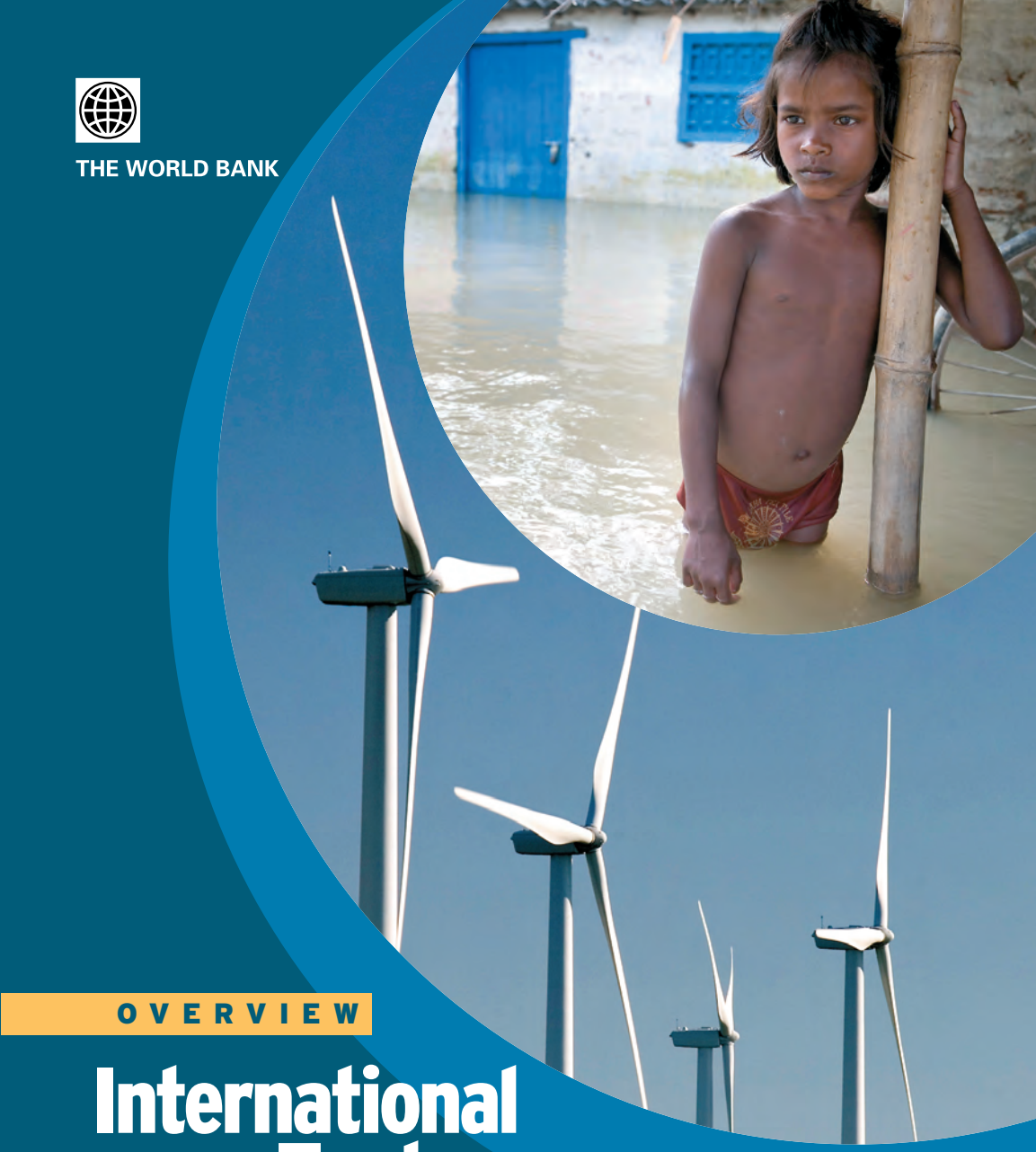


THE WORLD BANK

OVERVIEW

International Trade and Climate Change

Economic, Legal, and Institutional Perspectives

ENVIRONMENT AND DEVELOPMENT

International Trade and Climate Change

Environment and Development

A fundamental element of sustainable development is environmental sustainability. To address the phenomenon, this new series on Environment and Development covers vital current and emerging issues. It draws on analysis and practical experience from across the World Bank. Forthcoming volumes will address poverty-environment linkages at the household level, environmental health, environment and trade, natural resources management, climate change, strategic environmental assessment, policy instruments, and environmental institutions, among other topics central to the implementation of the World Bank's Environment strategy and the achievement of the Millennium Development Goals.

Second volume in the series
Proverty and the Environment: Understanding Linkages at the Household Level

International Trade and Climate Change

Economic, Legal, and Institutional Perspectives

OVERVIEW

THE WORLD BANK
Washington, DC

1818 H Street, NW
Washington, DC 20433
Telephone 202-473-1000
Internet www.worldbank.org
E-mail feedback@worldbank.org

This booklet contains the Introduction and Overview, along with a list of contents, from the forthcoming book, *International Trade and Climate Change: Economic, Legal, and Institutional Perspectives.* To order copies of the full-length book, published by the World Bank, please use the form provided at the back of this booklet.

