Trade and Climate Change: Issues in Perspective

Aaron Cosbey, Editor
International Institute for
Sustainable Development

ICTSD
International Centre for Trade and Sustainable Development

G|M|F The German Marshall Fund of the United States
STRENGTHENING TRANSATLANTIC COOPERATION

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Final Report and Synthesis of Discussions
Trade and Climate Change Seminar, Copenhagen,
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Preface

The event that resulted in this volume took place in Copenhagen in June 2008: a trade and climate change seminar hosted by the Danish Ministry of Foreign Affairs, The German Marshall Fund, IISD and the International Centre for Trade and Sustainable Development.

We were brought together because of the urgency of global climate change. Climate change and its twin, energy policy, are likely to be the most intractable economic issues facing the world for first few decades of this century. The reasons for this are becoming more and more apparent. The 2007 assessment report of the Intergovernmental Panel on Climate Change, the winner of the Nobel Peace Prize, confirms that global warming is taking place and that it is virtually certain that it is caused by human activities. And it urges governments to take immediate action. Other clarion calls have followed, from the Secretary-General of the United Nations, from the European Union, from non-governmental organizations and even from leaders of countries long considered holdouts against an active climate change agenda.

Each passing day seems to bring increased urgency to the task at hand. For a number of years, it was assumed that 550 parts per million (ppm) of CO_2 in the atmosphere represented an acceptable target for the stabilization of emissions. But that would likely represent a global average temperature increase of about 3°C, which the IPCC indicates would be very dangerous in terms of species loss, sea level rise and the increased possibility of the occurrence of non-linear events. The EU has therefore concluded that any concentration that results in an average temperature rise of more than 2°C is dangerous. That translates to a concentration in the atmosphere of 450 ppm.

This is no easy target. In early 2008, Shell, the international oil company, issued an update to its energy scenarios. Shell is a world leader in developing these views of the future. Shell believes that the world will be extremely hard pressed to stabilize at 550 ppm by 2050.

And now Dr. James Hanson of NASA, one of the world's most respected and courageous climate scientists, has called for a target of 350 ppm if we are to avoid a number of irreversible tipping points including massive sea level rise and huge changes in rainfall patterns. This is no mean feat, given that we are already at 380, with no signs of slowing down. So the need for action is immediate. The actions we take during the next 5–10 years will determine the future of the world's climate.

It's worth stressing that acting now and acting effectively does not mean economic ruin. A study by Lord Nicholas Stern, the former Chief Economist of the World Bank and of the British Government, put the cost of dealing with climate change at approximately one per cent of world gross domestic product annually, a figure that is probably on the high side. This is not an insignificant sum; it is far more than we are currently spending on development aid, and mobilizing it will

not be simple. But the alternative is instructive; Lord Stern calculates that *not* taking action could result in a drop of up to 20 per cent of global GDP because of the effects of climate change (most of which would be felt in developing countries).

Further evidence of the possible existence of a light at the end of the tunnel has come from a recent McKinsey study, which estimates that the world would need to produce US$7,300 of GDP for every metric ton of carbon dioxide emitted by 2050, up from a carbon productivity rate of US$740 now: "Increasing carbon productivity tenfold in less than 50 years will be one of the greatest tests humankind has ever faced. But both history and economics give us confidence it can be done." Most technologies are already available—ranging from better building insulation to cleaner coal generation—to cut world emissions of greenhouse gases by 64 per cent by 2050, or to 20 billion tonnes a year from 55 billion in 2008.

The study estimated that the costs of a "carbon revolution" were likely to be "manageable," at about 0.6 to 1.4 per cent of global GDP by 2030, figures comparable to those produced by the Stern Report. Substantial amounts could be raised by borrowing, muting any impact on growth. But the McKinsey study warned that the pace of change would have to be faster than during the Industrial Revolution. It noted that labour productivity rose tenfold in the United States between 1830 and 1955, and cautioned: "The tenfold increase in labour productivity was achieved over 125 years; the carbon revolution needs to be achieved in only 42."

Although it is obvious that climate change is a global challenge, it is not obvious at first blush why *trade* policy-makers should concern themselves with that challenge, the aims of trade being, after all, economic growth rather than environmental protection. The answer is that trade policy is not only about economic growth. The Ministerial Declaration that launched the Doha Agenda "strongly reaffirmed" WTO Members' commitment to the objective of sustainable development. And it argued that the goals of the multilateral trading system, and acting for the protection of the environment and the promotion of sustainable development, "can and must be mutually supportive." The same sort of language is in the Agreement Establishing the WTO.

Why is this sort of language in the trade texts? It is there because trade's ability to foster growth and increase well-being depends fundamentally on a healthy environment. And not just because climate change will play havoc with trade-related infrastructure such as ports, and with costs of transportation. If the Stern Report is right about the losses to be suffered from a lack of action, and if goals of the trading system are raising living standards and increasing human well-being, then climate change must be of fundamental concern to trade policy-makers. It will be impossible to deliver on those goals in the context of unchecked climate change; all the gains from decades of hard-fought trade reform could be too easily wiped away.

Let us also remember that, politically, reducing carbon emissions while continuing to produce economic growth is the only arrangement which can be viable

over the long term. As Tony Blair argued in a report for the Carbon Project, carbon reduction and economic growth must go hand in hand. So we must redefine and restructure economic growth.

Finally, many of the solutions to the problem of climate change impact heavily on trade and investment flows, involving fundamental economic restructuring of the world's systems of energy production, of transportation, of manufacturing, of resource extraction and harvesting. Or they involve invoking or amending trade measures in pursuit of climate change objectives. Like it or not, addressing climate change will affect the trade policy community, and trade policy-makers need to understand in advance what the linkages are, to try to ensure that they are positive for both climate change and trade objectives.

In reality, the trade and climate change agenda is, much like the broader trade and environment agenda, a rough assortment of issues with different dynamics and different sorts of solutions. There are a number of potential synergies between the trade and climate change regimes. There are a number of potential conflicts as well. And there are some entirely new concepts that we simply need to explore more deeply, to understand better how they might offer either synergies or conflicts.

Despite these compelling arguments, few trade experts have concerned themselves with climate change until very recently. With all of these considerations in mind, the Indonesian Government convened a meeting of Trade Ministers on the fringes of the recent climate change meetings in Bali. Until now, climate negotiations have largely been in the hands of Environment Ministers. And Environment Ministers, for the most part, are not significant figures in their own cabinets. Climate and energy policy has now moved to the centre of the economic debates of our time. It will need to sit on the agendas of Ministers of Finance and the Boards of Directors of major companies for many more years to come. The Bali meeting was a start for Trade Ministers, who treated the issue with curiosity and occasional hostility, but with some desire to keep it on their agendas for future meetings. They will need to keep it front and centre if we are to have any hope of devising mutually reinforcing trade and climate change policies.

The Danish Government had the foresight to take an interest in these issues as well, and the meetings it convened in June 2008, and the rich discussions they spawned, were the welcome result. The success of that meeting was at least in part a testimony to the value of bringing different communities together—trade people and climate change people tend to cluster within their own groups, each group speaking its own language. It is very fertile ground where you bring communities like that together. This volume speaks for itself in transmitting the substance of the discussions, but it is worth offering a few thoughts on the progress made there as a chapeau to the text.

The first obvious lesson from these meetings was that there is indeed a promising slate of issues where the trade community can contribute to its own objectives and also to those of the climate change community. We heard about the potential in areas such as liberalization of low-carbon goods, in the area of subsidy reform, of investment for clean energy, and in the area of standards and labelling. What

remains in all these areas, as well as the obvious need for greater clarity on benefits and pitfalls, is to try to fit the clear potential for good into a complex reality that includes an ailing round of multilateral trade talks, an advanced and Byzantine process of climate negotiations, diverse national interests, and a convoluted institutional mix of jurisdictions and responsibilities.

We also saw areas in which the reality seemed to be somewhat less than the promise. For example, there were limitations identified for intellectual property rights reform as a contribution to climate change objectives, the lesson seeming to be that IPRs may matter, but they are not in and of themselves a silver bullet. As well, while the paradigm of embodied carbon was useful in demonstrating the extent to which rich country consumption is responsible for developing country emissions, it seemed to open up few other promising avenues.

There were also areas where it was clear that the trade and climate change regimes need to tread carefully, with a full understanding of the implications of the various policy options. An obvious example is the controversial area of border carbon adjustment. What impacts might these sorts of measures have in terms of achieving their primary goals, and in terms of achieving the wider goals of international climate change cooperation?

One of the clearest areas of need is a research platform that is sensitive to more than just the environmental dimensions of these problems, and more than just the economic. There are important development dimensions to all these problems as well. What does it mean to developing country exporters, and to the prospects for poverty reduction in the exporting countries, if we adopt one or the other definition of environmental goods? Many developing countries have enormous comparative advantage at producing organic foods for export, but it's not likely that their proposals to have these listed as environmental goods will finally be accepted. What does it mean for developing countries to have border carbon adjustment imposed on their exports? Is this a major disaster, or a minor inconvenience? These are questions that go to the heart of sustainable development, of the need to marry environmental, economic and development dimensions in a holistic pursuit that is the heart of IISD's work. And they take us back again to the basic goals of the trade regime and the climate regime, both of which are aimed explicitly at sustainable development.

In the end, it's clear that there is a great deal of potential for trade policy to help us advance the climate change goals that are so important. And there is a great need to more clearly understand and avoid solutions that could damage both the trade regime and the climate regime. Clearly, there is no shortage of work ahead of us.

David Runnalls
President, International Institute for Sustainable Development
June 2008, Copenhagen

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Deborah Murphy served as IISD's Project Manager, and provided invaluable editing services on the conference background papers, which are encapsulated in this volume.

The event itself would not have taken place without the tireless efforts of a group of primary coordinators that included Mark Halle of IISD, Randall Soderquist of the German Marshall Fund, Ricardo Meléndez-Ortiz of ICTSD, Ann Tutwiler of the Hewlett Foundation and Bongki Engel of the Danish Ministry of Foreign Affairs.

The Danish government team responsible for making the event a success was headed by Søren Kelstrup, Head of Department at the Danish Ministry of Foreign Affairs, and included Svend Lykke Schmidt, Cennet Ünver and Albert Wright as well as Mr. Engel. The team from the German Marshall Fund was led by its Senior Director, Policy Programs, Thomas Kleine-Brockhoff and, along with Dr. Soderquist, also included Ulrike Leis, Mark Allegrini and Cathleen Kelly. IISD's team was led by Mark Halle (Director of Trade and Investment) and John Drexhage (Director of Climate Change and Energy), and also included IISD's President, David Runnalls. ICTSD's team, led by its Chief Executive Ricardo Meléndez-Ortiz, included Kamal Mustapha Gueye, Pedro Roffe, Malena Sell, Maria Julia Oliva, Mahesh Sugathan and Olga Nartova.

Joining me as session facilitators were John Barton (Stanford University), John Drexhage (IISD), Jennifer Haverkamp (Environmental Defence Fund), Trevor Houser (Rhodium Group) and Bernice Lee (Chatham House). Session thematic experts were Ahmed Abdel Latif (ICTSD) on IPRs, Nathalie Bernasconi Osterwalder (CIEL) and Olga Nartova (ICTSD) on standards and labelling, Trevor Houser (Rhodium) on border carbon adjustment, Moustapha Kamal Gueye (ICTSD) on embodied carbon and Mahesh Sugathan (ICTSD) on low-carbon goods liberalization. I had the pleasure of serving by their side as a session thematic expert on investment. Rapporteurs for the event sessions were Mikal Baranowski, Christina Elvers, Kristin Luber and Peter Sparding, all of the German Marshall Fund.

The overall seminar was masterfully chaired by Ambassador Svend Roed Nielsen, Under-Secretary for International Trade Policy and Business at the Danish Ministry of Foreign Affairs. Session presenters, from whose contributions the discussions greatly benefited, were Professor Rob Howse (University of Michigan), Sjamsu Erwidido (Indonesian National Committee for Enhancing Export & Investment), Marcin Korolec (Polish Ministry of Economy), Géraldine Kutas (UNICA, Brazil) and Henning Wuester (UNFCCC).

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Introduction

The Indonesian hosts of the meeting of Trade Ministers held in the margins of the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties in Bali on 8–9 December 2007 had relatively modest ambitions. They set out to achieve two things. The first was to secure the agreement of the participants that there is merit in convening Trade Ministers to discuss issues at the interface between trade, climate change and energy policy. In the event that this were achieved, they hoped the meeting would identify a number of specific ways in which the trade and climate change communities might support one another's aims and that might serve as useful inputs to the Bali Action Plan negotiations over the coming two years. Despite the real differences that exist between the North and South on some issues—particularly relating to how to broaden the list of environmental goods that might enjoy preferential status—there was a consensus on the need to pursue "mutually supportive linkages between climate change, international trade and development." In this context, Ministers called for additional analysis and for the exchange of information between climate change and trade officials.

It was clear from the presentations and discussions at the Bali Trade Ministers' meeting, and from the Chair's statement that summarized the conference proceedings, that the participants recognized the importance of trade rules for achieving climate change goals and saw the potential for positive outcomes if the policies relating to trade and climate change can be aligned and made mutually supportive. But it was also clear that there was a great need for more in-depth analysis on these issues, most of which were thrust onto the ministerial stage young and untested.

The Government of Denmark, in its capacity as the host of UNFCCC's COP-15 in 2009, picked up the challenge of exploring the issues further, and convened a seminar on trade and climate change in Copenhagen in June 2008. This volume is a record of the discussions and analysis that took place there—a record of how much the state of knowledge was advanced, and an assessment of how to go further.

Each chapter begins with a summary of key issues in one of the six thematic areas: liberalization of low-carbon goods; border carbon adjustment; embodied carbon in traded goods; intellectual property rights; clean energy investment; and standards and labelling. Building on that, each chapter then recounts the progress made in the Copenhagen expert discussions. Finally, each chapter concludes with a few thoughts about the issue and about the research needs that still exist. The overall approach to the issues asks three basic questions:

- What trade policy initiatives might succeed in fostering progress towards the objectives of *both* the trade and climate change communities? How might these initiatives be advanced?

- Are there elements of trade or investment law that represent genuine barriers to climate change objectives? How might these barriers be lifted?
- In looking for trade and climate change synergies and solutions, how might we ensure that they genuinely assist the world community in advancing human development, particularly in developing and least-developed countries?

It will become clear to the reader that this volume is not, and does not pretend to be, the last word on the complex set of issues that comprise the trade and climate change nexus. Rather, it serves as an advanced primer on the issues, and as a solid basis for more informed and effective policy-making in this area.

Chapter One: Liberalization of Trade in Environmental Goods for Climate Change Mitigation

Key Issues

Mahesh Sugathan

Summary of key issues, challenges:

- Trade is an important channel for the diffusion of goods to mitigate climate change. Lowering trade barriers brings their prices closer to world market prices, making them more affordable to consumers (industry and households) thereby reducing climate mitigation costs overall. Lowering tariffs on climate mitigation goods can also contribute to UNFCCC technology transfer mandates by facilitating access to these goods.
- Trade barriers can be lowered autonomously. More importantly, countries can engage in multilateral, regional or bilateral trade negotiations to lower barriers with binding commitments.
- Trade liberalization is only one of a range of factors—including gross domestic product (GDP), foreign direct investment (FDI), environmental regulatory frameworks and technical assistance—that affect actual trade in and diffusion of climate mitigation goods. Fiscal incentives, investment frameworks and intellectual property-related costs also determine access to, and affordability of, climate mitigation technologies.
- Many developing countries have other objectives, such as safeguarding sensitive industries and building domestic capacity, which may discourage them from pursuing all-out liberalization in climate mitigation goods.
- Negotiations on the liberalization of environmental goods and services (including climate mitigation goods) within the WTO Doha Round face some specific challenges. Definitional issues related to environmental goods remain unresolved. Complexities also exist with regard to their classification for customs purposes, making selective liberalization of climate-friendly goods challenging. The modalities of liberalization also remain contentious.

Introduction

The Stern Review has highlighted the potential contribution trade liberalization in clean technologies could make to climate change mitigation. Such trade liberalization could contribute positively towards moving economies onto "low-carbon" trajectories to the extent that it drives diffusion and access to low-carbon and energy-efficient technologies, as well as to renewable sources of energy.

Trade is an important channel for the diffusion of many climate mitigation technologies and goods. Few countries have the domestic capacities or know-how to produce all that they need. This is particularly true for developing countries, and although building domestic capacities may be their long-term goal, trade liberalization can provide rapid access to key technologies. Trade liberalization—whether locked in through negotiations at the WTO or elsewhere, or undertaken autonomously—can also lower the costs of environmental goods by allowing consumers (industries or households) to purchase them at world market prices.

A 2007 World Bank study, *International Trade and Climate Change*, points to the potential for liberalization in the area of low-carbon goods to lead to real increases in trade flows. According to Bank estimates, the removal of tariffs for four basic clean energy technologies (wind, solar, clean coal and efficient lighting) in 18 developing countries with high greenhouse gas emissions would result in trade gains of up to seven per cent. The removal of both tariffs and non-tariff barriers could boost trade by as much as 13 per cent. The net effect would, however, vary across technologies and across countries, depending on existing barriers and the import elasticities of demand.

Coupled with appropriate supportive measures, trade liberalization of climate technologies can also contribute towards fulfilling the technology transfer mandates contained within the UNFCCC. Similarly, trade liberalization can complement negotiations within the WTO Working Group on Trade and Transfer of Technology, which is mandated to "examine the relationship between trade and transfer of technology, and of any possible recommendations on steps that might be taken within the mandate of the WTO to increase flows of technology to developing countries."

This section will survey the key issues surrounding liberalized trade in low-carbon goods. It begins with an overview of progress to date in the WTO's negotiations on environmental goods and services. It then asks what the limitations of the liberalization approach are. If the final objective is contributing to climate change mitigation by increasing the dissemination of low-carbon goods and technologies (while also fostering an open multilateral system of trade), then are there other efforts that need to be considered as necessary or desirable complements to lowering tariff barriers? Clearly, trade barriers are only one of an array of factors from fiscal incentives, the nature of investment frameworks, availability of finance and intellectual property rights-related costs that determine access to and affordability of climate mitigation technologies. To conclude, this section asks what modalities are available for liberalizing trade in low-carbon goods, both within and outside the WTO.

The context of the Doha EGS negotiations

Paragraph 31(iii) of the Doha mandate, agreed by all WTO Members in 2001, calls for a reduction or, as appropriate, elimination of tariffs and non-tariff barriers on environmental goods and services. This mandate offers a good opportunity to put climate-friendly goods and services on a fast track to liberalization, although, as the negotiations to date have shown, this is not a simple proposition.

In principle, countries can derive the benefits of wider access to EGS by undertaking liberalization autonomously. However, trade negotiations in the WTO are expected to result in binding, predictable market access, as well as greater market expansion due to the scale of participation. In regional trade agreements, where the aim usually has been the liberalization of all goods and services, a separate, more ambitious EGS mandate has seldom been included.

Since the WTO is the only trade negotiating forum with a specific EGS mandate, this section will survey the key negotiating issues and challenges that have arisen in the WTO context, although more work is clearly needed to assess the prospects for pursuing opportunities within other fora, such as regional and bilateral trade agreements. The focus will be on goods, as negotiations have been more active in this area—although climate-related services are also key from a mitigation perspective.

Issues of product coverage: What to liberalize

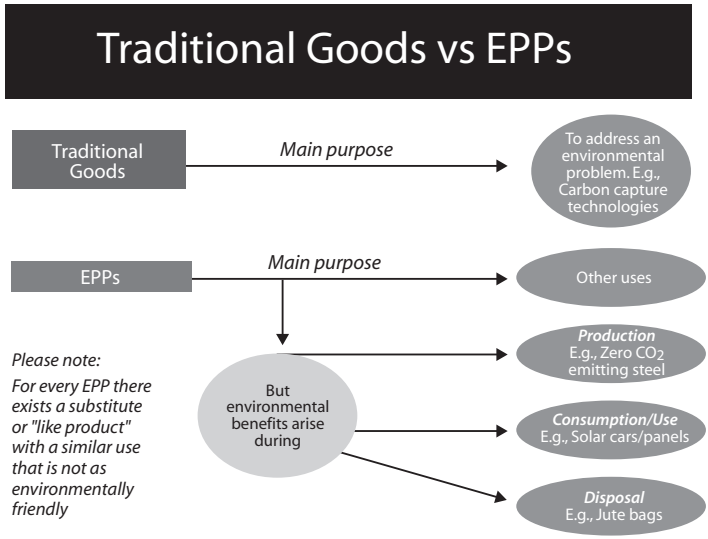
Defining and classifying climate-friendly goods. The absence of a universally accepted definition of environmental goods (EGs) has slowed down negotiations on product coverage. Two broad categories of EGs have featured in the WTO discussions so far: *traditional environmental goods*, with the main purpose of addressing or remedying an environmental problem (e.g., carbon capture and storage technologies); and *environmentally preferable products (EPPs)*, which include any product with certain environmental benefits arising either during the production, use or disposal stage *relative* to a substitute or "like" product. Figure 1 below provides some examples of products from both categories.

Introducing an additional layer of complexity, products can be environmentally preferable, either due to improvements in embedded technology (e.g., more energy-efficient variants of the same good, such as a car) or as compared to a different product (such as solar cookers versus wood-burning stoves).

In terms of classification, categories and sub-categories of goods are assigned a code within the Harmonized Commodity Description and Coding System (HS), allowing countries to track trade volumes and tariff levels. The more digits included in a code, the more specific the description of the good is. At the WTO, countries have HS numbers for products only up to the six-digit level. Beyond that, as product descriptions get more specific, different members use different codes and descriptions. This makes it difficult to clearly identify EGs, including climate mitigation goods, at the six-digit level. They are often lumped together

with other goods that are unrelated to the environment or climate mitigation. For example one list of proposed products contains HS-8413.81: "pumps for liquids, whether or not fitted with a measuring device; other pumps." Such pumps are often used by wind turbines for energy storage. But at the six-digit level of generality it is impossible to separate those pumps used in this manner from pumps used in any number of other applications. While it is possible to identify and liberalize specific goods using "*ex-outs*" beyond the HS-6 digit level, Members need to agree on product codes, or at least product descriptions in the area of climate mitigation, which can be a time-consuming process.

Figure 1. Traditional goods versus environmentally preferable products



Source: Claro et al., 2007.

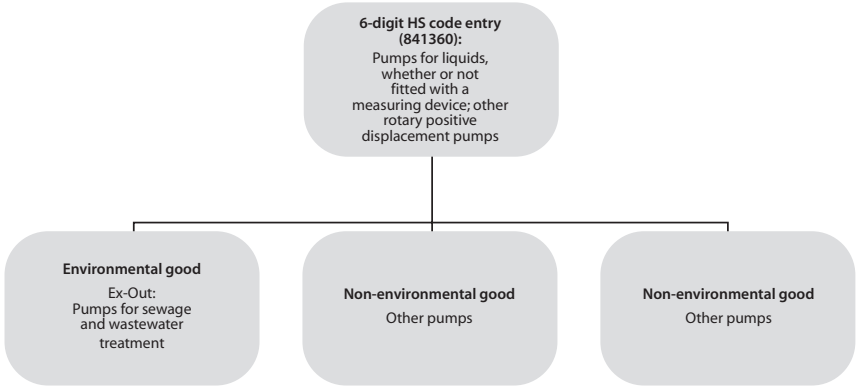
"*Processes and production methods (PPMs),*" *relativity and evolving technology*. Most WTO Members have not accorded "environmental goods" status to otherwise "like" products that have been produced using methods friendlier to the environment. This is due to the difficulty of distinguishing such products within the HS system and challenges of harmonizing standards and labelling, as well as to systemic concerns with regard to other non-product-related standards making their way into the WTO system as a basis for differentiated treatment. Even for products where the environmental benefits do not depend on PPMs, many are only relatively eco-friendly. Hybrid cars, which can be compared to electric cars, provide one example. Moreover, technological change could make existing "relatively friendly" EGs obsolete tomorrow. How should trade negotiations respond to these challenges? Once lowered and bound, tariffs cannot be raised again for obsolete products. At the very least, newer products that emerge should auto-

matically benefit from trade benefits accorded to the obsolete one. If relatively clean goods are accorded preferences, should we distinguish based on national-level baselines, or some internationally set baseline? Predominant methods of production differ dramatically across countries. Some experts, including Mytelka (2007), argue that only truly "clean" technologies should benefit from EG liberalization—as opposed to "relatively cleaner" products, but then we are left with the challenge of defining truly clean—particularly challenging as one takes a longer-term perspective.

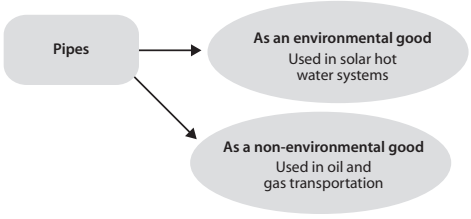
The dual-use problem. The dual use problem is one of most important challenges facing EG negotiators. It arises from the fact that most product categories proposed by WTO Members as EGs for rapid liberalization include, at the HS-6 digit level, other products that also have non-environmental uses. In other cases, a specific *ex-out* product, such as a pipe, may intrinsically be dual-use and used for environmental and non-environmental purposes. Pipes, for instance, are used as components of sewage treatment plants as well as for transporting oil and gas. The two types of dual-use products in terms are illustrated below.

Figure 2. Types of dual-use products

Dual-Use: Type 1



Dual-Use: Type 2



Most developing countries are hesitant to liberalize bound tariffs on dual-use products such as valves and pumps due to concerns about the impact of such overarching liberalization on their established domestic industries. Proponents of these liberalization efforts argue that the environmental benefits would be limited if liberalization was confined only to a handful of products used solely for environmental purposes.

