The remaining global R&D is also mostly in developed countries, apart from a few developing countries such as Brazil, India and South Africa.

50 Morocco has been shifting towards the use of renewable resources to generate power for three reasons: first, to reduce its dependence on foreign supplies of fossil fuels; secondly to eventually supply power – as an export – to the EU single energy market; and, finally, to encourage rural electrification. TNCs, as providers of technology as well as finance, are playing a significant part in this. For instance Temasol (a joint venture between the French companies EDF, Total and Tenasol) in rural electrification (UNCTAD, based on the Brazilian Institute for Energy Efficiency and "Morocco, Rabat targets independent energy", Middle East Economic Digest, 23 October 2009).

51 See Philips plc website available at http://www.philips.com.my/philips5philipsmy/about/company/local/ourhistoryinmalaysia/index.page (accessed 14 June 2010) and Osram website available at http://www.osram.com.my/osram_my/News/Professional/Cleanroom_OSRAM_Waferfab_Penang.jsp (accessed 17 June 2010).

52 See e.g. ICTSD, 2008.

53 For example, the Indian Government requires that the "the CDM project activity should lead to transfer of environmentally safe and sound technologies that are comparable to best practices in order to assist in upgrading of the technological base". Similarly, the Korean Designated National Authority for the CDM requires that "environmentally sound technologies and know how shall be transferred."

54 See www.unctad.org and www.empretec.net (accessed 8 June 2010).

55 See "The Green Bank - Financing the Transition to a Low-Carbon Economy Requires Targeted Financing to Encourage Private-Sector Participation", by John Podestra and Karen Kornblum, 21 May 2009, Center for American Progress, Washington, DC. Available at: www.americanprogess.org/issues/2009/05/green_bank.html (accessed 12 June 2010).

56 See "Kenya plans open-ended green energy fund: government", *Reuters*, 14 January 2010, available at: http://www.reuters.com/article/idUSTRE60D2CS20100114 (accessed 9 June 2010).

57 It has to be noted that thus far, the dispute has not yet been submitted to arbitral proceedings under ICSID or UNCITRAL

58 In March 2010, arbitration proceedings were suspended based on both parties' agreements.

59 In cases involving environmental regulations, some arbitral tribunals have put attention on public policy purposes (*Methanex*), while others have stressed economic effects above public interest (*Metalclad*, *Santa Elena*) or resorted to proportionality assessments of the financial impacts and the police power doctrine (*Tecmed*).

60 These agreements mention select multilateral environmental agreements such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Montreal Protocol and the Basel Convention.

61 United Nations, 1969: Art. 31.3.c. This principle was subsequently conceptualized by the United Nations International Law Commission (ILC)

as the process whereby international obligations are interpreted by reference to their normative environment. United Nations International Law Commission, 2006, para. 420.

62 For more on the quality characteristics of corporate reporting see UNCTAD, 2008b.

63 There are various assurance standards in use, including the two most frequently used: AA1000AS produced by AccountAbility and the International Standard on Assurance Engagements (ISAE3000) produced by the International Accounting and Auditing Standards Board.

64 The Greenhouse Gas Protocol was created by the World Resources Institute and the World Business Council for Sustainable Development. The three scopes are meant to help delineate direct and indirect emission sources, improve transparency, and provide utility for different types of organizations and different types of climate policies and business goals.

65 In terms of parts of figure IV.1 in section B.1, reducing scope 1 emissions relates to introducing low-carbon processes in the principal firms core operations, while scopes 2 and 3 relate to suppliers that can be supported and influenced by the principal firm.

66 See World Bank, 2009d.

67 See "Climate for Development in Africa Initiative", African Development Bank Group. Available at: http://www.afdb.org/en/topics-sectors/initiatives-partnerships/climate-for-development-in-africa-climdev-africa-initiative/ (accessed 16 June 2010).

68 See Asian Development Bank, 2006.

69 CDM Programme of Activities or "programmatic CDM" refers to CDM projects that in themselves are a bundle of many dispersed small-scale projects, e.g. small-scale biomass projects. Taken together small-scale emitters of GHGs are an area that was difficult to address in standard CDM projects due to high transaction costs. In addition, this project type is envisaged to be particularly suited to the situation of LDCs. Programmatic CDM has thus been suggested to be designed and implemented with the help of micro-finance institutions, who's loan officers can provide not only the necessary credit, but also fulfil the monitoring function (Bahnsen et al., 2009).

70 An example of ongoing activities is UNEP's Green Economy Initiative; see UNEP (2008) and the UNEP website available at http://www.unep.org/greeneconomy (accessed 18 June 2010).