ISBN: 978-0-8213-7329-3
DOI: 10.1596/978-0-8213-7329-3

CONTENTS

Acknowledgments

This report is the product of a team composed of Muthukumara Mani (Task Team Leader and Senior Environmental Economist, ENV/World Bank), Chandrasekar Govindarajalu (Senior Environmental Specialist, ENV/World Bank), Hiau Looi Kee (Senior Economist, DECRG/World Bank), Sunanda Kishore (Consultant, ENV/World Bank), Eri Tatsui (Consultant, ENV/World Bank), Cizuka Seki (Consultant, ENV/World Bank), Sachiko Morita (Consultant, LEGEN/World Bank), and Mahesh Sugathan (Program Coordinator, Economics and Trade Policy/ICTSD).

In preparing this report, the team has greatly benefited from detailed comments by peer reviewers: Bernard Hoekman (Senior Advisor, DECRG/World Bank), Thomas Brewer (Associate Professor, Georgetown University), Richard Damania (Senior Environmental Economist, SASEN/World Bank), Donald Larson (Senior Economist, DECRG/World Bank), and Masaki Takahashi (Senior Power Engineer, ETWEN/World Bank).

In addition, the following people provided valuable inputs and written comments to the report: Kirk Hamilton (Team Leader and Lead Environmental Economist, ENV/World Bank), Charles E. Di Leva (Chief Counsel, LEGEN/World Bank), Laura Tlaiye (Sector Manager, ENV/World Bank), Giovanni Ruta (Economist, ENV/World Bank), Sushenjit Bandyopadhyay (Senior Environmental Economist, ENV/World Bank), Anil Markandya (Professor, University of Bath), and Moustapha Kamal Gueye (Senior Programme Manager, Environment Cluster/ICTSD). The team greatly appreciates the contribution and guidance on technical issues especially pertaining to the WTO from ICTSD. Editorial support was provided by Alexandra Sears and Robert Livernash. The Environment Sector Manager is Laura Tlaiye, and the Environment Department Director is James Warren Evans.

CHAPTER 1

Introduction and Overview

THE ECONOMIC, SOCIAL, AND DEVELOPMENTAL consequences of climate change have received increasing recognition worldwide. The *Stern Review* (2006) notes that climate change is a serious and urgent problem, global in its cause and consequences. Current actions are not enough if we are to stabilize greenhouse gases (GHGs) at any acceptable level. The economic challenges are complex and will require a long-term international collaboration to tackle them. The recent report of the Intergovernmental Panel on Climate Change (IPCC) also categorically states that the impacts of climate change will vary regionally, but aggregated and discounted to the present, they are very likely to impose net annual costs that will increase over time as global temperatures increase (IPCC 2007). The Kyoto Protocol remains the key international mechanism under which the industrial countries have committed to reduce their emissions of carbon dioxide and other greenhouse gases (see box 1.1).

A number of issues still need to be resolved with regard to the efficient implementation of emissions reduction goals. Although 172 countries and a regional economic integration organization (the European Economic Community) are parties to the agreement (representing over 61 percent of emissions), only a few industrialized countries are actually required to cut their emissions (see appendix 1 in this report for a list of Kyoto Protocol signatories and their emission targets). The United States, which is the world's largest emitter, and Australia have not ratified the

BOX 1-1

The Kyoto Protocol

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) entered into force on February 16, 2005, following ratification by Russia. As of May 11, 2007, 172 countries and the regional economic integration organization (European Economic Community) have ratified, accepted, approved, or acceded to the Kyoto Protocol. The UNFCCC includes the principle of "common but differentiated responsibilities." Under the principle, as stipulated in Article 3, paragraph 1, of the UNFCCC, the parties agreed that (i) the largest share of historical and current global emissions of greenhouse gases has originated in developed countries; (ii) per capita emissions in developing countries are still relatively low; and (iii) the share of global emissions originating in developing countries will grow to meet their social and development needs.

Under the Kyoto Protocol, industrialized countries (called Annex I countries) have to reduce their combined emissions to 5 percent below 1990 levels in the first commitment period of 2008–12. Annex I countries include the industrialized countries that were members of the Organisation for Economic Co-operation and Development (OECD) in 1992, plus countries with economies in transition (the EIT parties), including the Russian Federation, the Baltic states, and several Central and Eastern European states. Countries that have accepted greenhouse gas emissions reduction obligations must submit an annual greenhouse gas inventory. Non–Annex I countries (developing countries) that have ratified the Protocol do not have to commit to specific targets because they face potential technical and economic constraints. Nevertheless, they have to report their emissions levels and develop national climate change mitigation programs.

Although the average emissions reduction is 5 percent, each country agreed to its own specific target. Within the Annex I countries, differentiated national targets range from 8 percent reductions for the European Union (EU) to a 10 percent allowable increase in emissions for Iceland.

Further, while Annex I countries must put in place domestic policies and measures to achieve their targets, the Protocol does not oblige governments to implement any particular policy, instead allowing countries to seek optimal ways to achieve greenhouse gas emissions reduction and to adjust their climate change strategies to the circumstances of their economies. The Protocol defines three flexibility mechanisms to help Annex I parties lower the overall costs of achieving emissions targets. The three mechanisms—Joint Implementation (JI), the Clean Development Mechanism (CDM), and emissions trading—allow them to reduce emissions, or increase greenhouse gas removals, in other countries, where it can be done more cheaply than at home.