The distribution question. A big challenge for the EG negotiations is to include products of export interest to developing countries. The perception is that EGs—being capital- and technology-intensive—are of export interest only to developed countries and a few middle-income developing economies. But some, such as Hamwey (2005), see significant export opportunities for developing countries in a large number of lower-tech environmental goods, such as parts and components. However, these also happen to be the "dual-use" products with which most developing countries have concerns.

Undoubtedly, many developing countries such as China and India have emerged as leading producers in clean energy sectors such as wind and solar energy, and Brazil is a world leader in biofuel manufacturing equipment. According to the World Bank (2007), exports of clean energy products such as efficient lighting are growing rapidly from many developing countries. Analysis by Dr. Veena Jha (2008) reveals that China and Mexico were among the top 10 exporters in various categories of EGs relevant to climate change mitigation discussed in the WTO. On the other hand, interest in the inclusion of agricultural products by Latin American countries, and particularly ethanol by Brazil, has met with some degree of resistance by traditional developed-country EG proponents.

Issues of modalities: How to liberalize

Approaches to liberalization. In addition to issues of product coverage, the question of how to approach the liberalization exercise has been another big stumbling block to progress in the Doha Round negotiations on EGS. For many developing countries, this issue needs to be resolved before the talks can progress to product coverage. Fundamentally, many developing countries are unwilling to commit to bound liberalization on lists that comprise mostly dual-use products. Some have therefore proposed their own alternative approaches to liberalization.

The *list approach* is favoured by the so-called "Friends of Environmental Goods," comprising Canada, the European Union, Japan, Korea, New Zealand, Norway, Chinese Taipei, Switzerland and the United States. The approach essentially consists of identifying and submitting lists of what Members regard as environmental goods of interest for accelerated and permanent liberalization by reducing or eliminating bound tariffs. India's *project approach* proposes liberalizing any good or service intended for a specific environmental project as approved by a Designated National Authority for CDM project activities and based on criteria developed by the WTO's Committee on Trade and Environment. Such liberalization would be temporary, lasting for the duration of the project, and domestic implementation of the criteria would be subject to WTO Dispute Settlement. The

integrated approach proposed by Argentina resembles the project approach but with further identification of goods used in the various approved projects. Both approaches were driven by concerns of ensuring "environmental end-use" of products that are mainly dual-use. A fourth approach—the *request offer approach*—has been proposed by Brazil whereby countries would request specific liberalization commitments from each other on products of interest to them and extend tariff cuts they deem appropriate equally to all WTO Members. Some Members have informally proposed combining various approaches, depending on whether the good in question was single or dual-use. At the time of writing, there appears to be no resolution on which approach or combination of approaches to follow.

The World Bank report (2007) has proposed accelerated liberalization of products, technologies and services used in CDM projects. According to the report, such liberalization could reduce equipment costs and contribute to lowering transaction costs for potential investors as long as they were complemented by certain measures, such as supportive local regulatory measures.

Technology transfer and special treatment of developing countries. During the course of negotiations, many countries, including China, have stressed the need to facilitate technology transfer. Canada, among others, has stressed technology transfer as occurring through aid, private investment, technical assistance, partnerships between research organizations and small companies, and trade in environmental technologies themselves. Others, such as Cuba, prefer a differentiated treatment for developing countries, including transfer of technologies on favourable and preferential terms with related know-how and necessary training. Lack of adequate attention to technology transfer remains one of the main complaints with regard to the "list" approach. No WTO Member has, however, proposed a practical way to operationalize technology transfer through WTO EGS negotiations.

Other cross-cutting issues that have been raised during EG discussions include the need to identify and deal with non-tariff measures and ensure special and differential treatment (S&DT) for developing countries. Various S&DT proposals—such as multiple product lists with different rates of tariff reduction, sensitive product exemptions and longer implementation periods—have been made by various WTO Members.

Other proposals

Over the course of time, a number of creative proposals have been put forward by external experts that could merit consideration from WTO negotiators as they struggle to resolve the issues of product coverage as well as the approach to liberalization. Rob Howse and Petrus van Bork for instance, in a paper undertaken for ICTSD (Howse, 2002), have proposed a duty-drawback scheme for products which are intended for an environmental end-use. Under this scheme, the duty collected at the border for "dual-use" products is refunded based on an application by the final purchaser certifying an environmental end-use for the product.

Instead of being required under any prospective environmental goods agreement to provide a preferential rate of tariff to the importer of an environmental good, WTO Members could charge the existing most-favoured nation (MFN) bound rate at the border, but be bound under WTO law to remit the duty upon presentation of a valid request by the end-user, accompanied by a certification that the product has indeed been used in a manner that yields the environmental benefits at issue. Howse and van Bork also extend this scheme to include environmentally preferable products in cases where, for any particular reason, a system based on the presentation of a certificate of conformity is not considered practical. In such cases, the producer of the EPP would pay the normal MFN rate of duty at the border, but the producer of the EPP would be entitled to request a duty-drawback, based on credible certification that the exported products to the WTO Member in question were manufactured in accordance with the PPMs in question. Howse and van Bork emphasize that such schemes are already in existence and hence there would be no need to create a new legal or institutional mechanism or framework to administer duty-drawbacks (Howse & van Bork, 2006). Some critics have, however, pointed out the administrative burden imposed by such a process as well as the possibility of corruption and diversion of products meant for environmental end-uses to other uses.

Cottier and Baracol-Pinhão (forthcoming) advocate an environmental area initiative (EAI) approach, organizing EGS negotiations on the basis of a prior identification of specific sustainable development target areas and goals. Adopting such goals and targets would partly draw from commitments to the UN MDGs and obligations under existing MEAs. Cottier and Baracol-Pinhão advocate the selection of environmental goods by using environmental services as a starting point. Goods are to be liberalized if one or the other of these conditions is met: (a) the good is essential to the delivery of the said services, or (b) it is a good or cluster of goods that is common to more than one type of environmental service. The EAI approach takes this into account by providing the necessary flexibility for Members to choose the mix or package of services and goods that corresponds to their national environment priorities (which could include, for instance, CDM projects). Under EAI, negotiations would cover tariffs, making use of listings, non-tariff measures and services, technical cooperation, as well as linkages to other regulatory areas, including IPRs to the extent they are relevant for the chosen field. Cottier and Baracol-Pinhão also advocate the liberalization of EPPs on a separate track in order to provide meaningful export benefits to developing countries, although they also provide the possibility of special and differential treatment under which developing countries may choose not to liberalize these products.

Stillwell (2008) advocates a similar approach of starting by identifying environmental activities and categories as proposed by a number of WTO Members and then deciding on product coverage on the basis of a number of criteria such as (i) contribution to the fulfillment of environmental priorities; (ii) direct use in addressing environmental problems; (iii) direct environmental benefit arising from their use; (iv) not having significant other non-environmental uses; and (v) offering export opportunities for developing countries.

The author has also suggested the possibility of combining list and project approaches based on whether the products were single-environmental use, or dual-use. To this the request offer approach by Brazil could also be added. Products could be further selected after screening on the basis of their dynamism in exports, sensitivity in terms of import liberalization or tariff-revenue, their use in the delivery of environmental services and subject to differentiated treatment in terms of depth, pace and sequencing of liberalization (Sugathan *et al.*, 2007). While these are valuable suggestions, the question of whether to include dual use goods, and if so which ones, and the question of what is an "essential" environmental good will remain subject to debate. Any revisions to the HS-codes that might be necessary to better capture environmental end-use products or PPM-based EPPs will be time consuming, so the best course may be to agree at least on a common set of product descriptions. Further, in the case of proposals like the duty-drawback scheme, administrative capacities and weaknesses in many developing countries will need to be considered. Perhaps this could be an area where technical assistance including that in trade facilitation negotiations could play a role.

Climate-relevant proposals. From a climate mitigation perspective, the EG negotiations have seen proposals from Qatar, the "Friends," and, more recently, from the United States and EU, which have included "climate-friendly" goods. Early on in the negotiations, Qatar proposed liberalizing natural gas-fired generation systems and advanced gas generation systems, citing a reference to its benefits under the UNFCCC. Qatar also referred to the Intergovernmental Panel on Climate Change (IPCC) Assessment Reports, which recommended increased use of natural gas over other fossil fuels as a way to reduce greenhouse gas emissions.

The "Friends" proposed a list of 153 products, which included categories such as renewable energy products, solid waste management, and heat and energy management products. On 30 November 2007, the United States and EU proposed accelerated liberalization of goods and services relevant to climate change mitigation, including zero tariffs by 2013 for 43 products that were identified by the World Bank from the "Friends" 153-product list as being relevant to climate change mitigation. There were to be longer phase-in periods for liberalization by developing countries and participation was made optional for least-developed countries. The list of 43 goods included a wide variety of products such as solar collectors and system controllers, wind-turbine parts and components, stoves, grates and cookers, and hydrogen fuel cells. The list was supposed to be a starting point for discussions rather than an exhaustive one. The United States and EU further suggested the negotiation of an innovative Environmental Goods and Services Agreement modelled on the existing WTO Information Technology Agreement (ITA) that would include other, non-climate-related EGs as well. Relevant climate mitigation services such as engineering, maintenance and technical testing were also covered.

Despite the United States pointing out that it was a net importer of these 43 goods and that developing countries such as China, Mexico, Malaysia, Chinese Taipei and Indonesia were among the top exporters, many developing countries questioned the "development dimension" of the proposed list. Brazil criticized the exclusion of ethanol from the list. Many developing countries were concerned

that the "climate goods" list, as with most other environmental goods proposed in the WTO, included dual-use products.

Beyond liberalization

This section has identified some of the key issues and challenges pertaining to environmental goods negotiations that also affect liberalization efforts for climate mitigation goods. At this stage it is useful to ask whether EG liberalization can address climate mitigation efforts in a broader sustainable development context. The answer appears to be that trade liberalization by itself may not be sufficient or only have a miniscule impact. A whole host of complementary measures—regulatory, capacity building, financial and technology-related—will be required. In this regard, analysis of the Friends' 153 EG list by Jha (2008) is revealing. Jha clearly shows that demand for these products may be determined by factors other than tariffs, such as gross domestic product (GDP), foreign direct investment, enforcement of environmental regulations (shown by environmental performance indices) and the number of bilaterally funded "environmental" projects. For instance, many African countries already have very low tariffs on many environmental goods, but little or no imports because their GDPs are constrained and they have other import priorities. Trade liberalization with a lack of purchasing power will certainly not help.

Further, while categories such as renewable energy and heat and energy management appear sensitive to tariffs, long-term dynamic comparative advantage (until 2015) in these products lies with developed countries (for renewable energy) and with middle-income developing countries (for heat and energy management products). It is thus important to ensure that benefits from trade liberalization also accrue to the poorer developing countries that may either lack resources to import such products or the capacity to produce, operate and deploy them.

Intellectual property rights may also act as a barrier to access, particularly in emerging climate technologies. Trade liberalization alone may not result in "take-off" of a technology in developing countries if costs are kept high due to high licensing fees or royalty payments. For a more in-depth discussion on this set of issues, see Chapter Four: *Climate Change, Technology Transfer and Intellectual Property Rights*.

From a long-term perspective, it will also be essential to help developing countries build up their own productive and technological capacities in this area. The World Bank report calls for smarter trade as an adjunct to freer trade, and proposes bundling trade liberalization with a package of technical and financial assistance. The question of how to operationalize this understanding is pursued in the concluding section that follows.

Additional opportunities for liberalization of low-carbon goods

With regard to trade liberalization, it is by no means certain that the Doha Round of negotiations will achieve what may be a desired level of trade liberalization with appropriate provisions that respond to the totality of developed and developing country interests. This is due to the complex political economy dynamics that will influence an eventual outcome, including progress in critical areas of the Doha negotiations, such as agricultural and industrial market access, concerns about impacts of liberalization on domestic industries and tariff revenues, as well as the inclusion (or lack thereof) of products of developing country export interests—including agricultural products.

This raises the issue of alternatives where liberalization initiatives for climate mitigation goods and services may be pursued. Within the WTO, Members might wish to consider initiatives similar to the ITA, which was open to voluntary participation—but concessions were extended on a most-favoured nation basis to all WTO Members. The agreement could come into effect when a certain number of Members joined, constituting a minimum percentage of trade in these products and services. Such an agreement could lie within the WTO Framework and could be tied to the timeline for conclusion of Doha Round talks. Another option is a plurilateral agreement similar to the WTO Government Procurement Agreement, which Members could opt to join. The trade concessions would extend only to participating Members. Such an agreement could also eventually be made multilateral (with benefits extending to the entire membership) once a minimum number of countries joined, constituting a certain percentage of trade in these products and services.

Both options would, however, still need to deal with the challenges that apply to the Doha EGS negotiations—particularly in terms of product classification. Another possibility would be to pursue liberalization of "climate mitigation" goods and services through regional trading agreements or bilateral free trade agreements. In such cases, there usually is no need for a separate EGS mandate, as the objective is to liberalize "substantially all trade"—although it may be possible to single out certain EGS for earlier liberalization. Because of the greater ambition of liberalization in regional trading agreements, dual-use of environmental goods may be less of a concern as compared to the situation in WTO EGS negotiations.

Whatever the forum for liberalization, it will be important to include it within a broader package consisting of complementary initiatives such as special and differential treatment and technical and financial assistance. The impact of trade liberalization for climate change mitigation efforts, as with most other sustainable development objectives, will be only be as effective as the broader enabling framework within which it is put into play.

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In-session Discussion

Aaron Cosbey

This section surveys the discussions that took place at the June 2008 Copenhagen Trade and Climate Change Seminar on the subject of liberalization of trade in environmental goods for climate change mitigation. While every effort has gone into ensuring that these notes accurately represent the session discussion, they are not intended to convey any explicit consensus of the session participants, and are written on the sole responsibility of the session facilitator, Aaron Cosbey. Mr. Cosbey was aided in his efforts by Christina Elvers and Peter Sparding, who acted as rapporteurs.

For much of the discussion, the talk centred on the existing efforts under the WTO's Doha mandate to lower or eliminate tariffs and non-tariff barriers to trade in environmental goods and services, though it was understood that low-carbon goods and services are in fact a subset of that larger group. As well, there was not much focus on environmental services, since the bulk of the WTO discussions to date have similarly focused on goods.

Fundamental questions

The discussions began with the fundamental question: is this an area of real importance? That is, is there strong potential for the liberalization of trade in low-carbon goods to contribute to climate change objectives? A number of reservations were raised:

- The volume of trade in the goods involved is small relative to overall trade flows, and the amount of GHG emissions reduced as a result of even an ambitious outcome may in the end be correspondingly small.
- Tariffs on many of these goods are already low, on average, particularly on industrial goods in developed countries (though there are significant peaks), and will be getting lower as liberalization of trade in general is successful.
- If the objective is to encourage trade in these goods, and that sort of trade has investment as a prerequisite, then all the liberalization in the world will not succeed in those countries that have very poor investment climates for such goods, whether because of regulatory barriers, generally poor investment conditions or lack of regulatory drivers.
- Non-tariff barriers to trade in such goods are generally held to be more significant than tariff barriers, but there are few efforts or proposals to deal with anything but the latter.
- By itself, liberalization may even have environmentally negative results, if it encourages increased production of such goods in countries where GHG intensity of production is quite high.

Nonetheless, there is good potential in the efforts being undertaken at the WTO, if they can be harnessed to become part of a broader effort to increase the capac-

ity in low-income countries to absorb the types of goods and technologies we seek to disseminate. This might be done by means of flanking conditions imposed on the WTO talks that obliged developed countries to support developing country capacity building and technical assistance aimed at these objectives.

Such efforts would address the important qualification raised above: that liberalization by itself offers little to those countries where the conditions do not favour investment (investment being intimately linked to trade). It was noted that the necessary efforts to attract this sort of investment consisted of not only removal of barriers, but also the promulgation of environmental regulations that would drive demand for environmental goods and services.

Questions of definition

One of the key difficulties in any effort to liberalize trade in low-carbon goods would be in defining such goods. Much of the discussion here drew from the experience of the EGS talks under the Doha work program, since so much effort in that venue had focused on definition.

As discussed in the background paper, goods could be defined as environmentally friendly by any of at least three criteria:

- By method of production: a good could be considered low-carbon because of the low amount of carbon emitted during its production process. This definition, however, gets into the difficulties associated with PPM-based discrimination (see Chapter 6 in this book on standards, labelling and certification).
- By its end-use as consumer goods: a hybrid car might be considered low-carbon, since it emits fewer GHGs in use than do other sorts of cars. This, however, is a relative judgement, and would need to be adjusted over time—something the WTO would find difficult to do.
- By its end-use as intermediate goods: a windmill turbine might be considered low-carbon, in that it is destined to contribute to energy generation in a manner that emits fewer GHGs than other methods. This sort of narrow definition would result in a list of goods in which, with only a few exceptions, developed countries have the overwhelming comparative advantage (though this picture is quickly changing).

In an ideal world, the definition of low carbon would take into account the full life-cycle of a good: how much carbon was emitted in the good's production, end-use and disposal, relative to the baseline case? This would give a solid objective foundation for choosing among the goods proposed by various countries. It would also be completely impractical, given the complexities of life-cycle analysis (LCA) on even a single good in a single application, to run such an analysis on the full range of possible goods.

But there was agreement not to let the perfect be the enemy of the good—to find a way to move forward that is both practical and effective. Several possibilities were suggested:

- Get agreement on a small number of goods as a Doha Round result, and agree on a process (preferably not based on negotiation, but rather on objective assessment of requests based on LCA) for adding further goods to the list.
- Whether in the process of agreeing to an initial small list, or in the process of adding further goods, seek help from outside the WTO in defining those goods. In the agricultural negotiations, Members have looked for help outside the WTO in defining special products, and in the fisheries subsidies talks, work done by the Food and Agriculture Organization (FAO) and others helped to define artisanal fisheries. Similarly, the WTO could look to organizations such as the International Organization for Standardization (ISO) and the International Social and Environmental Accreditation and Labelling Alliance (ISEAL) for help in defining environmentally friendly goods, or at least in formulating principles and criteria by which to define them. Note that the more complete and dedicated a definition is sought in another forum, the more risk that the same negotiating dynamics from the WTO will simply be repeated there by the same countries.

Modalities

In looking for ways to advance an effort to liberalize trade in low-carbon goods, we are confronted with a basic obstacle: the ongoing Doha process. The mandate in Doha is for liberalization of environmental goods and services, which is not quite the same thing, but is close enough that no low-carbon effort could conceivably be launched until there is some resolution to the WTO process. But the WTO process seems to be getting nowhere, so for the time being we are stuck.

To some extent, the suggestions made on definition might help resolve the logjam in the WTO. Further than that, it was suggested that efforts to advance liberalization of low-carbon goods might eventually proceed outside the EGS negotiations, either as a plurilateral deal within the WTO (modelled on the Information Technology Agreement), or as a joint unilateral effort outside the WTO, or within the context of regional/bilateral trade relations. In any of these contexts it would be easier to get agreement on definition, and all of them could conceivably help build toward the ideal: a multilateral agreement.

Several concerns were expressed with the sub-multilateral options, however:

- For the same reasons that progress has been slow in the WTO, it might be difficult to assemble a critical mass of countries, covering a significant amount of world imports and exports. The smaller the number of countries, of course, the smaller the final impacts of any agreement.
- The smaller the number of countries, the more risk that the signing club will define the list in a way that is self-serving: covering only those goods in which their tariff rates are already low (greenwash), or in which they have a commercial interest in exports.

Conclusions and Research Agenda

There are a number of areas in which more research would be helpful in furthering any efforts to liberalize trade in low-carbon goods and services. One of the most basic needs is perhaps for research to quantify the amount of actual GHG emission reduction that would transpire under the various liberalization scenarios. The World Bank has done some preliminary assessment of trade impacts, but there has been no effort to translate these into environmental impacts. It would be good to confirm or deny the environmental significance of the grand efforts that have gone on in the Doha Round.

It would also be good to know more about the non-tariff barriers that these goods face—to identify them, consider the challenge of lowering them and try to compare their significance to tariff barriers.

Also valuable would be policy research on what sorts of criteria or guidance might be helpful from outside sources in the WTO's task of defining environmental goods and services, or in the related task of defining low-carbon goods and services. This would include exploring what organizations might be legitimate providers of this sort of guidance.

There is a fundamental need to describe what technologies are needed by developing countries in addressing their climate change challenges; this is a basic prerequisite to any sort of demand-driven list of goods that those countries might use for climate change mitigation (and adaptation). There have already been technology needs assessments under the UNFCCC process, and this research could build on that. The research might also try to identify and describe the salient barriers to the dissemination of the identified technologies.

There is also a need for more thinking about liberalization of trade in environmental services, and its environmental potential. Similarly, there is a need for research that tries to explore the relationship between liberalization in environmental goods and services and investment, given the strong links that exist.

In the end, it seems that the liberalization of climate mitigation goods will bring benefits mainly to developed and a few middle-income developing countries, and may not lead to any environmental benefits in developing countries that lack purchasing power or have other import priorities. In fact, in view of the current state of progress, it may be that the negotiations under the WTO Doha Round will not result in any ambitious outcome on the liberalization of climate mitigations goods. In this case, other alternatives should be explored. These include negotiating an agreement within the WTO that would come into force only when a certain number of Members join, or a plurilateral agreement outside the WTO framework. Liberalization through regional trade agreements (RTAs), which would not necessarily need to single out EGS as a category, may be a more straightforward option.

Whatever the forum, any liberalization package will need to be complemented by a set of financial and technical assistance measures. The impact of trade liberalization for climate change mitigation efforts will only be as effective as the broader

enabling framework within which it is put into play. While some measures may be accommodated within a WTO Agreement on EGS, others may require other appropriate institutional homes, such as the UNFCCC. Whether any formal link should be made between EGS negotiations and the UNFCCC process, however, is debatable.

Chapter Two: Border Carbon Adjustment

Key Issues

Aaron Cosbey

Summary of key issues, challenges:

- Border carbon adjustment (BCA) is being proposed in a number of legislative and political fora. They are intended to address competitiveness concerns and carbon leakage, and to help force major developing countries to take on hard commitments in the negotiations over a post-2012 climate regime.
- There is a need for more research on the underlying competitiveness issues, which are important in only a small number of—albeit politically important—sectors, and which may be overstated by top-down economic models.
- The design details of any particular BCA will be key in determining whether it is WTO-legal. Most schemes would face difficulties with the disciplines on non-discrimination. They would then have to rely on GATT's General Exceptions. The existing case law here suggests that any scheme would have to take account of all sorts of foreign policies in considering whether climate change efforts were comparable to domestic efforts, and it would have to allow individual foreign producers to prove their energy efficiency exceeded the baseline. Both of these requirements would make for complex administration of the scheme. And it would have to be preceded by a good faith attempt to conclude a multilateral agreement, the existing Kyoto Protocol being an example.
- If the scheme covered only basic materials and not manufactures, it would disadvantage domestic manufacturers using those materials as inputs. But covering manufactures would be immensely complex.
- It may be that trade flows would simply re-route to deliver covered goods from countries that are taking strong climate measures, having little effect on the targeted countries.
- It is likely that the reaction of covered countries under such a scheme would be strongly negative, including at a minimum at WTO challenge. The larger question, though, is whether BCA in practice, or even as a threat, would in fact backfire on the objective of bringing major developing countries to the climate change negotiating table to take on binding commitments.

Introduction

Parties to the UNFCCC and the Kyoto Protocol are currently in talks designed to help shape a climate change regime to follow the Protocol's first commitment period, which ends in 2012. At this point, the nature of that regime and the commitments it will entail is uncertain. But if the IPCC is to be believed—and its projections are the basis for at least some of the post-2012 discussions—the GHG emissions reductions needed will be significant. This is particularly true in developed countries where cuts of 50–80 per cent by 2050 may be necessary to avoid dangerous levels of atmospheric GHG concentration (IPCC, 2007: Chapter 13).

In response to that challenge, a number of countries are pursuing or considering strong domestic action to address climate change. They are doing this either in anticipation of future regime obligations, as part of their obligations under the current treaties, or out of a desire to address the challenge of climate change irrespective of what might develop at the international level. In those countries, one of the key obstacles to such action is the fear that it may put their domestic industries at a disadvantage relative to producers in countries that do not take similarly strong action.[1] This is typically a developed country phenomenon, occasioned by the fact that in the first commitment period developing country Parties to Kyoto, and any non-Parties, have no hard targets for emissions reduction, and by the fear that they may avoid such targets in a post-2012 regime.

One policy option that has been repeatedly proposed to deal with such challenges is border carbon adjustment (BCA),[2] a trade measure that would try to level the playing field between domestic producers facing costly climate change measures and foreign producers facing very few. While a BCA could conceivably work in conjunction with any number of domestic climate change regimes, it has been proposed to date as a companion to either a domestic carbon tax or a cap-and-trade scheme. In the case of a carbon tax, a BCA would charge imported goods the equivalent of what they would have had to pay had they been produced domestically, in the manner of a border tax adjustment. Such a scheme might also rebate the paid tax to exporters, ensuring that they are not disadvantaged in international markets. In the case of a cap-and-trade scheme, a BCA would force domestic importers or foreign exporters of goods to buy emission permits based on the amount of carbon emitted in the production process, in a requirement analogous to that faced by domestic producers.[3]

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1 For an analysis of these competitiveness concerns see Cosbey and Tarasofsky (2007).

2 Often the whole class of measures discussed here are called border tax adjustments, or BTAs. But requirements to buy into domestic cap-and-trade schemes (discussed below) are more like regulations than taxes, and so adjustment to those schemes cannot rightly be called a tax adjustment.

3 Throughout this document *carbon* is used as shorthand for the full spectrum of greenhouse gases, of which carbon is the most significant. The Kyoto Protocol covers six such gases.

BCAs have typically been touted as means to address competitiveness concerns, as noted above. They might play at least two other useful roles. One is to avoid what is known as carbon leakage. That is, if strong domestic action causes firms to relocate to other countries, or to lose market share to those countries, then the emission reduction achieved at home is simply offset to some extent by an increase in emissions abroad. The fear in fact is that they will be *more* than offset, as production moves to low-standard jurisdictions. While it is closely related to competitiveness, carbon leakage is a distinct concern, focusing on the effectiveness of environmental policy. A final justification for a BCA is that it might act as an effective threat to encourage developing countries to take on hard commitments in the climate change negotiations—in the manner of trade sanctions, or threats of trade sanctions.

Like trade sanctions, BCA proposals have been greeted with some scepticism—even antagonism—by exporters to which they are likely to be applied. They argue that such measures amount to unfair protection of domestic industries in developed countries—precisely the sort of protection that the multilateral system of trade was designed to discourage.

Discussion on BCAs is particularly relevant at this time. They have been proposed in two bills before the U.S. Senate, both of which involve a cap-and-trade scheme and both of which foresee BCAs as part of the regime.[4] The Lieberman-Warner Bill, which eventually failed to pass the U.S. Senate but which will likely inform whatever future climate change legislation is passed, would have seen a Federal Commission certify countries that are not undertaking strong climate change efforts, triggering the requirement that their goods in key sectors would have to buy into the domestic cap-and-trade scheme. It is widely understood that China would be one of the key targets. In Europe as well there is talk of similar requirements. The EC-mandated High Level Group on Competitiveness, Energy and Environmental Policies proposed BCA in its second report in 2006. The second draft version of the EU's third-phase ETS contained a BCA, but that has since been dropped. A succession of senior French politicians has called for some sort of BCA, most recently with a focus on China as well.[5] In Canada, while the federal government is not yet considering a BCA, it was called for in a recent analysis by two prominent Canadian academics (Courchene and Allan, 2008).

As the prospect of meaningful national-level action on climate change becomes more likely, and while the state of the post-2012 regime remains undefined, the calls for the use of such measures are bound to increase in volume. And policymakers are bound to listen. As such, more in-depth analysis is needed to assess the pros and cons of such measures. This section is a first step toward that sort of

4 S-1766, Bingaman-Specter Low Carbon Economy Act, and S-2191 Lieberman-Warner, America's Climate Security Act.

5 Prime Minister Dominique de Villepin proposed BCAs in November 2006, and President Jacques Chirac repeated the proposal in January 2007. More recently, President Nicolas Sarkozy warned of such measures in a speech made in Beijing, November 2007, pointedly urging China to shoulder its global environmental responsibilities.

analysis. It begins by considering the underlying issue of competitiveness, the legal aspects of BCA use, economic effectiveness, administrative feasibility and, finally, the wider geopolitical implications.

Competitiveness

Not *all* domestic producers will be subject to competitiveness impacts from foreign producers. Some, for example, may not trade their goods across borders in any significant measure. In the literature on this subject (e.g., OECD, 2006: 69; Carbon Trust, 2004: 6) it is widely accepted that the following types of sectors are the ones that might be vulnerable:

- those that use large amounts of energy in the production process;
- those for which there are easy substitutes, either in the form of imports of the same good (highly traded goods), or in the form of different goods that can serve the same purpose; and
- those for which there are no cost-effective technologies available or foreseeable that would lower carbon intensity.

The differentiated nature of competitiveness impacts has clear implications for the design of any BCA scheme, which should ideally only cover those sectors that are truly vulnerable. A number of studies have tried to assess the extent of vulnerability of various sectors, using permutations of the criteria described above, and the same few sectors tend to stand out as particularly problematic: steel, aluminum, paper, chemicals and cement (Carbon Trust, 2004; Reinaud, 2005; Houcade *et al.*, 2007; and Houser *et al.*, 2008). The extent of vulnerability will of course vary from country to country, depending on predominant production techniques and energy sources, and even from facility to facility. In one U.K.-based study, the costs faced by domestic producers in the top five sectors ranged from over 40 per cent to just over 10 per cent of value added (Hourcade *et al.*, 2007). It also found that those sectors made up just over 0.5 per cent of GDP.

While this sort of research is indispensable as a basis for sound policy, it typically suffers from two weaknesses that may cause it to overstate the extent of vulnerability. For one thing, most models assume unilateral action—the implementing country takes action, but no other country does. This may be a necessary simplifying assumption, but in the final event it is not realistic. For another thing, as argued by Sijm (2004), top-down general equilibrium models for assessing the impacts of domestic policies will typically understate the ability of those policies to drive technological change that might blunt competitiveness impacts in the longer term.

Legal aspects

A border carbon adjustment is a trade measure and, as such, would be covered by the rules of international trade. These are embodied in the WTO, as well as in

numerous regional and bilateral trade agreements, but only the former is considered here, the relevant obligations contained in the latter being typically similar.

It is impossible to say in the abstract whether BCA would or would not breach WTO obligations, since any such judgement would depend fundamentally on how the scheme was designed. But it is possible to describe what WTO law says about that design.

First, it should not discriminate between domestic producers and foreign producers of like products—both should be treated similarly (national treatment principle). Arguably this is not a problem if the tax or cap-and-trade scheme can be made to have equal effect on domestic and imported goods.[6] If domestic producers in certain sectors are given free allocations of emission permits, for example, then their foreign counterparts must also get such treatment.[7]

Second, it should not discriminate between like products based on the country of production (most-favoured nation, or MFN, principle). The rules for like imported products should not favour any importing country over another. This might pose problems for schemes designed to focus on only a few key foreign countries. But before getting to that question, it is important to note the importance of what is meant by "like" products. Is a ton of cement produced with solar energy "like" a ton of cement produced using coal? Is a ream of paper from a country with no climate change policies "like" a ream of paper from an Annex B Party to the Kyoto Protocol?[8] This is a critically important question.

The WTO's Appellate Body has ruled that likeness "is, fundamentally, a determination about the nature and extent of a competitiveness relationship between and among products,"[9] which would seem to mean that steel is steel, and paper is paper, no matter how it's produced. Going further, likeness has been defined as being determined by four criteria: (i) the (physical) properties, nature and quality of the products; (ii) the end-uses of the products; (iii) consumers' perceptions and behaviour in respect of the products; and (iv) the tariff classification of the products.[10] It might be argued that consumers perceive dirty steel as different from green steel, but this would be something of a legal long-shot.[11] In the end,

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6 For a detailed argument of this proposition see Pauwelyn (2007).

7 Free allocation might also be regarded as an actionable subsidy under the Agreement on Subsidies and Countervailing Measures. See de Cendra (2006).

8 The Parties in Annex B of the Kyoto Protocol have subscribed to specific targets for reduction of GHG emissions.

9 See *European Communities – Measures Affecting Asbestos and Asbestos-Containing Products*, Report of the Appellate Body, (WT/DS135/AB/R) 12 March 2001, para. 99.

10 *Ibid*, para. 101.

11 The thin odds of success here are related to two facts: first, as emphasized in *EC-Asbestos* (para. 109, *inter alia*), a full picture of likeness can only emerge as a result of examining *all four* criteria, and in this case only one of them argues against likeness; second, even were consumer behaviour to be elevated so as to be predominant in this judgement, it would be difficult to argue that consumers prefer intermediate goods like steel that are efficiently produced, there being no markets or eco-labelling schemes one could point to that would support the claim.

guided by all these criteria, a WTO dispute panel would probably consider the two products to be "like."

The implication for MFN is that any BCA must treat steel from different foreign producing countries equally. That is, the United States could not treat steel from China differently from steel from the European Union. So a BCA could neither discriminate on the basis of a country's climate change policies, nor choose to just focus on the trading partners of major commercial interest, without violating MFN.

This would not be the end of the story, however, since such a measure might still be saved by recourse to GATT General Exceptions, found in Article XX. These allow members to breach GATT rules in certain circumstances. One possible justification for such a breach is for measures necessary to protect human, animal or plant life or health. Another is for measures relating to the conservation of exhaustible natural resources (provided such measures also apply to domestic production and consumption). Either might be applicable to BCAs that failed the MFN test.

A full analysis of how these two exceptions might or might not be applicable to BCAs is beyond the scope of this paper.[12] But if we assume, as seems likely, that BCAs would be accepted as covered by one of these exceptions, what does the case law tell us about how they must be designed?

There are at least three requirements of interest. First, BCAs must be designed to take into account *all* policies and measures implemented by its trading partners that might have an impact on climate change.[13] For example, in deciding whether a given exporting country is taking actions comparable to EU actions, it would not be permissible to require a cap-and-trade system like the one in force in the EU. The EU would have to consider whether a range of other policies (such as renewable portfolio standards, energy efficiency targets, technology requirements and fiscal measures) might, in the end, be delivering an equivalent result.

Second, BCAs must also take into account the differences prevailing among individual producers.[14] For example, it would be unacceptable to simply set a national baseline of carbon intensity of production for all producers from a given sector within a country. This would unfairly penalize highly efficient producers from countries where the average efficiency happened to be low (and therefore carbon intensity happened to be high). In effect, this would mean firm-by-firm (or perhaps even factory-by-factory) calculations of embodied carbon.

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12 But see for example Pauwelyn (2007); de Cendra (2006); Charnovitz (2003); Ismer and Neuhoff (2004); Biermann and Brohm (2003).

13 See *United States – Import Prohibition of Certain Shrimp and Shrimp Products*, Report of the Appellate Body, (WT/DS58/AB/R) 12 October 1998, paras. 161-164.

14 See *Ibid*, para. 165; also *United States – Standards for Reformulated and Conventional Gasoline*, (WT/DS2/AB/R), 29 April 1996, p. 28. (But note that in *U.S.-Gasoline* the ready availability of usable data and methodologies was a central factor in the AB's determination.)

Third, BCAs as a unilateral measure to enforce environmental policies should only be implemented after a concerted effort to gain multilateral agreement to address the problem.[15] In other words, before implementing a BCA, there should have been good faith (but ultimately unsuccessful) efforts to reach a cooperative multilateral solution to the problems that the BCA would address. This requirement does not go so much to BCA design, but to the groundwork that must precede it. It should be noted that the Kyoto Protocol would almost certainly be seen as a successful multilateral effort to address the problem, meaning any application of BCAs to Kyoto Parties such as China would be questionable from a legal standpoint. China is, after all, a fully compliant Party to a multilateral effort to address climate change.

In the end it must be borne in mind that even a definitive finding of WTO incompatibility would not be the final word on BCAs. In theory it would be possible for the Members to amend WTO law, reach specialized agreements or grant waivers that allowed for their use. This would, however, involve consensus (or in some cases majority), meaning agreement by a substantial number of WTO Members that the problems were real and urgent enough, and the proposed solutions fair and effective enough, to require such actions.

Effectiveness

Some aspects of BCA design will influence the degree to which they are successful in achieving their basic objectives, and three of these are surveyed here. First is the question of whether the scheme covers only basic materials (such as raw aluminum) or also covers manufactured products made from those materials (such as aluminum frame bicycles). As described in the next section, a broader scheme will be particularly difficult to manage, but a scheme that is more narrowly cast may have unintended adverse impacts. Specifically, it will raise the price of aluminum as an input good to domestic manufacturers of, say, bicycles, but it will not levy any charges on imported bicycles. Such a scheme protects the aluminum sector from competitiveness impacts, but not the sectors that add value to aluminum. It is worth noting that most developed countries depend more heavily on sectors providing value added than on production of basic raw materials.

A second question is whether foreign producers will simply be able to evade the controls imposed by a BCA. Houser *et al.* (2008) point out that the United States imports five million tons of steel from China annually and two million tons from Japan. They argue that a scheme that imposed border adjustment on Chinese

15 Technically this is not what the Appellate Body said in *U.S.-Shrimp*, though it is frequently cited as such. In its discussion on "unjustifiable discrimination" the Appellate Body said that a multilateral approach was much to be preferred, but in the end ruled against the U.S. not because of a lack of such an approach as such, but because it had taken such an approach with some states and not with others. That said, the language of the ruling *strongly* suggests that multilateral negotiations would be considered a prerequisite to a WTO-legal use of such a unilateral measure.

steel might simply cause increased flows from China to Japan, and increased flows from Japan to the United States, without in the end protecting U.S. steel producers. It is also possible to imagine scenarios where partially finished products are shipped to Annex B Kyoto Parties for finishing and final export from those Parties to the implementing state. To stick with the example of steel, India might export hot-rolled steel to Canada for cold rolling, and the finished product could then be exported to the United States as originating from Canada.

Finally, a BCA should be evaluated on its potential leverage—the extent to which it might in fact exert pressure on target countries to adopt stricter policies, or to take on tough treaty obligations. This potential will of course vary from country to country and sector to sector. In those cases where the percentage of a given good exported to the implementing country is particularly small, imposing the BCA will likely have little or no policy impact on the exporter.

Administrative feasibility

The concerns surveyed here stem primarily from the legal and effectiveness aspects surveyed above. In some aspects of BCA design there may be an inherent tension between administrative feasibility on the one hand, and effectiveness or WTO legality on the other.

It was noted above that WTO case law dictates what BCA must look like, including a requirement that would seem to rule out the use of nationally established baselines. That is, it would be considered unfair to adjust at the border for a given shipment of paper based on the national average energy intensity of paper production. Each producer should have the right to establish its own carbon footprint. This would be extremely complex to administer, and would involve a plant-by-plant determination of carbon emitted, as well as some sort of accredited verification process. Not only would the necessary data be unavailable for most producers (particularly in developing countries), it is also unlikely that the national authorities in those countries would rush to establish requirements that would make it available for that purpose.

Along the same lines, an ideal BCA would have to determine whether the exporting country or firm was in fact making efforts to address climate change that were comparable to those made in the importing country. That is, BCA should be applied only to the extent that it levels the playing field, but first we must find out how far from level it is. This is no easy task. China, for example, has no cap-and-trade scheme, nor does it impose a carbon tax, but it has made enormous efforts to increase energy efficiency (to the point of fiscally punishing or closing down energy-intensive producers) and introduce renewable energy sources (Cosbey, forthcoming). But these are not called climate change measures, and it would be a challenge to devise a common metric by which such policies could be compared to the policies of a country imposing a BCA.

It was also noted that BCA should avoid covering only basic goods, so as to avoid punishing domestic manufacturers that use them as inputs. In other words, BCA

should cover both aluminum *and* bicycles. But this would require an enormous amount of data, and a highly convoluted system of accounting, given the global nature of production chains today. Manufactured goods are typically assembled from a host of raw materials and semi-finished intermediate goods, often sourced from a number of different countries. Chasing down the full carbon footprint of these sorts of supply chains would be daunting enough even if the necessary data existed, but for the most part it does not.

In the end, any BCA would have to vary from the ideal. The question to be posed in each case would be to what extent in doing so it strayed from environmental effectiveness and WTO legality. Finding the right balance would not be easy.

Geopolitical implications

One of the three justifications for BCAs, described at the beginning of this section, was as a lever to bring reluctant countries to the negotiating table in the climate change talks, or otherwise to encourage them to take strong action on climate change. Any proposed BCA must be assessed on this criterion as a matter of primary importance.

It was noted above that some countries may not have particularly large trade flows to the implementing country in the vulnerable sectors. In such cases, the leverage will be correspondingly small. Houser *et al.* (2008) argue, for example, in the context of U.S. proposals to implement BCAs, that China's steel exports to the United States amount to less than one per cent of total production.

More fundamental, however, is the need to consider what impact BCAs would have on the climate negotiation process. In particular, is it likely that they could act as a lever to encourage non-Annex B Parties to sign up for hard targets in the post-2012 context? As a partial answer to this question, it should be recalled how developing countries reacted to the U.S. imposition of the measure that gives us much of the WTO dispute settlement material relevant to BCAs—a measure to ban imports of shrimp caught in ways that killed endangered sea turtles. To describe the reactions as vitriolic would be an understatement. India, Malaysia, Pakistan, Thailand and others argued forcefully that the measure amounted to eco-imperialism: the United States determining how other countries should manage their domestic affairs. They also argued that it was disguised protectionism, designed to restrict their exports and unfairly shelter U.S. producers. The measure was taken to the WTO's Dispute Settlement Body and argued vigorously there by all four countries, joined by Australia, Ecuador, European Commission, Hong Kong (China) and Nigeria as third-party participants. After their defeat under the Appellate Body rulings, several of these countries railed at the result, arguing in an unprecedented manner that the Appellate Body had incorrectly overstepped its bounds. In short, the measure proved divisive.

It is worth recalling that in the *Shrimp-Turtle* case the United States was arguably legitimately trying to protect the environment, and not its producers (at least as a first order objective), and that it had the benefit of clean hands, environmen-

tally speaking, having implemented the very measures to which it was asking others to adhere. BCAs might have neither of these benefits, being explicitly aimed at competitiveness concerns, and potentially being implemented by those Parties that have done historically, and continue to do, the most global damage in terms of climate change. It therefore might prove even more unpopular than the U.S. shrimp protection measures, if that is possible.

It is difficult to predict how such measures would eventually play out in the climate change negotiations. But certainly before any BCA scheme is implemented the answer to this question must be carefully explored.

On the other hand, hearsay seems to indicate that the *threat* of BCAs is having an impact on some developing countries' domestic policy-making processes, where the prospect of losing U.S. markets is a key consideration. This sort of argument is tough to substantiate, but if it is true it also needs to be considered. Some analysts argue that the best use for BCAs is for them to be seen but not used. Such a strategy would have to weigh the risk that, once created, BCAs would pass out of the control of their creators to be used in ways deemed useful by the legislators of the day.

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In-session Discussion

Trevor Houser

This section surveys the discussions that took place at the June 2008 Copenhagen Trade and Climate Change Seminar on the subject of border carbon adjustment. While every effort has gone into ensuring that these notes accurately represent the outcome of the session discussion, they are not intended to convey any explicit consensus of the session participants, and are written on the sole responsibility of the session facilitator, Trevor Houser. Mr. Houser was aided in his efforts by Michal Baranowski, who acted as rapporteur.

Overview

As developed countries contemplate or adopt national climate policy, concerns about a loss of competitiveness of internationally traded carbon-intensive industries (e.g., steel, aluminum, cement and basic chemicals) and leakage in emissions to countries without similar controls have prompted policy-makers to consider the use of a number of climate-oriented trade-related measures. This basket of policy approaches is often referred to as "border tax adjustments" (BTAs). Some proposals do, in fact, come in the form of a BTA, such as if a country that had introduced a domestic carbon tax imposed a comparable tax on imports of carbon-intensive goods at the border. But under the EU Emissions Trading Scheme or a potential cap-and-trade system in the U.S., trade measures would most likely occur in the form of a requirement that importers of carbon-intensive goods purchase emission allowances for goods sourced abroad equal to those required for domestic producers. Given this distinction, the group agreed that "border carbon adjustments" is a useful term when referring to both tax and allowance requirements for carbon-intensive goods adjusted at the border.[16]

The state of play in the EU

To help provide context for the discussion, a participant from the International Energy Agency in Paris gave a quick overview of the status of BCAs as part of policy design in the European Union. The second phase of the EU Emissions Trading Scheme, which ends in 2012, covers just under half of total EU emissions and includes the electric power sector and several manufacturing industry sectors. The third phase, as currently proposed by the European Commission, would expand the coverage to other carbon-intensive sectors, and would make auctioning the basic rule for the allocation of allowances for the power sector and a

16 The literature also refers to trade-related measures in climate policy simply as "border adjustments," which are inclusive of both BTAs and allowance requirements. The term "border carbon adjustments" adds useful specificity.

declining rate of free allowances for industry. As a result, concerns about the competitiveness of these industries and the potential for a loss in market share and thus emissions leakage outside of the EU has become an important part of the policy discourse. Yet, as the current draft proposal stands, industries may be provided with free allocation of emissions allowances to help address competitiveness and leakage concerns depending on the degree to which they are vulnerable, as determined by the EU in the run-up to the start of phase three (June 2010). The European Commission is entertaining the possibility of enacting a BCA for the most vulnerable industries if a suitable international climate agreement is not reached. If a BCA is imposed, the industry in question would not receive free allocation. The EU has suggested waiting to make a decision on BCAs until after COP-15 in Copenhagen out of concern that the threat of a BCA would negatively prejudice negotiations.

The state of play in the U.S.

A participant from the Finance Committee of the U.S. Senate offered an update on the status of BCAs in the U.S. Concerns among key carbon-intensive industries about international competitiveness and among some environmental groups and lawmakers about carbon leakage have generated significant support for including BCAs in U.S. policy. The U.S. Senate took up federal climate legislation (the Lieberman-Warner Bill) in early June, which contained a requirement that importers of carbon-intensive goods from countries not deemed to have adopted climate policy "comparable" to that in the U.S. by 2014 purchase allowances to cover the amount of carbon emitted abroad during the production of the goods in question (sometimes referred to as "embedded carbon").

The abbreviated nature of the debate in the Senate on the Lieberman-Warner Bill (which was not submitted for a vote) prevented any substantive discussion of the merits of BCAs but several session participants from the U.S. expressed a belief that it is likely BCAs of some sort will be required politically to get climate legislation passed. While addressing emissions leakage is one important objective, it's the competitiveness concerns, and the fact that carbon-intensive manufacturing in the U.S. is well organized and a key employer in certain areas of the country, that are foremost in policy-makers' minds as they contemplate BCAs. Unlike the EU, where the Commission is concerned that deciding to include BCAs in the third phase of the EU ETS before Copenhagen could negatively affect the outcome of climate negotiation, in the U.S. many see the option of imposing BCAs if countries do not sign onto a global deal (or do not adopt policy deemed "comparable" to that in the U.S.) as a useful incentive for getting large developing countries to agree to reduce emissions.

Objectives, effectiveness and possible alternatives

Given the variety of goals proponents of BCAs seek to achieve through their use, the group discussed what the existing research says about the effectiveness of BCAs in meeting each of these objectives.

Preventing emissions leakage

From an environmental standpoint, BCAs are seen as a possible tool for guarding against "emissions leakage," or the increase in GHG emissions in one country directly resulting from the introduction of climate policy in another, thus reducing the environmental effectiveness of that country's climate regime in contributing to a net decline in global emissions. In general, concerns about emissions leakage have centred around the possible migration of carbon-intensive manufacturing from countries with emissions caps to those without, or a transfer of market share in carbon-intensive goods from producers in countries with emissions caps to those in uncapped countries. But emissions leakage can also occur when climate policy in one country reduces demand for carbon-intensive energy sources like coal to an extent that the price of that energy source falls world-wide and demand increases in uncapped countries.

There was consensus among the group that despite a number of studies, both *ex ante* and *ex post*, to estimate or measure emissions leakage, it remains unclear how significant a risk leakage presents to the overall effectiveness of national climate policy.[17] In part, this is due to the fact that industries most vulnerable to emissions leakage, like steel, aluminum and chemicals, are experiencing dramatic changes in their non-carbon operating costs. Changes in exchange rates, energy prices, labour and capital costs are, in many cases, far more significant in a firm's decision about where to source supply or locate production than the existence of a carbon price. BCAs do not, and are not intended to, address these larger changes in operating economics. In addition, some recent modelling exercises estimate that the most significant form of emissions leakage will come through a resulting change in the price of high-carbon energy sources like coal and petroleum, against which BCAs do not guard.

Protecting competitiveness

Existing research provides a little more clarity on the impact climate policy would have on the competitiveness of internationally traded carbon-intensive industries than on the question of emissions leakage more broadly. Recent studies in the EU and U.S. suggest that climate policy would only negatively impact the competitiveness of a handful of manufacturing industries and would likely be fairly limited in its effect on output and employment levels (Houser *et al.*, 2008; Reinaud, 2005; McKinsey and Ecofys, 2006; Hourcade *et al.*, 2007; Reinaud, 2007; Morgenstern *et al.*, 2007). For some of the most carbon-intensive, however, such as lime, blast-furnace steel and some basic chemicals, the impact could be significant enough to warrant policy intervention.

17 Studies examining the first few years of experience of the EU ETS have found no evidence of leakage (Reinaud, 2008 forthcoming), (The European Carbon Market in Action: Lessons from the First Trading Period. Interim Report," by Mission Climat of Caisse des Dépôts, MIT CEEPR and University College Dublin). However, this is partly due to the amount of free allocation provided and the already high priced environment for the capped sectors.

Participants expressed concern about the effectiveness of BCAs in protecting the competitiveness of vulnerable industries, particularly if adopted unilaterally. Most BCAs currently considered in the U.S. and Europe only address domestic markets yet nearly all of the growth in demand for carbon-intensive goods like steel and cement is in the developing world. If only a single or small group of countries adopt BCAs, global trade patterns in commodity goods like steel and aluminum could easily shift in ways that would undermine the utility of border adjustments assessed by country of origin. And addressing imports only will do nothing to prevent a loss of market share in uncapped export markets. Most important, however, in terms of preventing emissions leakage, the non-carbon changes in operating costs for many of these industries will likely overwhelm those directly resulting from climate policy.

That said, many in the group expressed a belief that offsetting the impact of climate policy on key industries, however limited, will be a political necessity in both the U.S. and Europe. Others pointed out that while the discussion focused on the economic losers from climate policy, there will be winners as well, and that conversations about "competitiveness" need to expand to acknowledge that economies that readjust to a carbon constrained world are far more likely to be competitive in the future.

Creating leverage

The third stated goal of BCAs is to guard against free-riding by countries that don't reduce emissions. In Europe, until recently, consideration of BCAs for this purpose has traditionally been targeted at U.S. abstention from the Kyoto Protocol. As the U.S. takes up federal climate policy, however, all eyes are on the developing world in the hopes that the threat of loss of U.S. market access would be painful enough to compel large emerging economies like China and India to take on commitments and reduce emissions.