Source: UNFCCC, Essential Background, http://unfccc.int/essential_background/items/2877.php.

Protocol. The United States has conditioned its entry on further engagement of major developing country emitters, such as China and India.

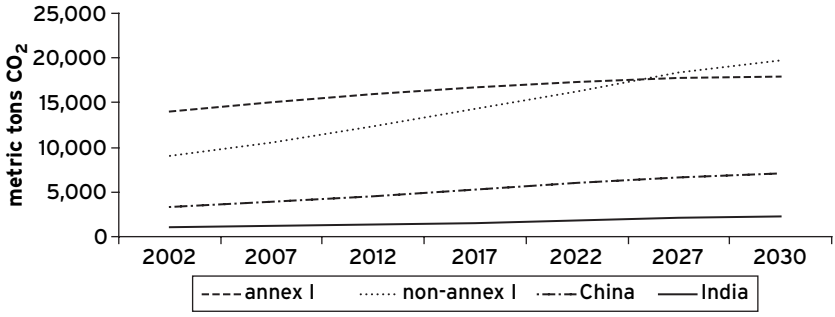
In countries that have begun to implement the Kyoto regime, this disparity in commitments has fueled a debate on issues of competitiveness and other economic impacts.[1] Businesses in many Kyoto-implementing countries have already started to urge their governments to ease competitive pressures through measures such as a border tax. A recent European Commission report suggests taxing goods imported from countries that do not impose a CO_2 cap on their industry as a way to compensate for the costs of climate change measures. Stiglitz (2006) advocates that Europe, Japan, and others adhering to the Kyoto Protocol should restrict or tax the import of American goods to make up for the fact that U.S. producers do not incur GHG-related costs of production and, therefore, produce goods that are less responsible toward the environment.

Unlike some other global environmental treaties—such as the Montreal Protocol on Substances that Deplete the Ozone Layer—the Kyoto Protocol does not contain explicit trade measures to enforce compliance.[2] Nor does it stipulate specific methods by which the members should design and implement policies to address climate change commitments. Nevertheless, as this study demonstrates, the disparity in effort between developed countries is leading to concerns about competitiveness and principles of equity. In turn, these concerns lead to much speculation about whether Kyoto should develop trade sanctions, or whether other Kyoto-supportive trade measures are appropriate to protect those industries that are absorbing the cost of GHG-reducing technologies. As a result, there is additional speculation about a potential conflict between the Kyoto and WTO regimes (Brewer 2003; Georgieva and Mani 2006; Loose 2001).

Reducing emissions in industrial countries is just one side of the story. It is becoming increasingly clear that developing countries will drive the future of global economic growth. Estimates show that by 2030, about half or more of the purchasing power of the global economy will stem from the developing world. Their share in world GDP could reach 60 percent in terms of purchasing power parity and their share in world trade almost 50 percent (World Bank 2007b). These increases have important implications for both GHG emissions and any future climate regime.

Though developed countries remain the largest per capita emitters of greenhouse gases today, the growth of carbon emissions in the next decades will come primarily from developing countries, which are following the same energy- and carbon-intensive development path as their rich counterparts have done. Among the developing countries, the greatest increase in carbon emissions will emanate from China and India because of their size and growth. It is projected that, between 2020 and 2030, developing country emissions of carbon from energy use will exceed those of developed countries. Any kind of post-Kyoto international regime that will emerge to address climate change cannot ignore these startling facts.

FIGURE 1.1
CO_2 Emissions from Energy Use, 2002 to 2030



Source: IEA Database 2006.

Climate change is a global challenge requiring international collaborative action. Another area in which countries have successfully committed to a long-term multilateral resolution is the liberalization of international trade. Integration into the world economy has proved to be a powerful means for countries to promote economic growth, development, and poverty reduction. Some developing countries have opened their own economies to take full advantage of the opportunities for economic development through trade, but many have not. The ongoing Doha "Development" Round is seen by many as a potential vehicle for real gains for all economies, and particularly developing economies, in the areas of agricultural reform, improved market access for goods and services, and clarification and improvement of trade disciplines.

The broad objectives of the betterment of current and future human welfare are thus shared by both global trade and climate regimes. Yet both climate and trade agendas have evolved largely independently through the years, despite their mutually supporting objectives and the potential for synergies discussed in this study. While the implementation of the Kyoto Protocol may have brought to light some inherent conflicts between economic growth and environmental protection, the objectives of Kyoto also provide an opportunity for aligning development and energy policies in such a way that they could stimulate production, trade, and investment in cleaner technology options. Since global emission goals and global trade are policy objectives shared by most countries and nearly all of the World Bank's clients, it makes sense to consider the two sets of objectives together.

Technology Options to Stabilize Greenhouse Gas Emissions

The stabilization of GHG concentrations—to as low as 450 ppm CO_2-equivalent—can be achieved by deploying currently available technologies and technologies

that are expected to be commercialized in the coming decades in the energy supply, transport, buildings, industry, agriculture, forests, and waste management sectors (IPCC 2007).

In the global discourse on climate change, technologies that help in mitigating the impacts by reducing the GHG emissions have been termed variously as "environmentally sustainable technologies," "environmentally sound technologies," "sustainable energy technologies," "clean energy technologies" (used in this report), and several other terms. Substantively there is little difference in the core set of technologies—energy efficiency, renewable energy, and a few other high-GHG-impact technologies—these technologies represent an evolution of a global discourse on the topic of climate change and the political realities of the stakeholders. The availability of these climate-friendly technologies is critical if developing countries' are to achieve low-carbon growth paths.