Existing research suggests that BCAs confined to those manufactured goods for which a carbon cost has a meaningful impact on product prices and for which domestic producers have limited ability to pass this price on to consumers due to international competition would cover a fairly limited subset of Chinese and Indian exports to the U.S. and Europe (Houser *et al.*, 2008). After all, the growth in demand for carbon-intensive goods is occurring in those very countries towards which BCAs are targeted. Chinese exports of carbon-intensive goods to the U.S., for example, account for well under one per cent of Chinese GDP. Expanding the list of goods to increase the amount of leverage a BCA provides is challenging on two fronts. First, accurately assessing the amount of carbon emitted in the production of a ton of steel or cement is, in itself extremely difficult. Doing the same for electronics, cars that contain carbon-intensive goods is nearly impossible. Second, even if an accurate determination of the amount of carbon emitted in the production of many of these manufactured goods could be made, assigning a price for that carbon through a BCA would have a negligible effect on its overall cost.

The most important question, however, is whether the threat of a BCA, regardless of the degree of economic activity at stake, would increase or decrease the chances of successfully reaching an international climate agreement that included a commitment by developing countries to reduce emissions. Participants' views on this question varied widely, from those who thought it would be helpful to those who maintained it would poison the negotiations in Copenhagen and beyond. It should be noted, however, that developing countries were poorly represented in the session (despite significant attempts by the organizers to include developing countries in the conference) so the group was left with the speculation of largely U.S. and European attendees.

Some participants stressed that while there is a risk that the adoption of BCAs by developed countries would have a chilling effect on international negotiations, lack of sufficient progress on U.S. climate policy could as well. If the inclusion of a BCA is, in fact, necessary to pass U.S. climate legislation, then the benefits of a more engaged U.S. must be weighed against the risk that a BCA would elicit protests from developing countries.

Alternatives

Several members of the group expressed a strong desire to explore measures other than BCAs that might be as—or more—successful in achieving the three objectives listed above. While there was consensus that many effective alternatives exist, such as free allocation, tax credits or other domestic cost containment mechanisms, a number of participants expressed the view that, in the U.S. at least, the policy debate may have moved beyond the point where alternatives to BCAs, regardless of how effective they would be, can be seriously considered.

Policy design options and international implications

The group discussed options for the design of BCAs in the context of their relationship to UNFCCC negotiations and the WTO. There was broad consensus that policy-makers in both Europe and the U.S. are concerned both about the impact of BCAs on the UNFCCC process and the health of the multilateral trading system. In terms of the trading system, a number of participants felt that the policy discussion thus far has focused too narrowly on whether a given BCA would be "WTO-legal" (a difficult determination to make give the limited amount of case history on the topic) rather than on whether a BCA would be effective in achieving its objectives and consistent with WTO principles such as non-discrimination. It was on these broader questions the group's conversation focused.

It was noted early on that, among the intended objectives of a BCA, protecting competitiveness of domestic industry is not a legitimate aim in the eyes of the WTO. Meeting environmental objectives may be (e.g., under an Article XX exception), so an important question is whether the BCA is effective in reducing emis-

sions. Here methodology becomes important. Several current BCA proposals would assess the embedded carbon of a good based on a nation-wide average. Such a calculation would not reward individual firms for reducing emissions and thus would be only environmentally effective if it compelled a country to enact national climate policy.[18] Several of the challenges with implementing BCAs unilaterally, such as boundary issues and risk of transshipment, would also have implications for how a BCA was viewed by the WTO.

There was also recognition that a country looking to implement a unilateral BCA will need to demonstrate first that it had made a good-faith effort to prevent leakage through participation in a multilateral climate agreement (such as the UNFCCC). A number of participants warned that the WTO Appellate Body would be extremely hesitant to adjudicate the WTO compatibility of trade measures based on a unilateral assessment of whether a country of export had put in place climate policies that were "comparable" to the policies of the country of import. Without having an explicit definition of such in a multilateral environmental agreement (MEA) on which it could rely, adjudicating a BCA could be more than the credibility of the Appellate Body can currently bear. The most likely MEA is a negotiated outcome of the UNFCCC process, and thus the principles of the UNFCCC are quite relevant when considering whether BCAs will be WTO-consistent. One of the main purposes of the UNFCCC, after all, is to reach an agreement on burden-sharing among different nations in reducing emission globally. There was a strong feeling among the group that the WTO would look to the UNFCCC process to guide a determination of what "comparable" action entails.

This intersection between the principles of the WTO and the UNFCCC has interesting implications of the effectiveness of BCAs in meeting their various objectives. Signatories to the UNFCCC, which include nearly all UN member states including the U.S. and China, have already agreed that individual countries have "common but differentiated responsibilities" based on ability and historic obligations. Any agreement reached at the COP-15 meeting in Copenhagen (even if it's just an agreement to continue to negotiate) will reflect this principle in the form of differentiated commitments. A country that is a party to the Copenhagen agreement may be constrained by WTO rules from using a trade measures against any other party that is in compliance with that agreement—even if the highly differentiated nature of the Copenhagen commitments could lead to emissions leakage.

18 In the EU, the success of a BCA is generally considered to be its effectiveness in preventing leakage directly resulting from EU climate policy, rather than compelling other countries to reduce emissions.

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Conclusions and Research Agenda

While the existing research has not demonstrated a significant risk of emissions leakage or loss of competitiveness resulting from national climate policy, there is considerable momentum towards the adoption of BCAs, particularly in the U.S. but also in Europe. As such, more work is needed to adequately underpin the decisions policy-makers will be making in the near future on the implementation of BCA schemes.

Additional basic research is needed on competitiveness, to identify which sectors are vulnerable and to what extent. Any policy aimed at addressing leakage and competitiveness concerns, whether a BCA or domestic cost containment mechanism, will need to identify the losers from climate policy in order to target relief.

Research is also needed on the design of BCA schemes. In the final event, is it possible that BCAs can meet all of the goals set for them—blunting competitiveness impacts, reducing emission leakage and applying leverage to foster more stringent climate policies in major developing countries? Can they also manage to be WTO-legal and administratively feasible?

There should also be more research on the available alternatives to BCAs, and their effectiveness at meeting the goals set out above.

Finally, there needs to be more thought given the wider implications of BCA schemes, along the lines of the geopolitical discussion above. At the end of the day, would such schemes foster or frustrate progress in the ongoing international climate change negotiations? The discussions on this question, where they are happening at all, are taking place in absence of serious input from developing countries. Given what is at stake, this needs to change.

While it is difficult to imagine how either the UNFCCC or the WTO might take up issues of leakage and competitiveness formally (outside of the WTO's Dispute Settlement Mechanism, of course), these issues will surely be a part of upcoming discussions both in the climate negotiations and in Geneva. Even if a successful climate agreement is reached at COP-15, these issues will not go away as countries will be moving at different speeds and in different ways to address climate policy. Both the trade and climate communities need to be thinking about these linkages now.

Chapter Three: Embodied Carbon in Traded Goods

Key Issues

Jiang Keijun, Aaron Cosbey and Deborah Murphy

Summary of key issues, challenges:

- The term "embodied carbon" refers to carbon dioxide emitted at all stages of a good's manufacturing process, from the mining of raw materials through the distribution process, to the final product provided to the consumer. Depending on the calculation, the term can also be used to include other GHGs.
- Important questions in climate change and international trade discussions are linked to embodied carbon. Should emissions be allocated at the point of consumption (meaning a calculation like embodied carbon), or at the point of manufacture (meaning a calculation like those currently performed for the purposes of the Kyoto Protocol)? Should international trade be considered in a future climate change agreement to avoid "carbon leakage" to developing countries?
- These questions have particular implications for a country like China that has experienced phenomenal economic growth, matched by increases in energy use, aggregate GHG emissions and exports. While embodied carbon may be a negotiating issue for China and other rapidly growing developing nations that are under pressure to curb increases in energy use and GHG emissions, there is still a lack of good research results to fully support the discussion.
- Initial research indicates that, in general, Annex B countries are net importers of CO2 emissions, but there is considerable variation. And the various assessment techniques used to calculate embodied carbon—e.g., life-cycle assessment, ecological footprint and hybrid LCA—face several challenges, including methodology, definition of boundary, data availability and cost.
- The concept of embodied carbon is also important in the discussion of competiveness issues, whereby those countries implementing emissions reduction policies will have to compete with exports from countries without mandatory emission reductions, where costs of production may be lower as a result. The basis for trade measures (e.g., border carbon adjustment) to level the playing field could be embodied carbon in products.
- But, is the concept of embodied carbon compatible with the principles of the multilateral system of trade? Specifically, can discrimination based on embodied carbon be accommodated in existing trade law? Given the proliferating number of schemes, both private and governmental, this question is important.

The concept of embodied carbon

The term "embodied carbon" refers to carbon dioxide emitted at all stages of a good's manufacturing process, from the mining of raw materials through the distribution process, to the final product provided to the consumer.[19] Depending on the calculation, the term can also be used to include other GHGs as well.

Important questions in climate change and international trade discussions are linked to embodied carbon. Should emissions be allocated at the point of consumption (meaning a calculation like embodied carbon), or at the point of manufacture (meaning a calculation like those currently performed for the purposes of the Kyoto Protocol)? Should international trade be considered in a future climate change agreement to avoid "carbon leakage" to developing countries?

The discussion of the importance of CO_2 embodied in global trade has been going on for over a decade (see for example, Shui and Harriss, 2006). Wyckoff and Roop's (1994) evaluation of the carbon embodied in the imports of manufactured goods in the six largest OECD countries between 1984 and 1986 warned that many national GHG policies, which are predicated on controlling emissions by reducing domestic GHG emissions, might not be effective if imports contribute significantly to domestic consumption. Schaeffer and de Sá (1996) studied the carbon embodied in Brazilian imports and exports from 1970 to 1992, and expressed concerns that developed countries were transferring CO_2 emissions to developing countries through offshore manufacturing and production of goods. Munksgaard and Pedersen (2001) questioned whether the producer or the consumer of goods should be responsible for CO_2 emissions; and Jiun-Jiun Ferng (2003) suggested using a benefit principle to assign responsibility for pollutant emissions related to the consumption of goods.

This chapter explores the embodied carbon concept and its possible impact on trade policy and the climate negotiations. It first provides context by examining how embodied carbon is measured and the challenges related to measurement. The paper then looks at implications for the climate change and trade regimes.

Calculating embodied carbon

A number of tools and methodologies have been developed to calculate embodied carbon. Key assessment techniques—e.g., life-cycle analysis, carbon footprint and hybrid life-cycle analysis. These are discussed below, along with the challenges they face.

Assessment techniques

Life-cycle assessment (LCA) is a production-based analytical tool that can used to undertake embodied carbon analysis. It includes the systematic evaluation of the

19 Han *et al.* (2008) refer to this as Mining to Products. The concept is also referred to as source to store, cradle to grave, or cradle to market, depending on the calculations. Embodied carbon is also sometimes referred to as embedded carbon or virtual carbon.

environmental aspects of a product or service system through all stages of its life-cycle—extraction and processing; manufacture; transport and distribution; use, re-use and maintenance; recycling; and final disposal.

Applied to embodied carbon, LCA would apply only to specific stages of the full life-cycle, not covering emissions generated during the use and final disposal stages. And it would be limited to an assessment of carbon or GHG emissions, ignoring other aspects of environmental damage. The Carbon Trust (2006) developed a carbon LCA methodology to assess the carbon footprint of different products by analyzing the carbon emissions generated by energy use across the supply chain.

Ecological footprint analysis is another consumption-based tool. Wackernagel and Rees (1996) defined the ecological footprint as the area of productive land and water systems required to produce the resources that the population consumes and assimilate the wastes that the population produces. The ecological footprint tool is used to analyze: (i) the amount of resources we have compared with how much we use; (ii) the amount a particular population group is dependent upon resource imports from outside its habitation area; (iii) the amount this group depends on outside areas for the waste assimilation; and (iv) whether nature's productivity is adequate to meet the future requirements of that particular population group. The ecological footprint is measured in "global hectares," an area unit adjusted to average world bioproductivity, and it can be applied for a product, community or region.

In 2008, The Energy and Resources Institute developed the *Hybrid Life-Cycle-Analysis*, which can be used for the assessment of micro-systems such as individual products (e.g., recycled paper). This methodology combines a bottom-up process analysis with a top-down environmental input-output approach. In this approach, the process analysis includes the collection of on-site, first- and second-order process data on embodied carbon or carbon footprints for the product or service; while higher-order requirements are covered by input-output analysis.

Challenges

The calculation of embodied carbon faces several challenges, including choice of methodology, definition of boundary and data availability.

Embodied carbon can be calculated by either top-down and bottom-up methods. Top-down methods using input-output analysis have often been applied to estimate embodied energy, CO_2 emissions, pollutants and land appropriation from international trade activities (Wyckoff and Roop, 1994; Schaeffer and Lael de Sá, 1996; Machado *et al*., 2001; Munksgaard and Pedersen, 2001; Muradian *et al*., 2002; Ferng, 2003; Hubacek and Giljum, 2003; Shui and Harris, 2006). This methodology can be used to analyze a country's embodied carbon in imports and exports as a whole, but it has difficulties at the sectoral level. Input-output tables are expressed in value added by sector, and each sector spans a number of differ-

ent specific products, each of which will have different carbon-to-value-added ratios, or *carbon co-efficients*. Since the sectoral carbon co-efficients are estimated averages of those ratios for all the products in each sector, they are not particularly useful for calculating the embodied carbon attributable to a given product. Of course there are also major uncertainties involved in estimating these co-efficients in the first place.

The bottom-up method calculates embodied carbon by examining the production processes of specific products. A large amount of preliminary data is needed; the calculation of embodied carbon for one product requires data for the many inputs to the manufacturing process. A single computer, for example, is an assembly of hundreds of different components, all potentially sourced from different producers, perhaps in different countries, all produced in different manners, using energy from various different sources, all with their own carbon coefficients. The level of detailed data and technological information required may not be available in all developing countries, because of weak data collection and statistics agencies. The TERI Hybrid Life-Cycle-Analysis, described above, attempts to get around the challenge of methodology choice by combining top-down and bottom-up analysis in one methodology.

Boundary issues, such as the range of emissions, are also a challenge in the calculation of embodied carbon. Full LCA of GHG emissions for a particular product could, in principle, include an examination of emissions associated not just with inputs to the product, but also the inputs to those inputs, and so on up the product's value chain. Many methodologies limit the calculation of embodied carbon to major inputs, and an often seen assumption is omitting the calculation of embodied carbon for equipment used for the manufacturing process. Established methodologies provide guidance on boundary issues, and include the GHG Protocol developed by the World Resources Institute and the World Business Council for Sustainable Development, and the ISO 14060 series that provides guidance for assessment of GHGs.

Other challenges are the cost and time requirements for analysis of embodied emissions, which can be prohibitive. Data collection and availability have been improved through work at the sector level.

The complexity of measuring embodied carbon is illustrated in the Blanke's (2006) life-cycle analysis of apples, which compares the primary energy consumed for both imported and home-grown apples in the Rhein-Ruhr area in Germany in the month of April. The primary energy to produce home-grown apples included energy for five months of cold storage, compared to the energy requirements of transporting apples from New Zealand (28 days transport) or South Africa (14 days transport). The increased energy required to import fresh fruit from overseas was partially offset by the energy needed for cold storage of domestic apples. But in order to *fully* offset the differences in embodied carbon for fruit imports from South Africa or New Zealand, home-grown apples had to be stored locally for nine or 18 months, respectively, i.e., in the latter case beyond the next harvest. As such, in this case, the embodied carbon differential between local and imported goods changed with the month of the year, and the age of the local produce.

Implications for the international climate change regime

The calculation of embodied carbon can be undertaken for a variety of reasons related to the climate change regime, including generating officially recognized GHG reduction "credits" for use in meeting mandatory emission targets, obtaining recognition for GHG reductions under voluntary programs, and offsetting GHG emissions to meet internal company targets for public recognition or other internal strategies.

Domestic policies for emissions reductions can be guided by embodied carbon calculation. An example is carbon-labelling policies that show consumers the carbon content of a product, allowing consumers to select low-carbon products, cut emissions by purchasing choices, and pressure suppliers to opt for low-carbon options in processes and supplies. Proposed legislation in the California State Assembly, The Carbon Labeling Act of 2008, would create a voluntary program for carbon labels on consumer products, much like nutrition labels on food items. The legislation could help California in its effort to meet the 25 per cent reduction of GHG emissions by 2020 mandated by the Global Warming Solutions Act. California envisions a cradle-to-market methodology that relies on available industry-wide secondary data for many inputs to the production process, and company-specific primary data for the California-based portions of the manufacturing process. The approach would consider raw material acquisition, transportation to the factory, manufacturing and transportation to market.

There is also some discussion of accounting for a nation's emissions consumption in a new international climate agreement. This would be a departure from the Kyoto Protocol that looks at emissions on a country-by-country basis and uses production-based (point of emissions) accounting methods to calculate a country's GHG emissions. This includes looking at domestic activities such as energy use, mining, industrial process, land use and sinks. In contrast, consumption-based accounting looks at the carbon embodied in goods in the country of where the good is consumed.

This has particular implications for a country like China that has experienced phenomenal economic growth, matched by increases in energy use and aggregate GHG emissions. China has also experienced a remarkable increase in exports. Peters and Hertwich (2008) assessed the balance of emissions embodied in trade (BEET) for a number of countries, and concluded found that China's BEET (embodied emissions in exports less embodied emissions in imports) was 585.5 $MtCO_2$, compared to the United States' BEET of -438.9 $MtCO_2$ (see Table 1). In general, Annex B countries—those with Kyoto targets—were found to be net importers of CO_2 emissions. But as a percentage of production-based emissions (i.e., the higher the figure, the more impact from production-based activities would have on the country's nation mitigation target), there was considerable variation. The highest impacts were for small-trade intensive economies.

Table 1: Balance of Emissions Embodied in Trade (BEET) for select countries

Annex B			Non-Annex B		
	BEET $MtCO_2$	**BEET as a % of production-based emissions**		**BEET $MtCO_2$**	**BEET as a % of production-based emissions**
Switzerland	-63.1	-122.9%	Singapore	-62.8	-128.2%
Latvia	-4.6	-60.7%	South Korea	-45.4	-11.4%
United Kingdom	-102.7	-16.6%	Morocco	-2.5	-6.3%
Germany	-139.9	-15.7%	Mexico	-17.6	-4.5%
Japan	-197.0	-15.3%	Brazil	+2.5	+0.8%
United States	-438.9	-7.3%	India	+70.9	+6.9%
Canada	+15.5	+2.8%	China	+585.5	+17.8%
Australia	+57.9	+16.5%	Indonesia	+58.1	+19.0%
Russia	+324.8	+21.6%	South Africa	+123.5	+38.2%

Source: Peters and Hertwich, (2008).

While this may be a negotiating issue for rapidly growing developing nations that are under pressure to curb increases in energy use and GHG emissions, there is still a lack of good research results to fully support the discussion.

Implications for the trade regime

Under the Kyoto Protocol, Annex I countries agreed to reduce emissions by a collective average of five per cent below their 1990 levels. These countries have adopted domestic mitigation policies and programs to help meet their reduction targets, including energy efficiency standards, emissions trading schemes and carbon taxes.

These mitigation measures normally increase the cost of industrial products, at least in the short run. This raises competiveness issues, whereby those countries implementing emissions reduction policies will have to compete with exports from countries without mandatory emission reductions, where costs of production may be lower as a result. Industry representatives, and some politicians, have reacted to these concerns by calling for the introduction of measures, including trade measures, to offset competiveness imbalances and level the playing field.[20] The basis for levying the taxes could be embodied carbon in products.

Examples of such proposals have come from various levels of government in the European Union and the United States. In the United States, the Leiberman-

20 For a more in depth discussion of these measures see the companion paper in this series: *Border Carbon Adjustment*.

Warner bill (America's Climate Security Act) which went before Congress in 2008, included a provision aimed at encouraging other nations to start reducing their GHG emissions.[21] Under the proposed regime if, two years after the enactment of the U.S. program, it is determined that a major emitting nation has not taken comparable action, the legislation would require importers of GHG-intensive manufactured products from that nation to purchase U.S. offsets. The number of offsets to be purchased would be calculated based on the embodied carbon in the good in question. Such a regime would be a simple extension of the concept of consumer-based accounting for carbon emissions. If the responsibility for those emissions lies with the consumer, then it can be argued that final responsibility for regulating those emissions should lie with the consumer government as well.

Another extension of this principle can be seen in the concept of "food miles"—the embodied carbon in a traded good as a result of its transport. The reasoning behind this concept is that the further a good travels, the more it contributes to climate change (though some analysts acknowledge that the mode of transport matters). The partial nature of this approach, however, has been called into question by studies arguing that on a life-cycle basis, embodied carbon can actually be *lower* in goods imported even from very distant countries than it is in locally produced goods (Williams, 2007; Saunders *et al.*, 2006). What seems to matter more is how the goods were produced, transport being only one of a long chain of activities necessary to bring a good to the consumer.

Is the concept of embodied carbon compatible with the principles of the multilateral system of trade? Specifically, can discrimination based on embodied carbon be accommodated in existing trade law? Given the proliferating number of schemes, both private and governmental, this question is important.

The key principle of trade law is non-discrimination: goods from foreign producers must get no worse treatment than like goods from domestic producers (national treatment); and goods from one foreign country must get no worse treatment than like goods from any other foreign country (MFN treatment). With respect to discrimination on the basis of embodied carbon, the million-dollar question is how to define "like" goods. Is a ton of inefficiently produced steel "like" a ton of efficiently produced steel? If so, then tariffs based on embodied carbon may violate the principle of non-discrimination.

This question is far from simple, and is examined in greater depth in the Chapter 2 of this report on border carbon adjustment. In the end, it is impossible to say in the abstract whether trade measures based on embodied carbon are legal or illegal from a trade law standpoint; any such judgement will depend on the nature of the specific measure. And the only definitive answer in any case would come from a dispute panel. But it is possible to say that trade law is an important consideration for such schemes, and that they should be vetted as best they can in advance against known trade case law.

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21 Bill S-3036. This bill replaced Lieberman-Warner's S-2191. Among other things, the bill has been amended such that the trade provisions become effective after two years, rather than eight. There is a variety of similar bills either before Congress or in the works.

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In-session Discussion

Jennifer Haverkamp

This section surveys the discussions that took place at the June 2008 Copenhagen Trade and Climate Change Seminar on the subject of embodied carbon in traded goods. While every effort has gone into ensuring that these notes accurately represent the outcome of the session discussion, they are not intended to convey any explicit consensus of the session participants, and are written on the sole responsibility of the session facilitator, Jennifer Haverkamp. Ms. Haverkamp was aided in her efforts by Christina Elvers and Peter Sparding, who acted as rapporteurs.

Overview

The workshop session produced a lively discussion of this cross-cutting issue which, as was evident during the working group summations at the end of the day, had cropped up in almost all of the other working groups. The group divided its time fairly evenly across definitional questions, methodological challenges, and trade and climate policy implications. The group's conversation was, however, hampered by the absence of a clear advocate for the embodied carbon approach to national accounting, and by limited representation of developing country interests.

Scope of the issue; definitional questions

As defined above, "the term 'embodied carbon' refers to carbon dioxide emitted at all stages of a good's manufacturing process, from the mining of raw materials through the distribution process, to the final product provided to the consumer." Both the discussion and the background paper highlighted the fact that the discussions of "embodied carbon" can be divided into at least two distinct policy applications:

1. National Accounting (i.e., using embodied carbon of products consumed as the basis of national greenhouse gas accounting in the UNFCCC context)
2. Product-specific measurement/characteristics (e.g., basing mandatory product characteristic requirements or voluntary labelling schemes on the products' low-carbon production processes)

Geographic focus: Participants noted that, with respect to national accounting, consideration of the embodied carbon approach is most often focused on the trade dynamic between the United States and China. In fact, more countries are implicated, including trade between developing countries.

Consumer product regulations and labelling: Policy issues

The discussion focused more on the challenges than the opportunities for embodied carbon as a policy tool at the consumer/product level. Some factors that appear to limit the potential for embodied carbon regulatory or labelling schemes to lead to reduced greenhouse gas emissions include:

- Daunting methodological issues in providing accurate information to regulators and consumers.
  - The group seemed to take enormous methodological complexity as a given, with several individuals providing examples of the challenges. It was suggested that the concept is only operational for primary products, or for those few products where one entity controls the entire production chain.
- The concept can be confusing for consumers.
- Effect on behaviour is unclear, and potentially negative.
  - Example given: an airplane symbol on labels in the U.K. to show long-range air transport for people concerned about food miles; result was increased sales of such products to people who concluded air-freighted products must be fresher.

Policy implications for the international trade regime

Voluntary labelling: Workshop participants generally agreed that voluntary labelling schemes for embodied carbon did not raise significant trade policy problems. The discussion did not go into depth, but participants felt the same issues had been well examined in the 1990s debates over ecolabelling.

Technical regulations and standards: In contrast, mandatory embodied carbon regulations implicate the complicated and cloudy jurisprudence surrounding "PPMs"—processes and production methods, and when their use violates national treatment (the obligation to treat imported "like products" no worse than those produced domestically). Participants agreed that it was unclear how a WTO dispute settlement panel might view a measure regulating embodied carbon content. Many were also of the view that, if possible, the matter should be resolved by means other than through a dispute settlement panel or Appellate Body decision. In other words, the group preferred to see the WTO or the UNFCCC negotiate a solution, if needed, as opposed to one developed through WTO jurisprudence.

Government procurement: The group had a limited discussion of WTO government procurement rules and how much latitude they gave governments to include embodied carbon characteristics in procurement specifications for gov-

ernment contracts. This was considered a potentially fruitful area of government regulation (as measured by the potential to reduce carbon emissions either directly or through changing peoples' behaviour), given the relative flexibility allowed by the WTO's Government Procurement Agreement (GPA), and the Agreement's limited membership. That is, few countries are parties to the GPA, which is a plurilateral agreement, with optional membership, as opposed to a chapter of the GATT or an integral WTO agreement with which all WTO Members must comply. Non-parties would not be bound by the rules. Moreover, while the GPA prohibits its members from discriminating against other GPA parties as countries, it gives a government significant flexibility to set specifications for the goods or services the government wishes to procure, including potentially by specifying PPM-based requirements. The sense of the group was that if GPA rules presented an impediment to low carbon procurement specifications, the GPA ought to be amended.

Policy implications for the UN Framework Convention on Climate Change

In the UN framework, embodied carbon has mostly arisen in the context of a debate over national accounting, with some countries that are currently net carbon exporters arguing that emissions should be accounted for at their point of consumption instead of the current calculations based on point of production.

The working group participants generally agreed that the debate on embodied carbon, and the examination of which party—producer or consumer—should bear responsibility for those emissions, has been a positive development in the UNFCCC negotiating process. It has usefully highlighted questions of equity and fairness in the allocation of responsibility, and helps inform the debate over common but differentiated responsibilities.

The group did not, however, embrace the concept as a practical policy tool. Most were of the view that the complexity of the methodological challenges is a very large stumbling block to actually introducing embodied carbon accounting as a mechanism for allocating emissions responsibility. Very careful study of the emerging literature on this question should be undertaken, therefore, by any party seriously considering advocating for its adoption. It is also important for major developing countries to develop the capacity to conduct these analyses, so as to determine for themselves whether such an approach is genuinely in their national self interest. It was noted in the discussions, for example, that due to the rapid evolution of their economies, some developing countries that today are major carbon exporters were importers just a few years ago, and the situation could revert to that in the not too distant future.

Transportation considerations: The group also discussed the significant contribution that mode and distance of transportation made to a product's embodied carbon quotient, and to an importing country's national accounting. Some advocated action to address transportation emissions in other, specialized fora. If the

International Civil Aviation Organization (ICAO) and/or the International Maritime Organization (IMO) were to develop a regime for controlling aviation and maritime emissions, or even if the UNFCCC were to do so, the importance—and all the complexity—of factoring transportation emissions into importing country national accounting or individual consumer product standards would fade.

Final considerations

As a final note—and perhaps as the prism through which to view any consideration of embodied carbon—the group discussed the primary objective of any system of regulation or national accounting based on embodied carbon; namely, the reduction of greenhouse gas emissions through changes in behaviour (whether at the national, facility or individual level).

Any decision to pursue an embodied carbon approach to climate policy should, therefore, be based on a well-grounded expectation that doing so will lead to reductions in global greenhouse gas emissions. This is especially true where, as here, the methodological and practical considerations require significant investment of effort and resources to accurately measure embodied carbon. Workshop participants pointed out that shifting accounting to the consumer country would not necessarily reduce emissions, despite the generally held assumption that consumers have choices (whether to purchase manufactured products, and which ones), in contrast to producers. In fact, producers and transporters often (though not always) have choices over sources of energy and inputs and mode of transportation. Embodied carbon accounting or product standards seem to run counter to the general "polluter pays" principle, which argues for taxing emissions as close to their source as possible, to encourage the producer to make low-emissions choices.

Conclusions and Research Agenda

There are gaps in our understanding of embodied emissions from a climate change and trade perspective, and more research is needed to assist the international community in properly assessing policy options.

One area requiring further work is increasing the number of products analyzed. Embodied carbon calculations have only been undertaken for a limited number of products and wider coverage is needed. Related to this is the need to extend boundary limitations to allow a more systematic analysis of embodied carbon. While product labelling schemes may have only limited value, analysis of carbon emissions throughout some representative supply chains could help educate manufacturers about energy cost saving and emissions reduction opportunities.

Regional analysis is also needed, especially in developing countries where the same products could have very different levels of embodied carbon. And international comparative analysis is essential to understand mitigation potential and links with trade issues.

More research needs to be carried out on the development implications of labelling based on embodied carbon. Economic development in poorer countries can be hurt by shrinking markets for products shipped long distances, but the alternative products do not always have smaller carbon footprints (note the well-known example of cut flowers from Kenya vs. those grown in heated greenhouses in northern, cooler climes).

It is also important to begin to examine known trade case law to try to determine whether measures based on embodied carbon—both voluntary and mandatory—might be compatible with the principles of the multilateral system of trade.

Finally, more attention needs to be paid to embodied carbon and its possible impacts on the climate change regime and negotiation process. While this would be a very political analysis, research is needed to extend the debate beyond rhetoric and perceptions of negative impact on competiveness that are not backed up with solid data. As noted earlier, it is important to begin to examine whether embodied carbon can be accommodated in existing trade law, and whether the concept is compatible with the principles of the multilateral system of trade.

Chapter Four: Climate Change, Technology Transfer and Intellectual Property Rights

Key Issues

Maria Julia Oliva

Summary of key issues, challenges:

- Enhanced action on technology development and transfer will be central in enabling the full and effective implementation of the UNFCCC beyond 2012. Yet disagreements remain, particularly on the obstacles to the transfer of climate-related technologies and the types of measures that should be taken to overcome them.
- Objectives and commitments on transfer of technology exist under the UNFCCC and Kyoto Protocol, as well as in the trade context. The difficulty of their implementation, however, highlights the importance of moving beyond general language to the consideration of concrete problems and solutions.
- Intellectual property (IP) is potentially both an incentive and an obstacle to the transfer of technology. The exact role of IP in the transfer of climate-related technologies remains unclear. No comprehensive study has been conducted on the impact of IPRs in the different categories of climate-related technologies. Nevertheless, there are calls to address the possible adverse effects of IP on the transfer of climate-related technology.
- The contribution of existing Trade-related Aspects of Intellectual Property Rights (TRIPS) flexibilities to climate-related technology transfer could be significant. Several provisions of the WTO TRIPS Agreement could be used to promote such transfer of technology. Some UNFCCC Parties and other stakeholders are of the view that additional measures should be taken to ensure that IP rules support the climate regime.
- A number of measures related to IP and other innovation and access to knowledge schemes could also be considered in the context of a post-2012 climate regime. Some of the possibilities already being discussed include financial mechanisms and guidelines on IP protection for publicly-funded technologies. Other emerging topics include prizes as incentives to climate-related innovation, and institutional arrangements for open or collaborative innovation.

Introduction

Technological solutions are imperative in meeting the challenges of climate change.[22] A critical factor in greenhouse gas emissions, technology is also fundamental to enhancing existing abilities and lowering the costs of reducing these emissions. Broad diffusion of current technologies and transition to new ones, for example, are expected to improve efficiency in energy use, introduce less carbon-intensive sources of energy, and further develop renewable energy sources. Indeed, the transition to a low-carbon economy, as all previous energy transitions in history, will be driven by cycles of technological discontinuities and innovations. In this context, the UNFCCC and the Kyoto Protocol require Parties to promote and cooperate in the development and diffusion, including transfer, of technologies that control, reduce or prevent GHG emissions.[23] Enhanced action on technology development and transfer will also be central in enabling the full, effective and sustained implementation of the UNFCCC beyond 2012, as recognized in the Bali Action Plan (see Box 1).

Box 1. Technology transfer in the Bali Action Plan

The Bali Action Plan launched "a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action," by addressing, *inter alia*:

"(d) Enhanced action on technology development and transfer to support action on mitigation and adaptation, including, *inter alia*, consideration of:

(i) Effective mechanisms and enhanced means for the removal of obstacles to, and provision of financial and other incentives for, scaling up of the development and transfer of technology to developing country Parties in order to promote access to affordable environmentally sound technologies;

(ii) Ways to accelerate deployment, diffusion and transfer of affordable environmentally sound technologies;

(iii) Cooperation on research and development of current, new and innovative technology, including win-win solutions;

(iv) The effectiveness of mechanisms and tools for technology cooperation in specific sectors;"

22 While this chapter focuses primarily on technology as a solution to climate change, it should be noted at the outset that technology is only a part of the overall solution, albeit a centrally important part. Also key will be addressing consumption patterns, primarily in developed countries but increasingly among the wealthy in developing countries as well. If increased efficiency of resource use simply means more consumption—the classic rebound effect—then technology will not get us where we need to go.

23 See, e.g., Article 4.1 (c) of the UNFCCC and Article 10 of the Kyoto Protocol. This note collectively refers to these technologies as "climate-related technologies."

Both aspects of the technology-related action in the Bali Action Plan—the development and the transfer of technology—are important. Technology transfer, however, has been the focus of technology-related discussions in most MEAs, including the UNFCCC. Remaining technological disparities at the international level and the consideration of mitigation commitments for developing countries in a post-2012 climate regime have determined that—as initial meetings on long-term cooperative action on climate change proceed—transfer of technology will take an unprecedented place on centre stage in the debate. Moreover, it is clear that significant divergences remain as to the obstacles that impede the effective transfer of technology for sustainable development, and the types of measures that can and should be taken in overcoming these obstacles.

Most transfer of technology occurs in the private sector. Channels for the transfer of technology can be market-based (including trade, foreign direct investment and technology licensing) or informal (such as imitation and the mobility of technical and managerial personnel). The role of the public sector, however, is no less critical. Given that the transfer of technology is not an automatic or costless process, legal and policy incentives are generally required to achieve the most effective rate and approach for transfer of technology in relation to national and international needs and objectives.

As a legal and policy measure, intellectual property is potentially both an incentive and an obstacle to the transfer of technology. IPRs, as private rights, have been established and conceived as instruments to promote innovation and the dissemination of knowledge. Yet an excessive scope or level of protection of IPRs might stifle innovation or make access to knowledge more difficult or costly. In any policy context, including climate change, a balance between the protection of IPRs and the promotion of public objectives, such as the transfer of technology, is necessary.

From discussions on the Bali Action Plan, it would seem that UNFCCC Parties disagree on whether such a balance exists under the current legal and policy framework governing IP and technology as it relates to climate change. As a result, they also appear to have diverse positions as to whether additional measures are necessary in the international IP system and beyond to ensure the transfer of the technologies needed for climate change mitigation and adaptation. The WTO TRIPS Agreement, which introduced IPRs into the international trading system and remains the most comprehensive international agreement on the topic, seems to have been of particular interest and concern in ongoing discussions on the transfer of climate-related technologies.

Increased research and analysis on the links between transfer of technology and IP will be fundamental to overcome these apparent differences, and to develop effective technology-related international cooperative action on climate change. Given the complexity of the topic, the present paper does not aim to comprehensively address the topic, but merely to provide an initial review of selected issues. In the context of ongoing work on trade and climate change, the objective of this paper is thus to briefly look at the relationship between IP and the transfer of climate-related technologies and outline some of the existing and prospec-

tive measures, primarily in the TRIPS Agreement, that could be considered in support of a post-Kyoto climate regime.[24]

Technology transfer: Role and potential impact of intellectual property rights

There is no single definition for "transfer of technology." In general, however, "transfer of technology" can be defined as the transfer of systematic knowledge for the manufacture of a product, for the application of a process, or for the rendering of a service (Draft International Code on the Transfers of Technology, 1985). The transfer of a technology is thus not exhausted in the transmission of the hardware, but also requires facilitating access to related technical and commercial information and the human skills needed to properly understand it and effectively use it. In this regard, a critical aspect of the technology transfer process is the development of the domestic capacities to absorb and master the received knowledge, innovate on that knowledge, and commercialize the results.

In the complex process of transfer of technology, the role of IP protection—despite being only one of many influential factors—has proven particularly contentious. Indeed, IP is potentially both an incentive and an obstacle the transfer of technology. IPRs were conceived as private rights to reward innovation and promote the dissemination of knowledge in the context of broader societal goals. By offering protection against a loss of control of information in technology-related transactions, IP is thus—in part—an instrument aimed at facilitating the transfer of technology. Studies have shown that such a positive impact does exist, including by establishing a link between stronger patent rights and productivity, trade flows, foreign direct investment and the sophistication of the technologies transferred (Maskus, 2003).

On other hand, the existence of IP protection does not guarantee or suffice for effective transfer of technology. IPRs need to be buttressed by appropriate infrastructures, governance and competition systems in order to be effective (Maskus *et al.*, 2003). Moreover, there may be circumstances in which IPRs are not incentives at all (Foray, 2008). The market power provided by patents and other IPRs over certain technologies—by allowing owners to limit the availability, use, or development of a process or product—may also result in prices that exceed the socially optimal level and hamper the transfer of these technologies (Hoekman *et al.*, 2004).

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24 Other concurrent and upcoming studies by the International Centre for Trade and Sustainable Development will look at additional aspects of the issue of trade and climate change—both generally and in relation to specific industry or technology sectors, other intellectual property rules and issues relevant to climate change, and technological change in relation to climate change. See, for example, the ICTSD policy paper on "Climate Change and Trade on the Road to Copenhagen."

Given the tension between IP protection and the transfer of technology, a "balancing act" is necessary to ensure international IP rules advance broader public policy objectives (Maskus, 2003). Such balance is considered to be particularly important in the context of the TRIPS Agreement, which establishes the most comprehensive minimum standards of IP protection, both in terms of covered areas and their applicability to all Members of the WTO. The TRIPS Agreement (Article 7) states that the objective of the protection and enforcement of IP should be to contribute "to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare." Article 8 also recognizes that measures "may be needed to prevent the abuse of intellectual property rights by right holders or the resort to practices which adversely affect the international transfer of technology."

Despite such language, concerns remain as to whether the TRIPS Agreement does achieve a balance between IP protection and the transfer of technology. Moreover, there is still no broad understanding in IP-related discussions at the WTO on the types of additional national and international policies needed to promote the transfer of technology. Article 66.2 of the TRIPS Agreement requires developed country WTO Members to "provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country Members." There are growing concerns, however, that such a mechanism is inadequate to promote effective transfer of technology in least-developed countries. An analysis of reports on the measures taken to date, for example, found several shortcomings, including in the types and areas of incentives chosen (Foray, 2008). As a result, the degree to which transfer of technology takes place under the TRIPS Agreement is still unclear, as are the specific measures that might be taken to encourage such flows of technology.

In the context of the UNFCCC, determining or addressing the role of IPRs in the transfer of climate-related technologies—although it has not been the focus of most related discussions—is not proving any easier. The UNFCCC and the Kyoto Protocol, like most MEAs, contain specific commitments on technology transfer. Article 4.5 of the UNFCCC urges developed country Parties, for example, to take all practicable steps to promote, facilitate and finance the transfer of, or access to, environmentally sound technologies and know-how, particularly to developing countries. Article 10 of the Kyoto Protocol, among others, reaffirms these commitments. Under Article 4.3 of the UNFCCC, moreover, developed country Parties are required to provide the financial resources needed by the developing country Parties to meet the agreed full incremental costs of implementing their obligations, including for the related transfer of technology. Indeed, the effective implementation by developed country Parties of their commitments on transfer of technology is inherently linked to the extent to which developing country Parties are required to implement their own commitments. As in other contexts, however, the difficulty of realizing the goals and complying with the obligations of transfer of technology in the climate change context highlights the importance of moving beyond language to concrete consideration of the problems and the potential solutions.

For example, in the UNFCCC context, the challenge of technology transfer really presents two related but different challenges. Technology is needed in least-developed and small developing countries as an engine of development, and the challenge is to ensure that it does indeed come, and that what comes does not contribute unduly to global climate change. As well, technology is needed in the fast-growing developing economies to help blunt the impact of growth on global climate change. The substantial energy infrastructure being put in place in those countries will, after all, be locked in for generations to come. Of course there is no bright line separating these categories of countries, but to the extent that their situations differ, so do the needs and dynamics of each with respect to climate-related technology needs.

The exact role of IP in the transfer of climate-related technologies remains unclear, however. IP is not mentioned expressly in UNFCCC or Kyoto Protocol provisions on transfer of technology. It was, however, been raised in the discussions of the Expert Group on Technology Transfer, for example, as both an element of and a potential obstacle to an "enabling environment" for transfer of technology—the establishment of the institutions, regulations, and policies needed to promote technology transfer. In a report by UNFCCC (2006) that identified common needs for and barriers to environmentally sound technologies in developing countries, IP-related issues did not feature prominently within a broad range of economic and market barriers to the transfer of technology. Although no comprehensive study has been conducted on the potential impact of IPRs in the different categories of climate-related technologies, initial research found that the impact of patents on access to solar, wind and biofuel technologies in developing countries might not be significant (Barton, 2007). On the other hand, studies by the European Patent Office (2007) have noted the increasing number and scope of patent claims in wind energy and biofuels technologies. The precise implications of these patent trends for the transfer of technology in these industry sectors remain uncertain.

Nevertheless, there are already significant calls to address the potential adverse effects of IP on the transfer of climate-related technology. On the eve of the Bali conference, for example, the European Parliament adopted a resolution, which stated that an ambitious post-Kyoto agreement might require "corresponding adjustments" to be made to other international agreements, including on IP.[25] In discussions on the Bali Action Plan, moreover, several developing countries have stated as their position that IP is one of the various obstacles that must be addressed in a systemic and cross-cutting manner to promote the transfer of technology. In the initial round of talks in 2008, Cuba, India, Tanzania, Indonesia, China and others stressed the need to address IP within technology discussions, while some developed countries including Australia and the U.S., affirmed their belief that IP was not a barrier, but a catalyst for technology transfer.[26]

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25 European Parliament resolution of 29 November 2007 on trade and climate change (2007/2003(INI)).

26 The first meetings of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol and the Ad Hoc Working Group on Long-term Cooperative Action under the Convention were held in Bangkok in April 2008.

As discussions on the Bali Action Plan continue, more research and analysis on the relationship between IP and the transfer of climate-related technologies will be useful in bridging these gaps. In addition, it will be helpful to increase the awareness and understanding of the types of measures that exist or could be taken—within and beyond international IP rules—to enhance the role of IPRs and other incentive schemes in promoting technology transfer. Measures within the international IP system will be looked at below.

Promoting the transfer of climate-related technology in the TRIPS Agreement

A central aspect of the TRIPS Agreement is that it not only establishes minimum standards of IP protection, but also incorporates certain flexibility, allowing countries to position IPRs in the context of their public policy objectives and priorities. For example, the TRIPS Agreement allows for certain limitations and exceptions to the protection of IPRs, and for national determination of the appropriate method of implementation. These provisions are known as "TRIPS flexibilities" and have been found to provide critical policy space in areas ranging from biodiversity and agriculture to public health and education.

The issue of TRIPS flexibilities came to the forefront of international discussions in the context of public health policies. These discussions led to the adoption of the Doha Declaration on the TRIPS Agreement and Public Health, as well as an amendment to the agreement to address the difficulties that WTO Members with insufficient or no manufacturing capacities in the pharmaceutical sector could face in making effective use of some of the TRIPS flexibilities. Though parallels with other public policy areas must be taken forth with care, the experience with the issue of public health has become a reference point for the discussion of TRIPS flexibilities, including in the context of the transfer of climate-related technologies. This section thus draws repeatedly on this experience, without aiming to advocate a similitude between the problems and the potential solutions in the two areas.

The issue of TRIPS flexibilities has already come up in ongoing discussions at the UNFCCC, where some Parties expressed their concern that these flexibilities may be insufficient to ensure a rapid and widespread transfer of technology. Nevertheless, it is useful to begin by looking at the types of provisions that are available for WTO Members, and could be useful in relation to climate-related technology transfer. For example, several provisions on patents—the exclusive rights granted for an invention—are deemed pertinent to enhancing the transfer of technology to developing countries. These provisions include:

- *Exemptions to patentability*. Patentability refers to the boundaries established in relation to what inventions—generally, products or processes that offer a new technical solution to a problem—may be patented. Prior to the TRIPS Agreement, countries could exclude inventions of certain types or in certain areas of technology, such as pharmaceutical products and agricultural meth-

ods, from patentability, based on their development priorities and strategies. Article 27.1 of the TRIPS Agreement now requires WTO Members to grant patents to all types of inventions in all fields of technology, as long as these inventions meet certain basic criteria. However, because the TRIPS Agreement does not define the patentability criteria (namely novelty, inventive step and industrial applicability), some critical policy space remains in relation to the scope of patentability in each country. The loose definition of these criteria has raised concerns given the resulting all-encompassing patents. For example, patent claims on synthetic biology products and processes among the most promising technologies for cellulosic biofuels are so broad that scientists worry it could bring the discipline to a standstill (Suppan, 2008). Defining the patentability criteria to adequately limit the scope of patents, on the other hand, would have a positive impact on further innovation by limiting the possibility of conflict with existing patents. In addition, in some contexts, it would also enhance the transfer of technology. Low-income countries in which market-based channels of technology transfer, such as investment and licensing, are not effective could safeguard other pathways to access some climate-related technologies, such as reverse engineering.

- *Exceptions to patent rights*. The TRIPS Agreement recognizes that the rights of a patent owner to prevent third parties from exploiting the patented product are not absolute. Indeed, Article 30 states that WTO Members may provide "limited exceptions" to these rights. That is, countries may—under certain circumstances—automatically allow the use of the patented invention by a third party without consent of the patent holder. The TRIPS Agreement does not define these circumstances, which will be linked to national policies and objectives. For example, a common exception addresses experimental use, allowing the use of patented inventions for research or experimental purposes by parties other than the patent owner. This type of exception will be relevant in the climate change context, where adaptation of the technology to local needs and environments will be particularly vital. It would also allow companies in developing countries to "invent around" patent claims to gain access to environmentally sound technologies, which has proved important in the context of the implementation of other MEAs.
- *Compulsory licences*. There are also other cases in which the TRIPS Agreement allows the use of a patented product or process without authorization of the rights holder. One of the most important—and perhaps most controversial—is the granting of compulsory licences. These non-voluntary licences are granted by an administrative or judicial authority to a third party, allowing the exploitation of the patented invention without consent of the patent owner.[27] Developing country Members consider this possibility as essential to ensuring that they can implement the TRIPS Agreement in a way that responds to broader public policies.

27 The process does have a number of safeguards under Article 31 of the TRIPS Agreement, of course, including the requirements that the proposed user should have made good faith efforts to obtain authorization from the patent holder, the use will be for domestic supply only, the patent holder shall be granted "adequate" remuneration, there be an established review process and so on.

Article 31 of the TRIPS Agreement, which deals with compulsory licences, does not define the grounds on which countries may allow non-voluntary licences, although a number of conditions and procedural steps are required. Climate mitigation or adaptation could provide valid ground for compulsory licensing, and could even be considered to be included in general references to "public interest" in most patent laws. Some countries also foresee compulsory licences in cases in which the invention is not exploited in the country, or is insufficiently exploited. Such a measure could restrain some of the anti-competitive practices feared as potentially impeding the transfer of climate-related technologies to developing countries. It is interesting to note that the issuing of compulsory licences in certain situations, including cases of national emergency, other circumstances of extreme urgency or public non-commercial use, is less arduous.[28] These compulsory licences could thus prove an effective tool to ensure rapid access to critical climate-related technologies in developing countries.

Beyond patent provisions, there are several other TRIPS flexibilities that may be pertinent in the context of the transfer of climate-related technologies. For example, Article 40 addresses competition policy, focusing on licensing practices that restrain competition and may impede the transfer of technology. As noted above, one of the concerns is that the market power provided by IPRs will result in restrictive practices that limit access to climate-related technologies. As a result, it is important to note that, under the TRIPS Agreement, WTO Members may adopt appropriate measures to prevent or control such practices. Another notable provision is Article 66.1, which recognizes the special needs and requirements of least-developed country Members and awards a special transition period for the implementation of the TRIPS Agreement. During this transition period, which is currently set to expire on 1 July 2013, these countries have available a range of channels for transfer of technology including, for example, imitation and reverse engineering.[29] These channels allow immediate and free access to some knowledge and facilitate the building of productive capacities, which is particularly important in conditions in which other channels of technology transfer, such as foreign direct investment and licensing, are not effective (Maskus, 2003).

From this overview, it is clear that the potential contribution of TRIPS flexibilities to climate-related technology transfer is significant. Indeed, there is no evidence to date that these flexibilities will not be sufficient to allow international IP rules to support the rapid and widespread transfer of technologies needed for climate change mitigation and adaptation. Moreover, the use of these flexibilities for climate change has not yet been challenged. Increasing public attention and concerns on the relationship between IP and the transfer of climate-related technologies, however, have resulted in calls for such measures and adjustments to the

28 In these cases, the requirements are waived for efforts to obtain authorization from the rights holder on reasonable commercial terms and within a reasonable period of time.

29 In addition, in 2002, WTO Members approved a decision extending until 2016 the transition period during which LDCs do not have to provide IP protection for pharmaceutical products.

TRIPS Agreement to support the post-Kyoto climate regime. In his speech to the UNFCCC Conference of the Parties in Bali, the Brazilian Foreign Minister proposed that a statement similar to the Doha Declaration on the TRIPS Agreement and Public Health should be considered in the climate change context. The European Parliament, for its part, has recommended launching a study on amendments to the TRIPS Agreement required to allow for the compulsory licensing of environmentally necessary technologies.

Proponents consider that these changes could establish and consolidate policy space that is important for a successful technology component in a post-Kyoto climate change regime. Explicitly incorporating climate protection as a grounds for compulsory licensing, or establishing a specific, streamlined procedure for issuing compulsory licences for technologies needed for climate change mitigation and adaptation would both be helpful in this regard. Other suggested modifications include limiting the patentability of climate-related inventions and shortening their length of protection (Third World Network, 2008).