In the recent literature, Socolow and others (2004) have used these technologies to identify strategies that are climate friendly. They introduce the concept of "stabilization wedges," which is helpful in understanding the scale of the challenge in order to stabilize carbon emissions by 2054—aiming at a CO_2 atmospheric concentration of 500 ppm. Each wedge results in a reduction in the rate of carbon emissions of 1 billion tons of carbon per year by 2054, resulting in 25 billion tons over 50 years. In other words, each wedge has the potential to reduce emissions by an increasing amount per year, starting at very low levels now and reaching 1 gigaton (Gt) per year by 2054, by which time emissions of CO_2 will have been reduced by a cumulative 25 Gt.

The Socolow study examined 15 such strategies, each based on a known technology with a potential to contribute to carbon mitigation (box 1.2). For example, a wedge from renewable electricity replacing coal-based power is available from a 50-fold expansion of wind by 2054 or a 700-fold expansion of solar photovoltaics relative to today.

More recently, the IPCC Working Group III (IPCC 2007) also called for a mix of policy instruments and incentives to reduce GHG emissions to a manageable 450 ppm. Specifically, the report suggests the following:

- Policies that provide a real or implicit price of carbon could create incentives for producers and consumers to significantly invest in low-GHG products, technologies, and processes, including economic instruments, regulation (e.g., standards), and government funding and tax credits. Integrating climate policies into broader development policies would facilitate the transition to a low-carbon economy.
- It is economically feasible to halt, and possibly reverse, the growth in global GHG emissions in order to stabilize their atmospheric concentrations. Key mitigation technologies and practices projected to be commercialized before 2030 include carbon capture and storage, advanced nuclear power, renewable

BOX 1-2

Summary List of Technologies Considered as "Wedges" for Climate Change Mitigation

1. **End-user efficiency and conservation**
   - Increase fuel economy of automobiles
   - Reduce automobile use by telecommuting, mass transit, urban design
   - Reduce electricity use in homes, offices, and stores
2. **Power generation**
   - Increase efficiency of coal-fired plants
   - Increase gas baseload power (reduce coal baseload power)
3. **Carbon capture and storage (CCS)**
   - Install CCS at large, baseload coal-fired plants
   - Install CCS at coal-fired plants to produce hydrogen for vehicles
   - Install CCS at a coal-to-synfuels power plant
4. **Alternative energy sources**
   - Increase nuclear power (reduce coal)
   - Increase wind power (reduce coal)
   - Increase photovoltaic power (reduce coal)
   - Use wind to produce hydrogen for fuel cell cars
   - Substitute biofuels for fossil fuels
5. **Agriculture and fisheries**
   - Reduce deforestation, increase reforestation and afforestation, add plantations
   - Increase conservation tillage in cropland

Source: Pacala and Socolow 2004.

energy (e.g., tidal and wave energy), second-generation biofuels, advanced electric and hybrid vehicles, and integrated design of commercial buildings.

- Governments must invest more in energy research and development (R&D) to deliver low-GHG technologies.

Successful GHG mitigation approaches, however, need to support developing countries' economic and social development needs and institutional, financial, and technical capacity. These countries cannot take on the same commitments as the developed countries as they often lack institutional, financial, and technical capacity, which will influence their ability to implement and comply with climate commitments.

In addition, developing countries must deal with poverty and other social challenges, and they may be reluctant to adopt restrictive policies that could limit economic growth and pose any threat to energy security. As a result, climate change may rank as a low political priority. However, developing countries are also more vulnerable to the impacts of climate change. Their economies are more dependent on climate-sensitive sectors such as agriculture and forestry, and they lack the

infrastructure or resources to respond to the results of changes in climate. Hence, any market-driven mechanism that facilitates the transfer of clean technology—at the same time entailing minimal costs to the developing countries' economies—may be viewed more favorably than the more traditional command-and-control regimes.

Technology transfer to developing countries has been a mandate of the UNFCCC. The convention includes provisions calling for the transfer to developing countries of technology and know-how related to environmentally sound technologies, or ESTs (Article 4, paragraphs 5 and 7).[3] The convention's component on enabling environments specifically focuses on government actions—such as fair trade policies; removal of technical, legal, and administrative barriers to technology transfer; sound economic policies; regulatory frameworks; and transparency—that create an environment conducive to private and public sector technology transfer.

Various sessions of the Conference of Parties (COP) have discussed this issue and have made decisions to promote development and transfer of ESTs. A key milestone in this regard was achieved at the COP-7 in Marrakesh in 2001, when a technology transfer framework was adopted to enhance implementation of climate-friendly technologies.

The *Stern Review* (2006) on the economics of climate change also identifies the transfer of energy-efficient and low-carbon technologies to developing countries as key to reducing the energy intensity of production. It further observes that "the reduction of tariff and nontariff barriers for low-carbon goods and services, including within the Doha Development Round of international trade negotiations, could provide further opportunities to accelerate the diffusion of key technologies" (p. xxv).

In that context, this study addresses an important policy question: how changes in trade policies and international cooperation on trade policies can help address global environmental spillovers, especially GHG emissions, and what the potential effects of national environmental policies aimed at global environmental problems might be for trade and investment.

The Debate on Trade and the Environment Revisited

There has been much debate over the last two decades on the role international trade plays in determining environmental outcomes. This has led to both theoretical work, identifying a series of hypotheses linking openness to trade and environmental quality, and empirical work, trying to disentangle some of the suggested linkages using cross-country or within-country data. Much of the focus, however, has been on local pollution issues. Studies have primarily looked at how changes in production and trade flows have altered the pollution intensity of production (composition effect) in both developed and developing countries, and how trade flows may themselves be affected by the level of abatement costs or strictness of pollution regulation in the trading partner countries.[4] A number of more recent studies have looked at the interface of trade and political economy

issues and their implications for the environment and natural resources (see box 1.3 for a synopsis of the general debate on trade and the environment).

In the policy arena, the importance of establishing coherent relationships between the trade obligations set out in various bilateral and multilateral trade agreements and environmental policies of countries is now well recognized. Environmental provisions in the General Agreement on Tariffs and Trade (GATT) allow adoption of product-related measures in certain situations if they are "necessary to protect human, animal or plant life or health," or "relat[e] to the conservation of exhaustible natural resources." In addition, other trade agreements—such as NAFTA and the U.S.-Singapore free trade agreement—include provisions that directly address environmental concerns.

Interestingly, the trade-environment debate has so far considered little in terms of global-scale environmental problems—climate change, declining biodiversity, the depletion of ocean fisheries, and the overexploitation of shared resources. These "public goods" issues, which require international cooperative action, can potentially lead to trade tensions if some countries get a "free ride" on the environmental efforts of others.[5] Although mechanisms such as the Kyoto Protocol (and other multilateral environmental agreements) deal with global environmental issues, none of the agreements have universal membership. This imbalance could lead to potential conflicts as treaty-member countries adopt measures to comply with the global agreements, which could be made binding on WTO members who are not parties to the same treaties.

Although there is potential for conflict between trade and the emerging global environmental regime to combat climate change, some issues currently on the agenda of the WTO could potentially be harnessed to promote broader global environmental objectives. For example, a multilateral liberalization of renewable energy sources or an agreement to remove fossil fuel subsidies would equally serve climate change objectives. The WTO negotiations on environmental goods and services could be used as a vehicle for broadening trade in cleaner technology options and thereby help developing countries reduce their greenhouse gas emissions and adapt to climate change. A more transparent and justifiable labeling and standards regime could similarly serve the interests of both trade and global environmental objectives. In addition, more uniform pricing of energy under the UNFCCC could negate some trade issues regarding competitiveness and leakage.

Focus and Results of This Study

In the context of the implications of linkages between trade and climate change, this study assesses the following:

- What are the main policy prescriptions employed by OECD countries to reduce greenhouse gases, and how do they affect the competitiveness of their energy-intensive industries?

BOX 1.3

Environmental Aspects of Bilateral and Multilateral Trade Agreements

The concerns with environmental implications of trade involve both the domestic implications of policy reforms and the global environmental dimension of bilateral and multilateral trade agreements. Although liberalizing reforms generally promote more-efficient resource use (including use of environmental resources), in practice there is no clear-cut reason to expect that trade liberalization will be either good or bad for the environment. The reason is that trade reforms undertaken in the presence of existing market, policy, or institutional imperfections in the environment or natural resource sector may lead to adverse environmental impacts. Some of the common concerns include the following:

- **Reducing barriers to trade will reinforce the tendency for countries to export commodities that make use of resource-intensive production factors.** As a result of weak environmental policies, trade liberalization in developing countries may result in shifts in the composition of production, exports, and foreign direct investment (FDI) to more pollution- or resource-intensive sectors.
- **Trade liberalization may directly affect environmental standards.** Intensified competition could lead to a "race to the bottom" as governments lower standards in the hope of giving domestic firms a competitive edge in world markets or attracting foreign investment.
- **"Environmental tariffs" may be employed against trading partners deemed to have inadequate environmental standards.** The risks associated with these tariffs are that they may be disguised protection of domestic firms.

In practice, however, the opposite often seems to be the case: most countries that are more open to trade adopt cleaner technologies more quickly, and increased real income is often associated with increased demand for environmental quality (WTO 2004). Greater openness to trade also encourages cleaner manufacturing, because protectionist countries tend to shelter pollution-intensive heavy industries. However, it is often the case that pressures on natural resources, including incentives to overexploit or deplete resources, are generally more directly related to policies and institutions within the sector than to trade openness per se (World Bank 1999).

Some more recent studies have looked at the interface of trade and political economy issues and their implications for the environment and natural resources (Barbier, Damania, and Lèonard 2005; Fredriksson and Mani 2004; Fredriksson, Vollebergh, and Dijkgraaf 2004). These studies highlight the role of lobbying groups in influencing both trade and environmental policy outcomes.