However, it is important to keep in mind the difficulties and vast political cost of modifications to the TRIPS Agreement, which became clear in the IP and public health debate. In addition, given the ongoing promotion of an agenda of higher levels and enhanced enforcement of IP protection, the risk of "opening" the TRIPS Agreement should not be taken lightly. Finally, on an issue as complex as climate-related technologies, it is questionable whether effective solutions could be achieved in the Council for TRIPS, a forum with a specific and limited approach. A similar situation arose in relation to IP and public health, which is now being addressed—in many opinions, more effectively and comprehensively—in the context of the World Health Organization. As a result, it is important to define the role of the UNFCCC and the climate regime itself in addressing the relationship between IP and climate-related technologies.

Intellectual property and the transfer of technology in the post-2012 climate regime

The scope of the Bali Action Plan would allow the consideration of a number of measures related to IP and other innovation and access to knowledge schemes in the context of a post-2012 climate regime—measures that may prove more feasible and effective than those sought in the context of the TRIPS Agreement. Although a detailed analysis of these potential measures is beyond the scope of this paper, it is nevertheless relevant to briefly mention the possibilities available in the context of ongoing UNFCCC negotiations. Some are already being discussed, including financial mechanisms to address the link between IP and the transfer of technology and guidelines on IP protection for publicly-funded technologies. Other emerging topics include prizes as incentives to climate-related innovation, and institutional arrangements for open or collaborative innovation.

Financial mechanisms are considered an important approach to addressing the issue of IP and transfer of technology. A "Multilateral Technology Acquisition

Fund," for example, has been proposed as a way to fund the transfer of technologies to developing countries through, *inter alia*, the buying-out of IPRs.[30] Given the relative success of the Multilateral Fund for the Implementation of the Montreal Protocol, such a proposal is actively being considered in the negotiations. Nevertheless, Anderson *et al.* (2007) note that, under the Montreal Protocol, "IP rights did not constitute as large a barrier to technology transfer as was feared." Moreover, it is unclear that the case-by-case approach used in ozone-related technologies would work in the climate change context, given the greater range of relevant technologies and potential patent challenges.[31]

The implications of public financing for the IPRs available over climate-related technologies have also been raised in the UNFCCC context, albeit not in recent negotiations. Government financing of research and development—significant in most environmentally sound technologies—particularly benefits climate-related technologies. Nevertheless, such financing currently has few implications for the mode of ownership, commercialization or transfer of these technologies, which are usually protected by IPRs (UNCTAD, 1998). As a result these technologies, though stemming from publicly-funded R&D, are not necessarily publicly available. A series of guidelines might guide public entities to retain some influence on the use and commercialization of publicly-financed climate-related technologies, and could be considered in the post-Kyoto climate regime.

30 See, for example, the statement of the African Group in COP-12 of the UNFCCC.

31 In addition, it should be noted that in the case of ozone-depleting substances, alternative technologies to specifically and effectively address the problem had been identified and were available, which is not the case in the climate change context.

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In-session Discussion

John Barton

This section surveys the discussions that took place at the June 2008 Copenhagen Trade and Climate Change Seminar on the subject of technology transfer and intellectual property rights. While every effort has gone into ensuring that these notes accurately represent the outcome of the session discussion, they are not intended to convey any explicit consensus of the session participants, and are written on the sole responsibility of the session facilitator, John Barton. Mr. Barton was aided in his efforts by Kristin Luber, who acted as rapporteur.

The session opened with a description of the historical concern that patent rights awarded under the WTO's TRIPS Agreement were inflating the cost of important life-saving drugs, taking them out of reach of the hands of those who need them the most. This concern was particularly acute in the case of Africa, where the price of HIV and AIDS medications has been at levels that price out most of the population. These concerns sparked a debate over whether or not intellectual property rights (IPRs) required under TRIPS should be applied to public health sector. Some stakeholders felt they were counteractive to the goal of public health, while others felt them critical for recovering the real costs of pharmaceutical research and development.

This debate culminated in the 2001 Doha Declaration of the WTO 4th Ministerial Conference.[32] The Declaration recognizes the importance of public health in interpreting the TRIPS Agreement, and, together with a subsequent TRIPS amendment, clarifies the possibility of compulsory licensing and third party supply of patented drugs. A group of trade specialists, policy officials and environmentalists have begun arguing that a similar type of amendment could be put in place to help facilitate the transfer of clean technology and climate-friendly goods.

The group quickly agreed that technology transfer is crucial to any Copenhagen agreement. It is politically essential, as indicated by the mention of technology in the Bali Action Plan and in the broader perception that technology transfer is part of the exchange for a developing country move towards binding commitments on greenhouse gas (GHG) emissions. It is also economically essential—nations will be unable to control their emissions adequately unless they have access to new technologies.

After some discussion, general consensus emerged on a second and crucial point: that IPRs are not as serious a barrier to technology transfer in the climate change sector as they have been in the pharmaceutical sector. Therefore it was felt that a Doha-type declaration was not needed at this point in the climate change context. This is partly because of practical problems of definition: almost any good

32 "Declaration on the TRIPS Agreement and Public Health," November 20, 2001. WT/MIN(01)/DEC/2.

can be labelled as "climate friendly."[33] But mostly it is because of the ways the industrial structure in the various climate-change sectors differs from those in the pharmaceutical sector. In the pharmaceutical sector, each product often has an effective monopoly (because it may be the only or the best treatment for a particular disease), and the effect of IPR exclusivity can be to permit a price mark-up that is enormous (up to a factor of 100) compared with actual costs of production. In contrast, in the climate change sector, new technologies are often in competition with others and must therefore be priced reasonably. The markets, for example, for renewable sources of electricity, such as wind and photovoltaic, are dependent on price. Industries are often relatively fragmented. The mark-up on manufacturing cost is therefore much less in the sector, so that royalties are a relatively small component of the cost of the adapting the new technologies. The major components of the cost are instead the actual goods and services involved.

Nevertheless, concerns were expressed. For example, the Chinese are said to believe that there are important patents on carbon capture and sequestration (CCS) technologies. There are certainly patents in the biofuel context, and there has been concern expressed about patents on flex-fuel automobiles (although many competing firms manufacture such automobiles). Might there be a particular problem with platform technologies?[34]

The group felt that there was a possibility that the current generally positive picture might not always hold. Patent holders might be irrational in their licensing policy. Industrial structures might be different in the future than they are now. And there is the possibility of patents monopolizing mandated standards, such as the patents that were acquired by UNOCAL in the 1990s covering certain reformulations of gasoline needed for the California market. Although these specific patents became unenforceable as a result of an anti-trust consent decree, one cannot always count on such unenforceability.

The group therefore considered ways to protect against such future possibilities. Such consideration is also important, it was argued, because many participants in the climate change negotiations believe that the pharmaceutical analogy may apply—that IPRs are a serious barrier to technology transfer and therefore to any effective global effort on climate change. The response proposed by the group was to include a monitoring system in any post-2012 climate change agreement. This system would review trends in actual technology transfer and would raise a red flag if IPR appeared to be causing problems. The intention was that the red flag would be credible and politically significant enough to force reform at the time, as through a future analogue of the Doha Declaration on TRIPS and Public Health, designed, of course, in accordance with the actual IPR issues that actually emerge in the future.

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33 See the discussion in the chapter in this report on liberalizing trade in low-carbon goods.

34 Platform technology is a term for technology that enables the creation of products and processes that support present or future development.

Even though IPR problems may not now be a serious barrier to technology transfer, there are other barriers. The real technology transfer that is needed requires the construction of new facilities to produce fuel and electrical power in more sustainable ways, to produce other commodities with less production of GHGs and to serve consumer needs. The overall costs may be very substantial. In some cases, these facilities will be economically attractive only if there is appropriate new regulation, such as the feed-in tariffs used in Europe to encourage use of renewable energy sources for electricity. Sometimes, the new technologies may not yet be economically competitive, but may be expected to become competitive as they are improved and work down a learning curve. The R&D involved is closely connected to industrial policy and international competitiveness. And there are questions of absorptive capacity and infrastructure. Hence, the task of technology transfer is in reality extremely complex. It is essential for each nation to design appropriate regulation and, in some cases, apply subsidies to encourage the adoption of those technologies that are not otherwise economically attractive to investors—this regulatory environment is crucial!

The group noted that some technology transfer has occurred through the Clean Development Mechanism (CDM) particularly in the wind sector. This generally involves the private sector, and has led to significant financial flow to some developing nations. Nevertheless, many doubted whether the CDM could deliver major reductions, particularly because of the substantial role it provides to governments in the follow-up as to whether additional emission reductions actually take place—governments are too forgiving of one another! The project approach does not allow the CDM to include many forms of GHG production. Moreover, the role of CCS under the CDM is currently a matter of debate, and the transaction costs under the CDM are large for smaller projects.

The group discussed the Clean Technology Fund: a new fund developed by the EU, U.S. and Japan, which will be administered by the World Bank. This fund is seen as a precursor to a new mechanism under the Copenhagen agreement. The fund aims to pay the difference of installing clean technology projects in developing countries (as compared with the cost of installing less clean projects). Participants thought such a fund could be a signal to the private market as large banks have stakeholders eager to invest in these projects. Participants also thought the fund could work as a catalyst for a UNFCCC clean technology fund and could assist in building the necessary infrastructure in developing countries to effectively and independently run the clean technology projects.

Such an approach was certainly successful under the Montreal Protocol. It was, however, viewed skeptically by many in the group. The capital needed to actually transfer technology for climate change is far greater than that involved in the ozone layer agreement. It is unclear how to determine which projects will receive support, e.g., placing carbon capture and sequestration (CCS) on top of coal plants in China. The management of the funds is likely to be politically contentious, as emphasized by the history of the Global Environmental Fund. It will also be difficult to obtain donor nation support for transferring technologies in those sectors, e.g., steel, in which the recipient nations may be producing products that compete with those of the developed world. And it is doubtful that

donor nations will be eager to provide funds to nations that have substantial accumulations of capital—indeed some potential recipient developing nations are investing in developed nations.

In facing this problem of transferring technologies, the group noted that there are possibilities, even for the poorest nations, such as cookers that reduce air pollution. The group suggested much more attention to public private partnerships (PPPs) of the type that have evolved in a number of other sectors. These include not just the medical sector (as exemplified by the International Aids Vaccine Initiative) but also other sectors, in particular those where such a partnership is used to finance the provision of a service in the developing world. It is important in designing these partnerships to get the private sector interested. The group also noted the possibilities of public funding, particularly for the technology needs of the poorest nations.

The group also strongly emphasized the need to serve developmental goals along with environmental goals. Mitigating the effects of climate change and alleviating global poverty are closely linked goals. The developing world will not be willing to proceed down a climate change road unless it is given an appropriate opportunity to balance environmental goals with developmental goals—and this will have an impact on climate change technology transfer. In many cases, technology will be needed not just to reduce GHG emissions, but to serve developmental aims while limiting GHGs.

Conclusions and Research Agenda

Given remaining uncertainties, a definitive conclusion on the relationship between IP and the transfer of climate-related technologies is not yet feasible. Similarly, there is still little clarity as to the manner to best address this relationship in the various relevant international institutions and rules, and not much discussion on the modalities by which we might address the different challenges posed by fast developing and least-developed countries. Nevertheless, an overview of the potential opportunities and challenges presented by international IP rules to technology transfer under the post-2012 climate regime does present important lessons for possible next steps both in the UNFCCC and in the WTO.

First, it should be noted that the TRIPS Agreement has a number of provisions that could be used to promote the transfer of climate-related technologies. The use of these flexibilities has not proved easy in other areas, but there is no *prima facie* evidence of such obstacles in the climate change context. Existing possibilities, therefore, should be explored in full.

It is also important to note the need for negotiating expertise in the area of technology and IPRs—an expertise that is not shared by many environmental negotiators.

As well, the consideration of measures related to IP and other incentive schemes should not be limited to the discussions on the TRIPS Agreement, but should also consider opportunities within climate negotiations. Considering IP-related issues in the development of measurable, verifiable indicators of technology transfer, for example, could be helpful in ensuring adequate consideration of any positive and negative impact of IP on the implementation of the relevant UNFCCC and Kyoto Protocol provisions. It would be useful to explore how to measure IP's contribution to or frustration of technology transfer for climate change, particularly in light of the language in the Bali Plan of Action that technology transfer must take place in a "measurable, reportable and verifiable manner." (Note that this language can create perverse incentives in evaluating projects that turn out not to work, for the evaluation can lead to arguments that reciprocal responsibilities are excused.)

In addition, a number of mechanisms increasingly explored and used in other public policy areas—including health, education and R&D—provide interesting examples to explore in ongoing UNFCCC negotiations as ways to enhance the technology transfer component of the post-Kyoto climate regime.

Research is needed describe the climate-related technologies most strategic for developing countries, the patent landscape of those sectors and goods, and the manner in which these patents impact the transfer of technology in practice (looking, for instance, at licensing arrangements: how technology is being commercialized, under what conditions, and to whom) could assist in moving negotiations towards more concrete problems and potential solutions.

Research also needs to be carried out to explore the hypothesis that IPRs are not likely to have a serious impact on technology transfer in the area of climate change, focusing on the technologies identified above. In making such an evaluation, the number of patents in the area is not the key issue—there will be many patents. Rather the key issue that may distinguish the pharmaceutical area from the climate change area is licensing practice and whether effective IPR-based markups and royalty rates are likely to be substantial as in pharmaceuticals or only a minor portion of overall costs. It is essential to get beyond anecdotes.

Whatever the importance of IPRs, there are surely other avenues of policy that are also important, or are of complementary importance, in fostering technology transfer. Research should identify the regulatory and subsidy structures likely to be useful to developing nations in achieving reasonable GHG control. This is crucial, for it is often only through such structures and arrangements that the technologies will become economically deployable. And the appropriate arrangements are likely to differ from nation to nation. And it should identify those elements of policy that might improve the capacity of host countries to receive and use new climate change technologies.

More research is also needed to identify and evaluate alternative methods of technology development and transfer that involve direct government actions, such as PPPs. There are many different forms of PPP; it is not yet clear which are applicable to climate change technologies. How have the processes worked? What about development of best practices?

Chapter Five: Clean Energy Investment

Key Issues

Aaron Cosbey

Summary of key issues, challenges

- If investment in energy infrastructure falls short of the monumental levels needed, we will be facing a crisis of development. If the investment materializes and is channelled into traditional modes, however, we will have a crisis of environment. The efforts needed diverge much further from the baseline case than we have yet succeeded in going.
- One of the ways to address this problem is to focus on fostering significant new flows of clean energy investment from the private sector. The public sector funds committed to date, and likely to materialize in future, are probably an order of magnitude too sparse.
- At the international level, international investment agreements (IIAs) may contain language that leaves government regulators exposed to binding compensable arbitration over climate change-related measures that impair investor profitability.
- At the domestic level, addressing policy and regulatory obstacles to clean energy investment may be one of the most important ways that governments, multilateral development banks (MDBs) and donors can observe their various technology transfer obligations. Trade policy may have a role to play here, similar to the role it plays in the Integrated Framework collaboration that aims to help LDCs better exploit potential gains from trade liberalization.

Introduction

Energy investment in developing countries is critically important to achieving development goals. According to the World Bank (2006:1):

> *Without access to modern energy services, the poor are deprived of opportunities for economic development and improved living standards. Modern energy services provide lighting, cooking, heating, refrigeration, transportation, motive power and electronic communications that are indispensable to increasing productivity, creating enterprises, employment and incomes, and accessing safe water and sanitation, as well as health and education.*

A key aspect of the development challenge for the coming decades is the immense need for new energy supplies. For many in developing countries the issue is basic needs. 2.4 billion people still use traditional biomass for cooking and heating, and 1.6 million women and children die each year from exposure to the resulting indoor air pollution (*Ibid*). 1.6 billion people worldwide have no access to network electricity (mostly in Sub-Saharan Africa and South Asia), and 80 per cent of those are the rural poor of developing countries (IEA, 2006: 157).

Energy needed to feed rapid economic growth in urban centres is also significant. IEA (2007) cites a need for $22 trillion in new energy investment between 2005 and 2030.[35] By 2030 the result would a 55 per cent increase in global primary energy use, with developing countries accounting for three quarters of that total (IEA, 2007). China alone in 2005 added more than 70 GW of new capacity to its grid—equivalent to adding two 650 MW generating stations per week or adding, over the year, the entirety of the U.K.'s installed generating capacity (Green, 2006).

In some sense, the IEA investment figures are better understood as a warning than as a projection: if these torrential flows of new investment do not materialize—and there is no promise that they will—then we will have a crisis of development.

On the other hand, as the IEA also makes clear, if they materialize along the lines of business as usual, then we will have a crisis of *environment*. Energy is a huge part of the climate change equation, accounting for some 80 per cent of global CO_2 emissions (IEA, 2007). IEA's reference case—the scenario that involves $22 trillion of new investment—results in a 57 per cent increase in CO_2 emissions by 2030. Even the IEA's best-case scenario—the *Alternative Policy Scenario*—results in a 27 per cent increase between 2005 and 2030.

These figures stand in alarming contrast to the needs, as laid out by the IPCC's Fourth Assessment Report and others (IPCC, 2007). The IPCC analysis, which is criticized by many as being too conservative[36]—estimates that to have even a 50 per cent chance of making a stabilization target of a 2°C global temperature increase, global emissions will have to peak by 2015, and be reduced from year

35 This is the IEA reference case.

36 See, for example, Hansen, 2007; Spratt and Sutton, 2008.

2000 levels by 50–85 per cent by 2050.[37] In other words, even the IEA's most optimistic projections take us squarely in the wrong direction.

Missing the 2°C target is seen by many to be courting disaster that extends beyond the environmental, to significantly impact development goals as well. According to the UN Scientific Expert Group on Climate Change (2007:5):

> *In our judgment and that of a growing number of other analysts and groups,... increases beyond 2°C to 2.5°C above the 1750 level will entail sharply rising risks of crossing a climate "tipping point" that could lead to intolerable impacts on human well-being, in spite of all feasible attempts at adaptation.*

Meeting the challenge

Daunting though this context may be, it is nonetheless possible for energy to make a substantial contribution to sustainable development. There are four elements to a success scenario:

1. Massive new investments globally in clean energy,[38] but most significantly in the developing countries that are the major source of growth in energy demand to 2030.
2. A transformation of existing energy supply infrastructure, primarily focused in developed countries where the majority of the world's stock is located.
3. A long-term collaborative effort by governments to foster revolutionary new clean energy technologies, and to help commercialize promising existing immature technologies, given the hurdles faced by private sector investors to doing so unassisted.
4. A focus on consumption, particularly but not exclusively in OECD countries. In part this can be achieved by a focus on end-use energy efficiency and conservation measures. But absolute reductions in consumption will also be necessary, particularly in light of likelihood that successful conservation and efficiency efforts will simply allow for increased consumption (the so-called "rebound effect") (Polimeni *et al.*, 2008).

This chapter focuses on the first of these four challenges (without prejudice to the importance of the other three). That is: how do we ensure that investment flows into new clean energy infrastructure in developing countries?

Public investment in clean energy has been on a steady increase. In February 2007 the finance Ministers of the U.S., U.K. and Japan proposed a $10 billion Clean

37 IPCC (2007: table TS.2). The 50 per cent odds are implied by the fact that the figures in that table are based on "best estimate" of climate sensitivity of 3°C, meaning there is a roughly 50 per cent chance that it could be higher or lower than 3°C. Obviously the shape of the probability distribution is also important.

38 For the purposes of this chapter, clean energy technologies can be defined as those that emit substantially fewer GHGs than their conventional counterparts.

Technology Fund to "help developing countries bridge the gap between dirty and clean technology" (Paulson, Darling and Nukaga, 2008). Part of Japan's Cool Earth Partnership, a fund worth $10 billion over five years, would go into the CTF, as would $2 billion from the U.S. and $1.5 billion from the U.K. over three years. Japan has also contributed to two funds in the Asian Development Bank that may have some impact in this area—the Investment Climate Facilitation Fund and the Asian Clean Energy Fund. As generous and necessary as such expenditures are, however, they are a drop in the bucket relative to the need. Even if 100 per cent of these funds were directed straight to clean energy investment in developing countries (in reality much less than that will be so directed), and was renewed annually until 2050 at those levels, it would amount to less than one per cent of developing country needs for such investment as projected by the IEA, even for its reference case.[39]

Obviously the private sector is going to have to be the main driver for the needed levels of investment. Private sector clean energy investment has, in fact, been growing at a furious pace over the last few years. In 2004 it stood at $30 billion globally, and by 2007 this figure had almost quadrupled to $117 billion (UNEP/NEF, 2007). While this is an encouraging trend, the volumes do not yet stack up well against the needs. Of that $117 billion only $55 billion was actual asset financing (the remainder being *inter alia* investment in IPOs, venture capital and private equity). IEA's $22 trillion figure averages out to 16 times this much annually.

This leaves us with the question: how can governments, MDBs and IGOs facilitate more of this kind of investment? With the limited funds available relative to the needs, it is inevitable that the best they can do is to act as facilitator and catalyst for larger flows of private sector resources. This section argues that there are several avenues that might be successfully pursued by governments to make such investments more attractive for private sector lenders and investors. It asks: what are the obstacles to clean energy investments, and what are the missing incentives? It finds these at both the international and domestic levels.

Obstacles and opportunities: The international level

The international regime for investment is, in fact, less like a regime than it is like a spaghetti bowl of separate agreements. There are a few obligations under the WTO's Agreement on Trade-Related Investment Measures, there are considerably stronger provisions contained in over 2,500 bilateral investment treaties, and there are about 30 investment chapters in bilateral and regional free trade agreements with commitments of a similar, often more ambitious, nature. The overall

39 Even if we assumed the funding was mandated to cover only the incremental difference between clean and conventional energy infrastructure, rather than covering the total needed investment, we would come up an order of magnitude short.

number of such international investment agreements (IIAs) is growing furiously.[40]

How does that body of law affect investment in clean energy? Its ostensible purpose is to protect investors, and thereby to increase flows of investment.[41] In the event that it did so—and the much-debated question of whether it does is beyond the scope of this paper—investment law might help foster clean energy investment, though it could conceivably also foster investment in traditional high-GHG emitting installations. As well, it might restrict policy flexibility to regulate in favour of clean energy. Or it might also be used to allow for proactive discrimination in favour of clean energy investment. These last two possibilities are briefly examined below.

Investment law varies from agreement to agreement, and the types of measures it applies to are specific to each case, but it is nonetheless possible to say in general terms how the "typical" investment law provisions might affect certain types of measures that favour clean energy investment.

Official promotion of clean as opposed to "dirty" energy investment would be unaffected under most IIAs, since in only a few agreements are there obligations that cover pre-establishment. That is, most investment law covers treatment of investors only *after* the investment has been made. For those few IIAs (albeit a growing number) that do cover pre-establishment investments, as long as government promotion of clean energy treats foreign and domestic investors alike, there should be no legal concerns.

A policy that created new limitations on GHG emissions from exiting installations, or which outright closed them or demanded significant retrofits from them, would face two types of restrictions, based on commitments in most IIAs related to expropriation, and to fair and equitable treatment. If the new policy had significant economic impacts (regardless of whether or not it had the same impacts on domestic facilities), the foreign investor might be able to argue that his or her investment was being indirectly expropriated, and claim damages. The case law on this is contradictory, some saying that a non-discriminatory measure of general application taken in the public interest cannot be expropriation, and others saying that any measure with strong enough economic impacts is expropriation, with damages due.[42] In the final event there is no *ex ante* certainty on this question.

The second type of obligation—fair and equitable treatment—is mostly about just and transparent process. But it has also come to mean, in some awards, no costly regulatory surprises. Most *bona fide* regulation, if undertaken transparently and

40 For an overview of that growth, and the drivers that underlie it, see Cosbey *et al.* (2004).

41 It did just this in the case of *Nykomb vs. Republic of Latvia*, where the investor took Latvia to binding arbitration after it retroactively changed a regulation that had decreed a higher feed-in tariff for new energy supply.

42 For an example of the former, see *Methanex vs. the United States of America*. For an example of the latter, see *Metalclad vs. the United States of Mexico*.

fairly, would be safe from such challenge, unless there was a stabilization clause in place between the investor and the host government. Such agreements typically guarantee an investor unchanged regulatory treatment for a number of years, and if one exists when new regulations are brought in, it can be the basis for arbitration under the fair and equitable treatment obligations.

A useful role for trade policy in this area would be to clarify the definition of expropriation, though such an undertaking would be difficult because of the scattered nature of the "regime." There is, certainly, precedent on which drafters can draw in elaborating *new* agreements, including language from the 2004 U.S. model BIT which cautions that "the fact that an action or series of actions by a Party has an adverse effect on the economic value of an investment, standing alone, does not establish that an indirect expropriation has occurred," and goes further to assert that "Except in rare circumstances, non-discriminatory regulatory actions by a Party that are designed and applied to protect legitimate public welfare objectives, such as public health, safety, and the environment, do not constitute indirect expropriations."[43] It might also be useful for trade policy-makers to consider the impacts of host country stabilization agreements on their climate-related obligations, there being a dearth of analytical work in this area.

Beyond the sorts of restrictions that IIAs might impose on domestic governments, it is useful to think about how such agreements might proactively foster clean vs. dirty investment. A survey of practice indicates that none of the current agreements do this, though the Energy Charter Treaty—a treaty explicitly aimed at fostering increased energy investment—does have some potentially useful environmental elements (Malik *et al.*, 2008).

Obstacles and opportunities: The domestic level

Investors, both foreign and domestic, consider a number of factors when making decisions on clean energy investment, a large number of which can be rolled together under the heading *domestic environment for investment*. In so doing, they assess how risky or difficult it will be to make an investment in a given country using a given technology, and add this to the expected costs. The sorts of barriers involved are varied. Some apply to all investments across the board; investors generally look for such things as political and macroeconomic stability, educated workforce, adequate infrastructure (transportation, communications, energy), functioning bureaucracy, rule of law, strong finance sector, as well as ready markets for their products and services.