- Is there leakage of energy-intensive industries from OECD countries to developing countries on account of the prescriptions' impact on industries' competitiveness?
- Under what conditions can one justify trade measures under the WTO regime? What are the impacts of levying trade measures on trade flows and emissions?
- What are the underlying trade and investment barriers to the use of clean energy technologies in developing countries?
- In addition to tariff and nontariff barriers, do other issues affect the diffusion of clean energy technologies in developing countries?
- Is liberalization of renewable and clean coal technologies a plausible solution to helping developing countries achieve a low-carbon growth path?
- The Doha Round of negotiations on environmental goods and services provides an opportunity for addressing clean technology transfer issues over the business-as-usual scenario. What conditions are necessary for negotiating a climate-friendly package under the current WTO framework?

The broad objective of this study is to analyze areas in which the climate change agenda intersects with multilateral trade obligations. The study identifies the key issues at stake, as well as possible actions—at the national and multilateral levels—that could help developing countries strengthen their capacities to respond to emerging conflicts between international trade and global climate regimes while taking advantage of new opportunities. The study also attempts to respond to the need for more sector-specific analysis.

Chapter 2 contributes to the literature by exploring the economic, environmental, and political rationale underlying the potential tension between implementation of the Kyoto Protocol and the existing WTO principles. The chapter further identifies areas where priorities for proactive policy initiatives could minimize potential damage to both trade and global environmental regimes. Chapter 3 explores and identifies key barriers and opportunities to spur the transfer and diffusion of climate-friendly and clean-energy technologies in developing countries. It further identifies policies and institutional changes that could lead to the removal of barriers and increased market penetration of climate-friendly technology. Chapter 4 examines and builds on the different approaches that have emerged in the negotiations surrounding trade in environmental goods and services, and it proposes a framework for integrating climate objectives in the discussions. Chapter 5 presents our conclusions and provides a framework for integrating and streamlining the global environment within the global trading system.

Findings and Recommendations

In an attempt to advance the trade and climate change agendas, this report presents the following key findings and recommendations.

Findings

Industrial competitiveness in Kyoto Protocol–implementing countries suffers more from energy efficiency standards than from carbon taxation policies. Though the Kyoto Protocol didn't come into force until 2005, in the 1990s most OECD countries had already established regulatory and fiscal policies, emissions trading systems, and voluntary agreements to combat GHG emissions. Efforts by countries to reduce emissions to meet and exceed Kyoto targets have raised issues of competitiveness in countries that are implementing these policies. The analysis in chapter 2 suggests that efficiency standards are more likely to adversely affect industrial competitiveness than carbon taxes. Some industries—such as metal products and transport equipment—are more severely affected by the increasing efficiency requirements. For those industries, the analysis also suggests that it does not matter whether such standard requirements are imposed by the exporting country, the importing country, or both.

The effects of carbon taxation policies on industrial competitiveness are often offset by "policy packages." Though competitiveness issues have been much debated in the context of carbon taxation policies, the study finds no evidence that industries' competitiveness is affected by carbon taxes. In fact, the analysis suggests that exports of most energy-intensive industries increase when a carbon tax is imposed by the exporting countries, or by both importing and exporting countries. This finding gives credence to the initial assumption that recycling the taxes back to the energy-intensive industries by means of subsidies and exemptions may be overcompensating for the disadvantage to those industries. A closer examination of specific energy-intensive industries in OECD countries shows that only in the case of the cement industry has the imposition of a carbon tax by the exporting country adversely affected trade. In the case of the paper industry, trade actually increases as a result of a carbon tax. Results also suggest that trade is not affected when both countries impose the tax.

Some evidence supports relocation (leakage) of carbon-intensive industries to developing countries. A gradual increase in the import-export ratio of energy-intensive industries in developed countries—and a gradual decline in the ratio in some developing regions—indicates that energy-intensive production is gradually shifting to developing countries as a result of many different factors, including climate change measures in developed countries. Although the trend is converging, the import-export ratio is still greater than 1 in developing countries and less than 1 for developed countries, suggesting that developing countries continue to be net importers of energy-intensive products. Lack of strong evidence of relocation suggests that while the overarching objective of climate policies is to reduce emissions, these policies have been designed to shield the competitive sectors of industrialized economies. More stringent climate policies in industrialized countries

in the future may continue to provide the necessary impetus for a more visible leakage of carbon-intensive industries.

Trade measures can be justified only under certain conditions. If a country adopts a border tax measure or even resorts to an outright import ban on products from countries that do not have carbon restrictions, such measures could be in violation of the WTO rules unless they can be justified under the relevant GATT rules. Articles XX(b) and (g) allow WTO members to justify GATT-inconsistent measures, either if these are necessary to protect human, animal, or plant life or health, or if the measures relate to the conservation of exhaustible natural resources, respectively. However, Article XX requires that these measures not arbitrarily or unjustifiably discriminate between countries where the same conditions prevail, nor constitute a disguised barrier to trade. Since most climate change measures do not directly target any particular products, but rather focus on the method by which greenhouse gases may be implicated related to production, issues related to process and production methods (PPMs) are critical for the compatibility between the WTO and Kyoto regimes. In the recent Shrimp-Turtle dispute,[6] the WTO Dispute Settlement Panel and the Appellate Body may have opened the doors to the permissibility of trade measures based on PPMs.

The proposed EU "Kyoto tariff" may hurt the United States' trade balance. There is increasing industry pressure in the EU to sanction U.S. exports for not adhering to the Kyoto targets. This has resulted in calls for a Kyoto tariff on a range of U.S. products to compensate for the loss in competitiveness. Simulation analysis undertaken for this study finds that the potential impact of such punitive measures by the EU could result in a loss of about 7 percent in U.S. exports to the EU. The energy-intensive industries such as steel and cement, which are the most likely to be subject to these provisions and thus would be most affected, could suffer up to a 30 percent loss. Actually, these are conservative estimates, given that they do not account for trade diversion effects that could result from the EU shifting to other trading partners whose tariffs could become much lower than the tariffs on the United States.

Varied levels of tariff and nontariff barriers (NTBs) are impediments to the diffusion of clean energy technologies in developing countries. While the current Kyoto commitments for GHG emissions reduction apply only to Annex I countries, the rising share of developing-country emissions resulting from fossil fuel combustion will require future commitment and participation of developing countries, particularly large emitters like China and India. Some developing countries have already taken measures to unilaterally mitigate climate change; for instance, they have increased expenditures on R&D for energy efficiency and renewable energy programs. It is important that these countries identify cost-effective policies and mitigation technologies that contribute to long-term low-carbon growth paths. Especially for

coal-driven economies like China and India, investments are critical in clean coal technology and renewable energy such as solar and wind power generation. Detailed analysis undertaken for the study in chapter 3 suggests that varied levels of tariffs and NTBs are a huge impediment to the transfer of these technologies to developing countries. For example, energy-efficient lighting in India is subject to a tariff of 30 percent and a nontariff barrier equivalent of 106 percent.

Recommendations

A closer examination of the "policy bundle" or package associated with energy taxation is warranted. The results emerging from the analysis in chapter 2 suggest that carbon taxation policies do not adversely affect the competitiveness of energy-intensive industries. This finding suggests that complementary policies (implicit subsidies, exemptions, etc.)—which are used in conjunction with carbon taxation policies levied by Kyoto Protocol–implementing countries, particularly on energy-intensive industries—could be negating any impact of carbon taxation. A more detailed study of this issue is warranted, as it will yield a greater understanding of the implicit subsidies or costs that are associated with each industry. The importance of this finding cannot be understated, as trade measures are justified based on perceptions of higher costs for energy-intensive industries in developed countries and associated loss of competitiveness on account of those costs. The political economy of carbon taxation policies may be used to gain greater insights into the policy package as well.

It would be useful at the outset for trade and climate regimes to focus on a few areas where short-term synergies could be exploited. The energy efficiency and renewable energy technologies needed to meet future energy demand and reduce GHG emissions below current levels are largely available. The WTO parties can do their part by seriously considering liberalizing trade in climate-friendly and energy-efficient goods as a part of the ongoing Doha negotiations to support Kyoto. Within the UNFCCC, it would also help to accelerate and bring greater clarity to the technology transfer agenda. Within the Kyoto Protocol, the most important priority regarding the linkage to trade would be to facilitate a uniform approach to the pricing of greenhouse gas emissions.

Removal of tariff and nontariff barriers can increase the diffusion of clean technologies in developing countries. As stated above, access to climate-friendly clean energy technologies is especially important for the fast-growing developing economies. Within the context of the current global trade regime, the study finds that a removal of tariffs and NTBs for four basic clean energy technologies (wind, solar, clean coal, and efficient lighting) in 18 of the high-GHG-emitting developing countries will result in trade gains of up to 13 percent. If translated into emissions reductions, these gains suggest that—even within a small subset of clean

energy technologies and for a select group of countries—the impact of trade liberalization could be reasonably substantial.

Streamlining of intellectual property rights, investment rules, and other domestic policies will aid in widespread assimilation of clean technologies in developing countries. Firms sometimes avoid tariffs by undertaking foreign direct investment (FDI) either through a foreign establishment or through projects involving joint ventures with local partners. While FDI is the most important means of transferring technology, weak intellectual property rights (IPR) (or perceived weak IPR) regimes in developing countries often inhibit diffusion of specific technologies beyond the project level. Developed country firms, which are subject domestically to much stronger IPRs, often transfer little knowledge along with the product, thus impeding widespread dissemination of the much-needed technologies. Further, FDI is also subject to a host of local country investment regulations and restrictions. Most non–Annex I countries also have low environmental standards, low pollution charges, and weak environmental regulatory policies. These are other hindrances to acquisition of sophisticated clean energy technologies.

The huge potential for trade between developing countries (South-South trade) in promoting clean energy technology in those countries needs to be explored more. Traditionally, developing countries have been importers of clean technologies, while developed countries have been exporters of clean technologies. However, as a result of their improving investment climate and huge consumer base, developing countries are increasingly becoming major players in the manufacture of clean technologies. A key development in the global wind power market is the emergence of China as a significant player, both in manufacturing and in investing in additional wind power capacity. Similarly, other developing countries have emerged as manufacturers of renewable energy technologies. India's photovoltaic (PV) capacity has increased several times in the last four years, while Brazil continues to be a world leader in the production of biofuels. These developments augur well for a buoyant South-South technology transfer in the future.