There are a number of barriers that are specific to *clean energy* investment. These include a lack of clear guidance on future energy policy (lack of signals), monopoly structures for existing producers with lack of purchase agreements or feed-in tariffs for independent producers, lack of fiscal incentives for clean energy

43 U.S. Model BIT, Annex B.

production, weak environmental regulation and enforcement, subsidies for conventional energy sources, a domestic financial sector that has little experience with new technologies, and so on.

These types of policy barriers will differ fundamentally from country to country, a function of the many factors that shape national energy policies, including history, politics, geography and chance. But the basic story remains the same: many countries, particularly the least developed among them, are not getting their full share of potential clean energy investment because their existing policies make them unattractive for any but the highest return projects. This basic finding is repeated in study after study (Amin, 2000; Chandler and Gwin, 2008; Point Carbon, 2007: Dayo, 2008). That being the case, any focus on clean energy investment that does not address domestic barriers will be hamstrung from the outset.

What can be done to address this challenge, and is there a role for trade policy in the effort? The first need is for analytical national studies that highlight the obstacles to clean energy investment and the potential for profitable investment of this type. As noted above, the opportunities and obstacles will vary significantly from country to country, and diagnostic studies will help to identify the full range of potential actions that are needed to help make clean energy investment more attractive to both domestic and foreign investors. Trade policy-makers have taken a lead role in similar efforts, notably the Integrated Framework for Trade-Related Technical Assistance to Least Developed Countries, which has a mandate to perform these types of diagnostic studies to identify obstacles to increased export trade. The Integrated Framework is a collaborative endeavour, involving the International Monetary Fund (IMF), the International Trade Commission (ITC), the United Nations Conference on Trade and Development (UNCTAD), the United Nations Development Programme (UNDP), the World Bank and the WTO. The type of effort described here would obviously demand different partners, including the International Energy Agency, the World Bank (which has an active Energy Sector Management Assistance Program), perhaps the Energy Charter Treaty and others. But the WTO should arguably be at the table, given its mandates on investment and technology transfer, and its stated objective of sustainable development.

Following on from this type of diagnostic study there would need to be a concerted effort at implementation, in which trade policy-makers arguably have less of a role to play than do those involved with official development assistance. This again would mirror the role the WTO has played in the IF exercise.

Action in this area would also be possible at levels below the multilateral. In both diagnosis and implementation there may be a role for the types of cooperative mechanisms that are normally established under modern bilateral and regional trade agreements; these agreements typically cover cooperation, technical assistance and capacity building on environment and development matters, among others (OECD, 2007).

Concluding thoughts

There is a flurry of activity, funding and political capital being directed at the challenge of clean energy technology, aimed at getting it into the hands of investors in developing countries as they make decisions that will have climate change impacts for generations to come. The World Bank has established its Clean Technology Fund, Japan has announced its Cool Earth Partnership, the U.K. and U.S. have followed suit with billions of dollars committed. Other multilateral development banks and individual donor countries are also active in supporting dissemination of technology to address climate change concerns.

The related theme of technology transfer is also attracting an increasing amount of attention. For the first time in UNFCCC negotiating history it is a key issue, having been incorporated in the Bali Action Plan commitments. Negotiators are searching (with varying degrees of success) for ways in which to give effect to the technology transfer obligations to which they have subscribed under the UNFCCC, the Kyoto Protocol and the Bali Action Plan.

In the area of clean energy investment the two agendas come together. The problem of technology transfer is essentially an investment problem; not enough investment is taking place in transformative technologies that will both provide new sources of energy, and do so at a significantly lower cost to the environment. Successfully addressing the barriers to clean energy investment, making host countries more attractive for that investment, is essential for technology transfer. It is, in fact, arguably one of the most effective policy options that governments have available for fostering technology transfer. As noted above, governments cannot muster the scale of resources necessary to make them the primary drivers of technology transfer. Some argue further that they are ill-equipped because ownership of the requisite intellectual property rights vests with the private sector (a set of issues examined in greater depth in another of the background papers from this series on intellectual property rights and technology transfer). In any case, improving the domestic investment environment for clean energy technology is an entirely appropriate role for governments, MDBs and aid agencies in the pursuit of both development and environmental benefits. It is therefore surprising that in all the activity related to clean energy investment and technology transfer there has not been more attention paid to this challenge.

More attention also should be paid to the implications of international investment agreements for climate-related investment. The uncertainties of interpretation, particularly with respect to indirect expropriation, may in the final analysis chill new regulations designed to address climate change. And there may be potential for IIAs to take on an unprecedented proactive role in promoting clean investment, as opposed to any and all investment, but this possibility needs much more thoughtful analysis.

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In-session Discussion

John Drexhage

This section surveys the discussions that took place at the June 2008 Copenhagen Trade and Climate Change Seminar on the subject of clean energy investment. While every effort has gone into ensuring that these notes accurately represent the outcome of the session discussion, they are not intended to convey any explicit consensus of the session participants, and are written on the sole responsibility of the session facilitator, John Drexhage. Mr. Drexhage was aided in his efforts by Michal Baranowski, who acted as rapporteur.

While much of the discussion in this session recognized that the formal climate change negotiations can potentially play a critical role in promoting clean energy investments, for clean energy investments to significantly change business as usual forecasts on traditional energy use, the real action will take place in the form of private investment of one sort or another. The UNFCCC, multilateral development banks (MDBs), etc. can, at best, play a leveraging role in accessing much more significant amounts from the private sector.

The discussions then focused for the most part on the barriers and opportunities for increasing investments in clean energy.

Fundamental questions

Before that however, there was a discussion around the relative importance of this issue. The group was reminded that the IEA had forecast that to meet growing energy needs, particularly among developing countries, an additional $22 trillion would be required by 2030 and up to $44 trillion by 2050. If those levels of investment aren't met, we will face a crisis of development. However, if they are met exclusively, or in the main, through traditional fossil fuel sources, then we are likely to meet with a crisis of the environment. And if this effort is not managed correctly in its implementation, it could also create serious international equity problems.

This last point was particularly interesting, as there was an unease with how this issue was being cast—almost singling out those who currently lack any adequate access to energy to also deliver on the global clean energy mandate. There was a strong agreement around the table that the transition to a clean energy world needed much stronger leadership, particularly in the areas of implementation and financing, from OECD countries. The extent to which clean alternatives complement developing countries' wider development priorities, including energy security and health, will be a critical factor in the amount of "uptake" of clean energy by those countries.

It was also pointed out that this issue, unlike many others on the trade and climate change file, potentially carried a positive agenda; focusing on broadening and deepening clean energy investments could potentially be a "confidence build-

ing measure" that will demonstrate that this set of issues covers more than offensive trade measures, such as border carbon adjustments.

Questions of incentive

The first issue addressed revolved around incentives towards clean energy regimes and it was generally agreed that one necessary, but insufficient, condition was pricing carbon and other relevant greenhouse gas emissions. In fact, one could make the argument that the long term accomplishment of Kyoto was to set an investment signal, albeit a relatively weak one at this stage in time. The specific contribution of a post-2012 regime under the UNFCCC, then, is not so much developing and/or managing specific mechanisms but in continuing to place limits on GHG emissions, strengthening the overall investment signal. And price is just one component—also required are credible and transparent regulatory frameworks and, where appropriate, incentives that target the promotion of clean energy alternatives. Some caution is warranted on the latter point, given the recent experience of bio fuels development. Any decisions around incentives/subsidies must include a full life cycle analysis of supporting any particular technologies to ensure their overall environmental sustainability.

There was also some discussion on how feasible it was to speak of a global carbon price, particularly over the short to medium term. It is unlikely that developing countries, even the major economies, will agree to limits on their GHG emissions before 2020 (at the earliest) and most, if not all LDCs are likely to never have any such quantitative constraints on their emissions, begging the question how then to incentivize clean energy deployment in those areas without a carbon price. Clearly public funding opportunities will need to play a more prominent role in those situations but they can never expected to be the major players except in the most exceptional of circumstances. Domestic-level regulatory initiatives will have to play a major role in assigning a carbon price. Public-private partnerships, as a general principle, were agreeable to all, but further elaboration was not explored as much as clearly is required.

And of course, we have the Clean Development Mechanism (CDM), part of the Kyoto Protocol. There was some discussion as to how major a role it will play in the future, given some of the structural problems related to additionality, verification the relatively narrow scope of the instrument, but there was a sense that if it does continue to play a role, most see its profile increasing in LDCs over the next few decades and receding in more major developing economies (where it is currently prominent)—either due to them eventually taking on their own targets or to the development of other market mechanisms that focus more on sectoral/programmatic approaches. That said, no one disputed the fact that the CDM will likely not become the major vehicle for clean development, but one of a number of possible investment opportunities. And again, priority, if not the exclusive priority, will be first afforded to those clean energy initiatives that address primary development needs, including, but not limited to, energy and health.

Not much time was spent in trying to define clean energy: is it only traditional renewable? Could it also be hydro and other forms of non carbon sourced energy, even including nuclear? Carbon capture and storage? How does energy efficiency get captured in "clean energy" regime? These can hardly be treated in a homogenous manner (e.g., the CDM has yet to recognize nuclear or CCS in its suite of activities) and while this was recognized it was not addressed in this session.

International barriers to clean energy investment

Unlike the world of trade which, post-Uruguay Round, has developed a structured multilateral regime, investment has currently no such coherence and energy investment probably even less. It was accurately described in the group as "spaghetti bowl" of bilateral agreements and investment provisions in some free trade agreements, such as NAFTA. While no final views were shared, some thought it would critical to develop a more coherent international regime around clean energy. Kyoto, in fact, has effectively become the proxy mechanism of governance for clean energy, but perhaps something more discretely focused on clean energy investments would be preferable. Options, none of which are mutually exclusive, include an expanded IEA, the German push to create an International Renewable Energy Agency, an expanded mandate for the Energy Charter, or special provisions under the WTO devoted to incentivizing clean energy investments.

Areas of focus for such fora would include negotiating waivers allowing subsidies for relevant technologies, developing rules and/or codes of conduct for bilateral investment agreements that would treat clean energy areas in a preferential manner. It was pointed out that codes of conduct would hardly be sufficient incentives for clean energy investments and what might be more helpful is the "spotlight" practice—use a respected international organization, such as the WTO, OECD or IEA, to bring regular attention to a country's domestic energy and development practices and report on the extent to which that country is actually making the necessary transition to a clean energy future.[44] Again, the effectiveness of such programs was brought into question, with the observation that Canada, for example, regularly gets strongly criticized ("raked over the coals" might be more appropriate) by the OECD on its environmental performance, particularly as it relates to its GHG emissions, but it appears that has done very little in actually affecting energy investment interest in Canada.

44 The WTO's Trade Policy Review Mechanism was mentioned as a model, though it was noted that a great deal more openness to public input would be needed.

Domestic barriers to clean energy investment

Progress on developing an effective international regime for clean energy investment is likely to be glacial, as long as we don't accompany it with establishing strong incentives, domestically/internally, to support clean energy investment. For example, in many countries the most daunting part of the challenge has to do with the monopoly structure of their power sectors, though this has changed enormously over the past two decades.

Progress on a strong transition to clean energy will only take place in most developing countries in much the same way that it can only happen in OECD nations—through strong policy signals at the national level, coupled with fiscal/budgetary measures that reward /incent clean energy and penalize, or at least withdraw subsidies from, more carbon intensive fossil fuels. And those will only be considered if it can be demonstrated that taking on such measures also works to support their overriding development objectives. For example, China's aggressive Five Year energy efficiency programme is being pursued primarily to address their growing concerns on escalating energy and resource costs. The fact that it also works to reduce GHG emissions is not as critical a factor in the decision to push hard for energy efficiency across China.

Another important factor—common to all developing countries—is implementation. Here, national governments typically play far less of a role and local and/or regional governments can be absolutely critical in determining whether national policies or goals actually get enacted. And it is here where we need much more innovative thinking—energy service companies (ESCOs), micro-financing are but two examples—on how we can best support communities, SMEs and individuals to make the appropriate energy investments. Saying this is, of course, of a magnitude easier than actually getting it done, but there seemed to be strong agreement that it was here, more than anywhere else, that attention is most urgently needed. Capacity building would be an important component of that, but again, it needs to be structured in a way that works to use the market as the primary implementing force. For example, one could examine how the CDM could be reformed (or another market mechanism developed) that would provide stronger incentives for clean energy development. That is but one example, and we need to look at many other innovative approaches in other fields to see what we can implement in clean energy. Perhaps we need to revisit the notion of a Clean Energy Fund that could be financed by any number of means (again looking to the research and proposals already developed for financing an Adaptation Fund).

Conclusions and Research Agenda

Arguably, technology transfer is an investment problem; not enough investment (both domestic and foreign) is flowing into dissemination of clean energy technologies. The key challenge is how to make such investment a more attractive proposition. More emphasis on domestic barriers and opportunities, and on the influence of international investment law, are warranted.

That said, a clean energy future can only be attained through the full integration of development and environment. In particular, a clean energy focus will only be successful in developing countries (and indeed in developed countries) to the extent that it enhances energy security and access while also providing local health benefits.

That future can only be partially fulfilled under the UNFCCC regime. Many other actors at different levels will also need to play their parts. Further research is needed to explore the potential usefulness and possible forms of a dedicated multilateral regime addressing energy/clean energy. There is also a need for more thinking on how to mobilize private sector investment flows into clean energy at the levels that will be needed.

Public investment will also be important. OECD countries need to take the lead in reducing their domestic emissions and in supporting investment and technology development that drives clean energy while meeting the primary energy demands of developing countries. And the multilateral development banks need to focus on the areas of need identified here. In the current flurry of turf grabbing on clean energy investment, there seems to be no rush to address the sort of domestic barriers that will be critical in deterring private investment flows. MDBs are logical agents for this sort of work as it should mesh with current priorities and traditional expertise in development assistance: capacity building and improving the investment environment for both domestic and foreign investors.

Each country has its unique context, its own specific needs, barriers and opportunities, meaning that any one-size-fits-all approach is doomed to failure. There is a strong need for country-specific research of the needs and opportunities, and for demand-driven country specific approaches.

And there is a need for more research on other methods of fostering clean energy investment. How might the international community address the problems identified with international investment law? What sorts of international investment law might be used proactively to foster clean energy investment? Is the CDM a useful model for international cooperation in this area? Is a new multilateral institution needed?

Chapter Six: Standards, Labelling and Certification

Key Issues

Paul Waide and Nathalie Bernasconi-Osterwalder

Summary of key issues, challenges:

- This paper looks at two kinds of standards and labels relevant to climate change and trade: product standards and labels, and those based on processes and production methods (PPMs).
- Product standards and labels, both voluntary and mandatory, are widely used around the world to address market information failures, principal agent problems and other barriers to dissemination of high efficiency products.
- These instruments have a huge potential for reducing energy use and thereby addressing climate change. The ongoing mandatory switch to compact fluorescent lighting in a handful of countries will eventually reduce more GHG emissions than the entire current roster of CDM projects. Moreover, these kinds of emission reductions stand out as highly cost effective, most having negative overall costs from a life-cycle perspective.
- Trade policy-makers should treat these instruments with deference, and not automatically assume that they are unnecessary barriers to trade. Moreover, there is considerable scope for both facilitating trade and benefiting the environment by harmonizing measurement, testing, certification and accreditation procedures internationally.
- Standards and labels based on PPMs (both voluntary and mandatory) are increasingly being considered or implemented as tools to address climate change, since the way in which goods are produced can have widely varying climate change impacts. They are typically intended to inform consumers and influence their behaviour, but can also address carbon leakage, or the potential loss of competitiveness.
- Such measures have been controversial in the WTO context. PPM-based standards are typically (but not exclusively) levied by Northern importers against Southern exports, may involve costly changes to production processes, and may provide scope for protectionism. In all of these facets, however, they are not fundamentally different from product standards.
- PPM-based standards do, however, have a different history under trade law from product-based standards, a key question being whether governments may distinguish between products based on how they were produced. Case law on GATT's general exceptions has cleared the way for PPM-based standards,

but with a number of ancillary requirements to reduce the scope for protectionism.

Introduction

This chapter looks at two types of standards: product standards that describe a good's characteristics, such as energy efficiency; and standards that describe how a good was made, based on processes and production methods (PPMs), such as carbon-intensity for manufacturing. For both types, the paper asks how they might be better used to aid efforts to address climate change, and what types of obstacles might need to be considered. In the area of process standards, the obstacles that trade policy might address are primarily challenges of international cooperation. In the area of PPM-based standards, in addition to the lack of international cooperation, the obstacles also relate to international trade law. Each will be considered below.

Product energy performance standards and labelling

Equipment standards and labelling schemes date back to at least the 1960s when France first applied a refrigerator efficiency standard, and became more popular after the first and second energy crises in the 1970s with the United States, Russia and Canada developing regulations for some goods. However, it wasn't until the early 1990s that such instruments started to become more widespread and the number of products addressed broadened. At least 61 countries—representing 80 per cent of the world's population—are currently implementing energy performance standards or labels for at least one product, and they are increasingly being applied to broad portfolios of energy-using products. Most major economies have implemented a range of minimum energy performance standards that prevent low-efficiency appliances from being sold on the market. Nor are they alone; Egypt, Japan, Korea, Thailand, China, Brazil, Russia, Iran, Israel, Columbia, the Philippines, Tunisia, South Africa, Bahrain, Turkey and a great many other economies currently have some blend of standards and labelling in place, with many more such instruments being developed.

Justification and design issues

Standards and labelling schemes serve to correct market information failures and principal agent problems,[45] which hinder the ability of consumers to identify or

45 Principal agent barriers come in several forms, but derive from the separation of the individual who is procuring the energy- using equipment from the one who is paying the bill. This leads in many cases to a so called "split incentive," where it is not in the interest of the procurer to pay any additional costs required for more efficient equipment, as they

access energy-using products with optimized energy costs and environmental performance characteristics.

Energy labels allow consumers to know how energy efficient a product is, and to factor this into their purchasing decisions. For many energy-using products, the energy cost over the lifetime of the product is of a similar, or greater, magnitude to the cost of purchasing the product in the first place. This is a very important factor in the economic consideration of a product's service. In the absence of energy performance labelling, manufacturers have little commercial incentive to minimize a product's energy consumption. Prior to the introduction of energy labelling in the European Union, the least efficient refrigerators on the market used eight times more energy than the most efficient models to provide the same cooling service, and lifetime in-use energy costs exceeded the purchase price several times over.

Labels can be voluntary or mandatory and can be of a so-called comparative type or an endorsement type. Endorsement labels are the simplest, are invariably voluntary and simply endorse some aspect of the product's performance. The most well-known example is the *Energy Star* label that is applied in many parts of the world on products that meet superior energy-efficiency performance levels. As their name suggests, "information labels" provide more information about the energy and related product performance levels and are intended to provide enough information for consumers to make more informed product choices. They can be voluntary or mandatory and they can be of a straightforward information type or be of a "comparative" type. In the former case they may simply report how much energy a product uses whereas in the latter case, they would also compare that to the energy used by competing products providing an equivalent service level. Experience has shown that simple information labels are much less informative to consumers than comparative labels and are less likely to have an impact.

Almost all current information labels are of the comparative type and, within these, there are two broad categories: those that use "categorical" scales to illustrate the comparative energy performance of the products; and those that use continuous or "sliding" scales. Continuous scales are used in the older mandatory energy-labelling schemes adopted in the United States and Canada. They apply a horizontal scale that indicates the least and most efficient products on the market at each end and then an arrow to identify the exact performance of the labelled product within the scale. Categorical labels—first applied in the Australian and Thai energy labels, then adopted in the Korean, EU, Iranian, Brazilian, Chinese, Japanese and other labelling schemes—indicate comparative energy performance by a graded "categorical" efficiency scale such as numbers, letters or stars. Several labels use a 1 to 5 numerical scale, many use an A to G letter scale and some use a 1 to 5 or 6 star scale.

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will not see the benefit from a reduced energy bill. The most widely recognized case is between landlords (who pay for efficiency) and tenants (who pay the power bills), but split incentives can also occur within companies where capital acquisition management is often done separately from operations and maintenance management.

Energy efficiency standards are regulations that require certain energy performance levels to be met before a product can be sold. In the 1980s and 1990s, many economies applied these on a voluntary basis, but compliance rates were generally insufficient and there is now a general move away from voluntary standards towards mandatory ones. Such standards can induce significant cost-effective energy savings and related reductions in environmental impacts that would not otherwise be achieved due to principal agent problems and other market imperfections such as high knowledge transfer costs (IEA, 2007a).

To simplify compliance activities, most economies apply mandated minimum energy performance levels. Some however, including the EU, have used a mix of instruments, such as a combination of mandated minimum levels and negotiated voluntary fleet-average performance levels, linked to the share of the market within each energy label performance category. Several countries, including the United States, Canada, Europe and China, conduct technical and economic analyses to determine the extent to which it is possible to design products to meet higher energy efficiency levels and to estimate the impacts of mandated efficiency increases on product costs, life-cycle costs and the environment. This information is used in deciding where efficiency levels should be set. Most countries applying energy performance standards also apply energy labels so that the energy performance standards remove less efficient products from the market while the energy labels encourage the sales of higher efficiency products. This can have a dynamic market transformational impact where the performance thresholds applied in the standards and labels are periodically ratcheted upwards as cost-effective higher efficiency products gain market share.

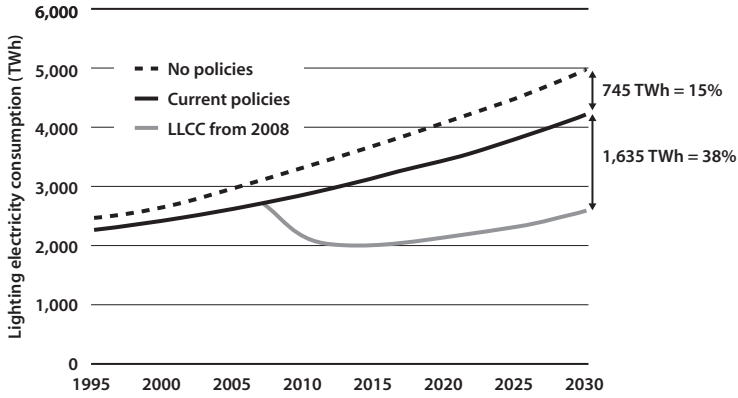
Impacts and potentials

Standards and labelling schemes have a significant potential to reduce energy use and thereby address climate change. Impact evaluations have shown that they are generally highly effective in inducing significant low-cost energy savings. They have also shown that much higher cost-effective savings could be realized were the standards and labelling efforts to be more ambitious, have wider product coverage and be better administered. Current standards and labelling schemes within the OECD are generally credited with reducing total energy bills across the affected broad end-user sectors, e.g., the residential sector, by between 10 and 20 per cent (IEA, 2003, 2006, 2007b; CLASP, 2007). Savings for individual product types can be much higher, up to 70 per cent in the case of refrigerators in the United States (CLASP, 2007). While *ex-ante* estimates of cost-effectiveness have generally predicted highly cost-effective energy savings from such measures; ex-post evaluations have found that these have often underestimated the overall cost-effectiveness of the savings because they have overestimated the impact of the standards and labels on product prices. In many cases, it has not been possible to detect product price increases induced through standards and labelling regulations (IEA, 2007b). Even if the ex-ante estimates are accepted, however, the value of the energy savings is generally many times that of the increase in product costs and, as a result, the life-cycle costs of products have fallen where effec-

tive standards and labels have been implemented. The associated GHG abatement costs are therefore negative for consumers and society as a whole and are typically among the most cost-effective policy-induced abatement opportunities.

For the most part, current requirements are far from the point at which the marginal cost of saving energy would match the marginal cost of energy supply and are still further from reflecting the marginal value of carbon dioxide abatement. As a result, governments remain ambitious about such regulatory measures in order to better mine the economic, energy security and environmental benefits they bring. Figure 1 shows how much electricity has been consumed globally by lighting, how much would have been consumed without the current set of standards and labelling and related policy measures (such as building codes and fiscal/financial incentives), and how much *more* could be saved using existing technologies if all new lighting products sold into the market had an efficiency level that minimized life-cycle costs to the end-users (LLCC, or lowest life-cycle cost).

Figure 1. Global lighting electricity use



Source: IEA, 2006.

Lighting currently accounts for 19 per cent of global electricity demand and attainment of the least-life-cycle cost scenario from 2008 to 2030 would cumulatively save end-users US$1.6 trillion, avoid the emissions of 16.6 billion metric tons of carbon dioxide at a net abatement cost of negative US$161 per metric ton, and allow global lighting service levels to increase by over 80 per cent. For these reasons, there has been a flurry of activity to intensify lighting energy efficiency efforts, most notably such that almost all OECD economies and many non-OECD ones are in the process of phasing-out inefficient incandescent lighting. Even allowing for the fact that efforts have only begun in this domain since 2007–2008, the projected GHG savings from this single product measure are of a similar scale to all the savings booked into the CDM pipeline to 2012, and are greater over the longer term. Substantial untapped cost-effective savings potentials exist for a plethora of other energy using products, which collectively

account for a significant proportion of global energy use and GHG emissions, including household appliances, commercial equipment, industrial electric motors and drives, vehicles and buildings. As a result, standards and labelling efforts are being intensified in all these domains.

Implications for trade policy

Efficiency standards and labels are reported to be the single largest cause of national notifications to the WTO under the Agreement on Technical Barriers to Trade (TBT Agreement). Given their importance in stimulating highly cost-effective energy and emissions savings, this is likely to continue. Whatever costs these regulations imply for industry and trade, it can be argued that they are generally less than the value of the energy savings they foster, and so there is a strong argument that trade regimes should not focus on discouraging or prohibiting such measures as non-tariff barriers to trade.

That said, there is much that countries could do to facilitate trade while respecting the need for economies to be able to apply efficiency standards and labelling regulations. At present, there are varying levels of international coordination on the procedures to be used to measure energy consumption and to define energy efficiency. In many cases, international measurement and methodological standards, such as those issued by the ISO or International Electrotechnical Commission, are used; but national or regional measurement and methodological standards are also still commonly applied for some products. Often these reflect historical differences in standardization that tend to encourage market-specific differences in product design features to evolve and hence are not simple to address retrospectively. In some cases, they reflect differences in local product usage conditions such as environmental or prevalent behavioural differences, which can reduce the applicability of internationally harmonized standards to specific markets. For products that have climate-invariant energy usage, such as personal computers and televisions, there is little technical reason for nationally specific differences in energy test procedures. However, for those that are quite sensitive to climate, such as refrigerators and air conditioners, there is greater justification. Nonetheless, even these products contain a number of non-climate sensitive components, for which much could be done to standardize test procedures

Nor are test procedures and methodologies the only area offering potential for closer international alignment. There are often important differences in the systems used to certify product performance levels and to accredit certification and testing agencies. While most economies use certification and accreditation processes that are in line with broad recommendations issued by the ISO, many processes involve locally specific elements. As a result, test results are not recognized in all markets and reporting requirements vary.

In principle, efforts could be strengthened to minimize unnecessary differences in energy performance test procedures, certification, accreditation and compliance regimes to simplify the number of different tasks a manufacturer has to undertake in order to sell products into multiple international markets. Such steps

could be taken in ways that protect the environmental and economic validity of the standards and labelling schemes while reducing compliance costs for producers and ultimately product costs for consumers.

While trade negotiators may wish to focus attention on these opportunities, they should not underestimate the complexity involved in resolving the issues, nor the scale of resources and time that would be required for progress to be achieved. The cause of differences usually varies according to the product concerned and its associated product-specific technical issues. Differences in certification and accreditation can also derive from a varying degree of importance placed on the need to ensure the validity of product performance claims and on the strategies adopted to address this. Any potential alignment process would need to recognize that technical competences reside among diverse groups addressing these issues and to ensure that these were represented in any barrier removal process to ensure that legitimate functional distinctions were maintained and the overall integrity of standards and labelling schemes was ensured. Furthermore, there is a powerful argument that alignment should not come at the expense of the relevance and ambition of the energy performance standards and labels, which implies that alignment efforts should not be unwieldy nor override the current processes.

Processes and production methods-based standards

As described above, standards, labelling schemes and certification programs—mandatory or voluntary—have been particularly useful tools to promote energy efficient products and provide consumers with information about the energy efficiency of products and related savings. In addition to these sorts of standards, governments, the private sector and NGOs are elaborating a variety of environmental and social standards, labels and certification programs that look at the entire life-cycle or carbon footprint of a product. This approach involves looking at products' processes and production methods (PPMs), and relates to the manner in which products are made and natural resources are extracted, grown or harvested.

The premise is that the production method applied to produce a product can negatively affect the environment and human health. In the context of climate change, the amount of GHGs emitted into the atmosphere from the production of a product depends, in large part, on the manner in which it was produced and on how the energy used in the production process is generated. Most countries have adopted policies and measures aimed at avoiding or mitigating the harmful effects caused in the process of production, often including measures to reduce GHG emissions. However, the policies and regulatory approaches vary greatly across the globe. This has several consequences:

- First, the production of a product can lead to different levels of GHG emissions in different countries. The contribution to global warming by the pro-

ducer can therefore vary depending on the regulatory framework of a country and on the production method actually applied (since even in absence of policies and regulatory frameworks, a producer can choose a low- or high-carbon production method).

- Second, differences in regulatory frameworks can have competitiveness effects because production of the same type of product can be more costly in those countries taking measures to limit GHG emissions during production.
- Third, because the end product is largely independent of the production method used for its production, it is usually impossible for consumers to know anything about the product's total contribution to climate change.

As a response to these concerns, many countries are considering the adoption of trade-related measures that take into account the method of production (PPM-based measures). These can include import and export restrictions on products produced in a certain way (standards); labelling requirements regarding the production method used to produce a product; tax schemes based on production methods; and border tax adjustments levied on imported products to counterbalance PPM-based domestic taxation or regulation.

While the use of trade-related PPM-based measures is not new, their profile has grown over the past two years because of the international community's renewed recognition of the need to address climate change challenges. In particular, the competitiveness concerns of producers in those countries that have committed to GHG emissions cuts have provoked a discussion of the need to level the playing field. Moreover, policy-makers have voiced concerns that imposing high costs on domestic producers may cause production of carbon-intensive industries to shift to countries lacking regulation to control GHG emissions. Such "leakage" of emissions abroad, it is argued, could undermine the goals of an international climate change regime.

Recent proposals for national and regional carbon controls have included provisions aimed at reducing the impacts of the regulation on domestic competitiveness, as well as creating incentives for foreign countries to implement their own carbon restrictions and prevent leakage.[46] Border tax adjustments are one option, where a state imposes the domestic carbon or energy tax on imported products. A similar effect can be achieved within cap-and-trade systems by requiring the purchase of carbon allowances or credits at the border. Exporters from countries without carbon restrictions would thus face the same taxes or requirements to purchase carbon allowances as domestic producers of similar products. These types of schemes are examined in further depth in a separate paper in this series, *Border Carbon Adjustment*.

Product standards and labelling are yet another way to address concerns relating to the climate impacts of production processes. An example of this type of policy

46 See e.g., "Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC"; U.S. S.2191 Lieberman-Warner Climate Change Security Act (2007); U.S. S.1766 Bingaman-Specter Low Carbon Economy Act (2007).

application is provided by recent discussions on biofuels. For climate change, energy security and political reasons, many governments are promoting the use of biofuels. Both the EU and the U.S., for example, are adopting mandatory standards and targets for the fuel mix used in the transportation sector.

However, a wide range of actors is raising concerns about biofuels targets for environmental, social and economic reasons. Though one of the main putative reasons to support and promote biofuels is their potential to reduce GHG emissions, recent studies have shown that, in some cases, biofuels over their life-cycle lead to increases, rather than decreases in GHG emissions. Moreover, biofuels production also raises concerns about other types of environmental and social harm, such as potential impacts on land use, water resources, biodiversity and food security. It is therefore crucial that every aspect in the life-cycle of biofuels be considered, including the amount of fossil fuels consumed during the cultivation of crops, the manufacture of fertilizers, fuels processing and distribution. An assessment of the carbon balance should also take into consideration the GHG emissions resulting from land use changes as land is converted to biofuel crop production, and as production for other markets is displaced. A draft EU directive, for instance, proposes PPM-based standards on environmental sustainability (such as life-cycle GHG emissions savings of 35 per cent), and a prohibition on the use of raw materials cultivated from land with high biodiversity or high carbon stock. EU Members are also discussing other environmental, social and labour criteria. In this context, they are considering, among other things, requiring exporting countries to be parties to key international environmental and labour treaties; requiring exporters to pass "sufficient" domestic legislation in these areas; and requiring exporters to report on environmental and social standards.

Other stakeholders are also looking at the sustainability of biofuels production and processing. The *Roundtable on Sustainable Biofuels*, an international initiative bringing together farmers, companies, NGOs, experts, governments and intergovernmental agencies aims at achieving "global, multi-stakeholder consensus around the principles and criteria of sustainable biofuels production by June 2008." Similar endeavours also exist in other areas. For example, various private certification schemes have been elaborated to promote sustainable forestry practices. A widely used scheme is that of the Forest Stewardship Council, which provides certification of products, such as timber and paper from well-managed forests. Given the importance of forests for climate change because of their role as sinks, the relevance of these schemes in the climate change context is undeniable. These certification schemes are largely voluntary, but widely used.

Challenges from a trade law and development perspective

In the WTO context, there has been some resistance to using PPM-based measures, especially, but not exclusively, by developing countries. Several factors explain why such measures are controversial. First, by limiting imports to prod-

ucts produced in a specific manner, a WTO Member may make it more difficult and expensive for exporters from other countries to sell in its market, as they will have to adapt their PPMs to the requirements of the importing country. Financial burdens and technical difficulties created by PPM-based measures can be especially hard on smaller producers and on producers in developing countries. It should be noted, however, that product standards can raise similar financial burdens, as they too may require changes in production.

Critics of trade-related PPM-based measures also claim that PPM-based import restrictions impinge upon the sovereignty of the exporting state because they aim to influence PPMs abroad. The claim regarding national sovereignty is linked to the idea that the importing state is imposing its values or ethical and cultural preferences on the exporting state. This criticism is generally countered with the argument that the importing state is not demanding the use of a particular PPM in the exporting country, but is rather regulating what enters its own territory in line with the objective of promoting more sustainable consumption and production patterns within its borders.

Moreover, the use of PPM-based measures raises questions of equity: while PPM-based measures are most frequently used by rich, importing countries, the products that are denied entrance into these important markets are frequently those of developing countries. Such measures therefore pose a particular burden on Southern exporters. This, however, may be changing. In the biofuels context, for instance, Brazil—the world's top exporter of ethanol—has stressed that Brazilian ethanol, produced from sugar cane in factories fuelled by bagasse, an agricultural residue, is efficient and provides substantial GHG reductions compared to many other biofuels. Brazil has thus expressed its desire that the method of its ethanol production be taken into account.

Finally, some countries fear that PPM-based measures are particularly vulnerable to disguised protectionism. WTO agreements and case law so far appears able to deal with this problem. The GATT general exceptions clause (Article XX), for example, while not disallowing PPM-based measures, prohibits such measures if they are merely protectionism masquerading as environmentalism.

Some PPM-based measures have been challenged under the dispute settlement mechanisms of the 1947 GATT and, later, of the WTO. The most recent PPM-related dispute is the *U.S.–Shrimp/Turtle* dispute, which involved a measure banning the importation of shrimp harvested in a way that might harm sea turtles. While the *U.S.–Shrimp/Turtle* rulings made clear that PPM-based measures affecting trade are not prohibited by WTO rules *per se*, they did not give *carte blanche* to states wishing to adopt PPM-based measures. Rather, the Appellate Body, while upholding the environmental measure, set out conditions for its application, requiring among other things cooperative efforts, flexibility, and assistance in the measure's implementation. For example the Appellate Body found that the U.S. measures established a "rigid and unbending" standard, and that it was not acceptable to "*require* other Members to adopt essentially the same comprehensive regulatory programme." It found instead that an importing Member was permitted to require regulatory programmes *comparable in effec-*

tiveness to the Member's own programmes. Transparency and due process also played an important role in *U.S.–Shrimp/Turtle*, where the Appellate Body criticized the absence of a transparent and predictable certification process. In particular, the Appellate Body contested: the partisan nature of the inquiries and certifications, the absence of formal opportunity for the country under investigation to be heard or to respond to any arguments made against it, the absence of formal written reasoned decision and of notice of denial, and the absence of procedure for review of, or appeal from, a denial of an application.

The two WTO agreements relevant to the issue of PPM-based measures relating to GHG emissions are the GATT and, possibly, the TBT Agreement. The GATT covers mandatory PPM-based measures, including standards and other internal regulations. It is unlikely that the GATT also covers voluntary measures. The TBT Agreement, on the other hand, covers mandatory and non-mandatory measures, but only appears to cover PPM-based measures that are related to the product itself. For example, the TBT Agreement clearly would cover measures that disallow products produced in a way that could make the end-product unsafe for the consumer. It is unclear, however, whether the TBT Agreement would also apply to PPM-based measures that cannot be detected in the end-product and could thus be qualified as "unrelated" to the end-product. This would be the case with measures aimed at reducing GHG emissions in the production process of a product.

One of the main legal issues that could likely arise under the GATT is the obligation not to discriminate between "like" products. This involves the question, for example, of whether a WTO Member can treat a product more favourably based on the level of GHG emissions during its production: is a ton of GHG-intensive steel "like" a ton of low-GHG steel? No case law yet exists dealing specifically with the issue of whether or not products could be considered "unlike" based on their method of production. However, one case, *EC–Asbestos*, did look at whether a product's health effects should be taken into account when determining whether or not products were "like." In that case the Appellate Body found that chrysolite asbestos fibres and certain other fibres were not 'like products' because they were physically different, partly due to the fact that chrysolite asbestos fibres are carcinogenic and also because they had different tariff classifications. More generally, the Appellate Body found that "the health risks associated with a product may be pertinent in an examination of likeness under Article III:4." This does not go as far as affirming that PPMs are relevant to likeness (especially because the decision focused heavily on the physical properties and adopted a "fundamentally" economic interpretation of likeness) but it does move away from a definition based strictly on commercial criteria, to one that takes account of other public policy objectives such as health and safety.

The second legal issue relates to GATT's general exceptions clause, which can justify environmental and health measures that are otherwise inconsistent with the GATT (for example, based on discrimination among like products). In order to justify a measure under the general exceptions clause, a Member must first show that its measure relates to the conservation of an exhaustible natural resource, or is necessary to protect human, animal, or plant life or health. Additionally, the exceptions clause provides that measures may not be applied in a manner which

constitutes a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or in a manner which constitutes a disguised barrier to trade. Based on the *Shrimp/Turtle* decisions, which gave refuge to a PPM-based measure, it can be expected that climate-related PPM-based measures, too, could be justified. However, these measures would have to satisfy some of the requirements set out in *Shrimp/Turtle* including that they be enacted in good faith and in conjunction with, or after, coordination and/or cooperation efforts. The Appellate Body also indicated that measures should be applied in a sufficiently flexible manner to permit compliance, and be transparent and procedurally fair.

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In-session Discussion

Bernice Lee

This section surveys the discussions that took place at the June 2008 Copenhagen Trade and Climate Change Seminar on the subject of standards, labelling and certification. While every effort has gone into ensuring that these notes accurately represent the outcome of the session discussion, they are not intended to convey any explicit consensus of the session participants, and are written on the sole responsibility of the session facilitator, Bernice Lee. Ms. Lee was aided in her efforts by Kristin Luber, who acted as rapporteur.

Standards—whether voluntary or mandatory—can play a key role in driving the global transition to a low carbon future at the national or international level. As highlighted in the previous section, product standards and labels have been widely used to address barriers to disseminating high efficiency products and services, such as market information failures and principal agent problems.

Emission reductions from energy efficiency gains can be highly cost effective, as most have negative overall costs from a life-cycle perspective. This further underscores the potential role of standards in driving emission reductions and climate mitigation, whether through setting minimum standards or encouraging best available ones (as does the *Top Runner* programme in Japan).

Developing countries continue to view standards as non-tariff barriers to exports rather than a catalytic component towards achieving common climate and other public policy goals. How best to use standards in a dynamic fashion to promote social and macro-economic gains in developing countries?

Political economy concerns. Despite potential gains, political economy issues abound. As the lion's share of standard-setting is driven by the private sector as part of their voluntary supply chain management, they have complex interactions with the global trading regime embodied by the World Trade Organization. The multilateral trading system has traditionally dealt with mandatory regulations and standards set by international bodies. In recent years, however, some developing countries have called for greater attention to private standards at the WTO: they complain that the growing number of supermarket standards are hard for small producers to comply with, and that nominally voluntary standards can effectively become compulsory, since the price of non-compliance is near-total exclusion from an export market.

These political economy issues around standards should not be under-estimated. As one participant pointed out: "whoever controls the standards has control over the market." The need for ensuring that standards are non-discriminatory, and that they do not unnecessarily restrict trade, is thus paramount. Despite repeated calls for equivalence or harmonization, the nature of the beast encourages differentiation among labels and certifications. It is therefore important to ensure standards are not captive to special interests focusing merely on market share and competitiveness concerns.

Overcoming environment-development challenges. There has also been manifest tension between development and environmental concerns in global discussions on standards and labelling. Carbon labelling schemes are often viewed with suspicion. Developing countries have been decrying the way standards have acted as non-tariff barriers to their exports. This is due in part to the proliferation of standards and the fixed cost incurred in upgrading facilities to meet ever tightening standards, labelling and certification processes.

It was suggested by some participants that these standards also amounted to challenges to sovereignty, as the importing state can impose standards on the exporting/developing state, which may stifle economic growth. Questions were also raised as regards the equitable distribution of the burden between developed and developing countries in the global transition towards higher energy efficiency and environmental standards.

End use versus PPM-based standards. In addition to standards and labelling that relates to the characteristics of the end products, there are increasing attempts by governments and private sector actors to explore standards and certification that consider the life-cycle or carbon footprint of a product. In WTO parlance, this means using a product's PPMs as a basis for standard-setting, labelling or other policy measures.

In many developed countries, but particularly in the U.S. and the EU, concerns over "leakage" of high emissions sectors abroad, due to climate policies like carbon taxation, higher efficiency standards and emissions caps, are prompting policy-makers to consider trade-related measures based on PPMs to address climate-related challenges. As noted in the previous section, these can include import and export restrictions on products produced in a certain way (standards); labelling requirements regarding the production method used to produce a product; tax schemes based on production methods; and border carbon adjustments levied on imported products to counterbalance PPM-based domestic taxation and regulation.

However, the WTO-legality of differentiating among otherwise "like" products on the basis of PPMs remains hotly debated, and participants came to no consensus on this question.[47] Some emphasized the importance of deference of the trade regimes to environmental principles, while others feared that climate policy would be hijacked by protectionist interests.

Standards and IPR concerns. Innovation and diffusion in some sectors will be driven by technical standards, not price. But meeting certain standards involves the use of patented technologies. Standards and technical regulations may (inadvertently or by design) reduce options for the use of existing and future technologies—in the form of technical production methods or product-specific features. The risk that dual "lock-in"—proprietary/closed standards and patent protection—will frustrate the diffusion of existing and horizon climate technologies must be factored into policy and regulations.

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47 In the context of border carbon adjustment, this question is discussed in depth in the chapter devoted to that subject.

Getting the process right

Given the complexity of issues around climate standards and development considerations, participants explored steps needed to ensure the coherence of environmental and development concerns. The importance of participatory processes was underscored. Public-private partnerships (PPPs) are key tools in enabling developing countries to strengthen capacity to meet ever rising standards, labelling and certification requirements.

Science and evidence, not political negotiations, must drive standards and certification processes. From a climate mitigation perspective, it might be useful to assess the entire carbon lifecycle of the product at the design phase of the standard-setting or certification process. Should it be too complex to do so, one participant suggested that at least up to 70 per cent of the chain should be assessed. Biofuels is often cited as a negative example to demonstrate the need for scientific underpinning of standards. A few participants pointed to the higher emissions reduction potential from Brazilian sugarcane ethanol as opposed to corn ethanol from the U.S., yet the U.S. standard in effect mandates the use of domestic corn ethanol.[48]

Transparency in the process of standard making, in developed and developing countries alike, can contribute to the chances that they will achieve their stated policy goals. This requires clarity of purpose, however—an upfront understanding of the stated public policy objective of each standard. Ensuring that the notification process at the WTO functions effectively in to promoting transparency practices is also important.

Technical and financial assistance are urgently needed for developing countries to meet minimum standards set by the EU and U.S. through building national and regional standard-related infrastructure. Participants discussed existing initiatives conducted by a variety of United Nations programmes and agencies including UNCTAD and UNIDO. It is unrealistic to expect developing country producers to adopt the full range of standards currently in the marketplace.

Ensuring developing countries' participation in a meaningful manner in standard-setting, labelling and certification processes is central. Participants questioned whether it would be realistic for individual countries to develop the infrastructure to participate actively in the myriad of global standards regimes. One proposed a regional division of labour through establishing regional centres of excellence as a cost effective mechanism to strengthen capacity in developing countries. An example from the Caribbean was cited to support this model.

Protectionist interests must be kept at bay. Developing countries fear new standard policies will be protectionist and skewed to benefit developed countries. There is

48 The standard achieves this by mandating ethanol use, but then acting in concert with prohibitive tariffs on imported ethanol. Even absent the tariff, the U.S. standard does not specify the need for the mandated biofuels to be produced in a way that ensures GHG emission reductions on a life cycle basis.

a need to address this potential bias, not least through ensuring that the WTO should do what it was established to do—help prevent standards from constituting unnecessary restrictions to trade, and ensuring non-discrimination. This could include upfront development impact assessments of standards, labelling and certification, so as to avoid unfair and unintended damage to prospects for growth and poverty reduction.

Harmonization and its challenges: The proliferation of standards for products can be confusing, especially for stakeholders like small farmers in developing countries. Targeting assistance would be required to enhance the capacity of small farmers to meet these potentially competing requirements. Perhaps more important is the need to work towards harmonization. Participants questioned the equity of harmonizing towards standards driven by developed countries. The timing and sequencing of standard harmonization could also prove problematic without legitimate institutions to tackle issues around regulatory competitiveness.

Assessing current carbon labelling initiatives

A number of private and public initiatives are currently underway to assess the embodied carbon content of specific products. In the U.K., for example, food retailers like Tesco are developing a carbon footprint labelling scheme that evaluates and ranks foods by the grams of carbon per kilogram produced during the entire lifecycle of the product. Currently about twenty products are ranked at Tesco, with a view to expanding this coverage towards over 100 products.

On a parallel basis, the Carbon Trust and the U.K. government are developing a methodology for evaluating the life cycle carbon impact of products and working towards common standards including the development of carbon reduction labels. Factors that go into the evaluation include: product shelf life, country of origin, infrastructure in the country of origin, and how far the food product must travel.

In general terms, there can be either negative or positive labelling on carbon. In some countries, including Switzerland and Germany, organic certification bodies have excluded imported organic products in their schemes. This amounts to a *de facto* ban on organic imports from developing countries. In the U.K., government intervention has stopped the Soil Association in its track towards similar moves. In agriculture, a monopoly on food certifications for food imported via air currently exists. Most participants argued against banning organic imports on the basis that they had not been locally grown. On the other side of the coin, a key initiative is underway in Sweden to label positive carbon performance to encourage best practice—though air-freighted goods are excluded from this scheme.

For non-food products, there have been increasing experiments with some form of carbon accounting in supply chain management, not just for European companies but also for those from the U.S., including Wal-Mart. Moving forward on carbon labelling, it is important to caution against overly simplistic methodolo-

gies or processes for carbon life cycle assessments. Especially for manufactured goods, hundreds of processes may have contributed to production. Participants considered the following issues:

- Some participants questioned the necessity of carbon labelling given the existence of legitimate regimes on emissions, namely the UNFCCC, and whether private initiatives are appropriate tools for emissions reduction. Others regarded labelling regimes as effective tools, especially if set by the private sector. This is not least because the role of the UNFCCC is confined to inter-governmental negotiations and national action on climate change.
- Common standards and procedures to develop carbon labelling could be valuable. In order to build consumer confidence and shape consumer behaviour for climate mitigation, the legitimacy of the label as well as the corresponding certification processes is key. The challenges of carbon life cycle analysis primarily relate to different boundary parameters, data sources and measurement conventions.
- While labelling and certification pose economic challenges for producers, positive opportunities could be identified for developing countries to create climate friendly labels and markets in a proactive manner. This however may require a change in the mindsets of the exporting communities in developing countries.
- Since it will be difficult, if not impossible, to prevent commercial players from coining their own standards to carve a niche in the market, there is a need for transparency requirements to ensure comparability. This applies not only to climate-related labels but also to those related to public policy goals such as public health, biodiversity and other environmental issues.

Conclusions and Research Agenda

A major problem for exporters is the lack of comprehensive information on the type of standards and regulations applicable to their products and, increasingly, to the methods used in their production. This problem is particularly acute for developing country exporters, as it is often difficult for them to obtain necessary information.

Transparency and notification of standards and other measures (product-related or PPM-based) are therefore essential for assisting developing countries to comply with new standards and retain or gain market access. Both the Agreement on Sanitary and Phytosanitary Measures (SPS Agreement) and the TBT Agreement contain transparency-related obligations. However, experience indicates that the notification process has been insufficient for assisting developing countries to identify and understand SPS and TBT measures affecting their exports. Some advances have been made in this respect in the context of special and differential treatment discussions. In November 2004, WTO Members adopted a decision on a procedure to ensure that the importing Member consults with any developing country Member that has expressed a concern regarding the potential effect of a newly proposed or modified SPS measure. Similar approaches could be adopted with respect to other types of measures.

Another problem relates to the fact that, even where environmental and health measures are transparent and developing countries have access to all necessary information, countries may still face problems adapting their exports to new requirements. WTO Members should therefore provide developing countries (especially least-developed countries) with the necessary financial and technical assistance to enable them to effectively respond to the introduction of climate-related standards and measures (both product related or PPM-based). In large part this is in line with the obligations Members have towards developing country Members under Article 11 of the TBT Agreement. It is also worth considering whether this type of capacity assistance might be provided under the auspices of the UNFCCC.

Propounding and promoting international standards and labels (mandatory or voluntary) should be done with the involvement of a wide array of stakeholders in order to ensure that the standards do not unintentionally discriminate against some producers. Assisting the participation of developing countries or their producers in elaborating those standards will be essential. In line with WTO case law and as with any domestic standard, international standards should be flexible, and should allow different approaches to achieve the same goal.

A number of studies point to the difficulties faced by exporters—especially from developing countries and especially SMEs—dealing with non-harmonized international standards, and this paper points to ways they could be harmonized so as to both facilitate trade and benefit the environment. That said, such efforts will be difficult, and harmonization should not come at the expense of flexibility for ambition by individual states. Harmonization of methodologies is another question and it might prove valuable, for example, to establish common boundary,

data and measurement conventions in measuring the embodied carbon in the labelling of goods.

This volume is the result of a trade and climate change seminar held in Copenhagen in June 2008. Following the structure of that seminar, it explores six themes that link trade and investment to climate change, for each asking where trade policy might be of service to climate change objectives. It lays out the background issues for each theme, recounts the in-depth discussions on each from Copenhagen, and describes the research agenda that might guide further efforts. In the end, this work is an important step forward in better understanding the complex web of trade and climate change linkages.