Clean technology trade would greatly benefit from a systematic alignment of harmonization standards. The volume of trade and the level of tariffs can be examined by identifying and tracking the unique HS code associated with each technology or product under the Harmonized Commodity Description and Coding System (commonly called the harmonized system or HS). Typically, each component of the technology has a different HS code. At the WTO-recognized six-digit code level, clean energy technologies and components are often found lumped together with other technologies that may not necessarily be classified as being beneficial to either the global or even local environment. Solar photovoltaic panels are categorized as "Other" under the subclassification for light-emitting

diodes (LEDs). Such categorization suggests that reducing the customs tariff on solar panels might also result in tariff reduction for unrelated LEDs. Similarly, clean coal technologies and components are not classified under a separate category, and all gasification technologies are lumped together. The imprecise definition also raises another issue for countries that are considering removal of trade barriers to clean energy equipment and components. In cases where the codes are not detailed enough, the scope of the tariff reduction may become much broader than anticipated.

The ongoing WTO negotiations on environmental goods have the potential to contribute significantly to both trade and climate change efforts, but the negotiations will need to address a number of challenges. Liberalizing trade in specific goods and technologies that are relevant for climate change mitigation may have implications with regard to the costs of mitigation measures, particularly those technologies that face high tariff and nontariff barriers to trade. The relevant concerns cannot be disregarded, such as those related to definition of relevant products (especially products that also have nonenvironmental uses); harmonizing classifications and descriptions across countries within the harmonized system; changes in technology; issues related to perceived impacts on domestic industries; and nontariff measures and access to technology. Goods that would benefit include those that directly address climate change mitigation, as well as environmentally preferable products that contribute to zero or reduced GHG emissions during production, consumption, or use. Goods and technologies used in CDM projects (including programmatic CDMs) are particularly relevant.

Political economy dynamics may necessitate the consideration of innovative packages for trade liberalization in climate-friendly goods. One package could be an ITA-type agreement within single undertaking, whereby members representing a minimum percentage of trade in climate-friendly products would join. Such an agreement could be a subcategory within any larger negotiated package of environmental goods or in a separate agreement. A second option, particularly if negotiations on environmental goods fail to reach a meaningful outcome, would be to consider a plurilateral agreement similar to the agreement on government procurement. In that option, the agreement could come into effect immediately or even independent of the conclusions of the Doha Round negotiations, but only the signatories would extend as well as receive the benefits of trade liberalization in climate-friendly products. The advantage in the second option would be that members, particularly developing countries, need not feel compelled to sign on immediately.

RTAs also offer opportunities, but there are challenges to consider. A collapse of the Doha Round could result in a spurt in regional trade agreements (RTAs) as more WTO members seek alternative routes to pursue their trade agenda. A number

of problems associated with defining environmental and climate-friendly goods will be less of an issue, as most RTAs would normally liberalize at a broader HS level (usually six-digit). With regard to provisions aimed at building supply-side capacities and technical assistance, RTAs may be better suited to include provisions tailored to the needs of participating developing countries. On the other hand, RTAs may also result in the diversion of trade from countries that are most effective at producing climate-friendly technologies if those countries are excluded from an RTA.

Making tangible and immediate progress is necessary in several venues. Just as business as usual in GHG emissions is not sustainable, business as usual in trade negotiations is not an adequate response to challenges posed in the study. At least some of the steps mentioned could be taken in the context of the Doha Round and perhaps even agreed to separately if WTO members fail to come to an agreement and the Doha Round is terminated or suspended indefinitely. Although the role of WTO negotiations has been emphasized in this study, there are other venues where similar progress can be made. In particular, the next COP/MOP (Conference/Meeting of the Parties to the Protocol) meetings in 2007 and the G-8+5 summit in 2008 both offer opportunities for the leaders of the major GHG-emitting countries to make specific commitments to reduce tariff and nontariff barriers to international trade and investment in goods, services, and technologies that contribute to the mitigation of climate change.

Notes

1 Competitiveness concerns were the explicit prime motivation for the withdrawal of the United States from the Kyoto process. Competitiveness concerns have since plagued Canada, the United States' largest trading partner and the bearer of a relatively difficult emissions reduction target.

2 The Montreal Protocol on Substances that Deplete the Ozone Layer is one of the first international environmental agreements to include trade sanctions to achieve the stated goals of a treaty. It also offers major incentives for nonsignatory nations to sign the agreement. The treaty negotiators justified the sanctions because depletion of the ozone layer is an environmental problem most effectively addressed on the global level. Furthermore, it was argued that without the trade sanctions, there would be economic incentives for nonsignatories to increase production, damaging the competitiveness of the industries in the signatory nations as well as decreasing the search for less-damaging CFC alternatives. Article IV of the Montreal Protocol stipulated that one year after the treaty came into force, all imports of controlled substances "from any non-party states are banned and that none of the signatories are allowed to export a controlled substance to non-party states."

3 The UNFCCC uses the term *environmentally sound technologies* for climate-friendly technologies. This paper uses the term *clean energy technologies* to be consistent with the Clean Energy Investment Framework (CEIF).

4 The issue of trade and the environment has surfaced at the World Bank from time to time. Two edited volumes (World Bank 1992, 1999) focused on issues such as pollution havens, "race to the bottom," and foreign direct investment inflows. These were quite useful in informing the broader discussion in the area at that time.

5 The traditional arguments of trade and growth, which are often positively associated with local pollution issues, do not in fact hold for global externalities such as greenhouse gas emissions. This is due to the classic "free rider" problem. Any country individually would have little incentive to cut back emissions, because it would bear the costs alone even though the benefits would accrue to all.

6 *United States—Import Prohibition of Certain Shrimp and Shrimp Products*, WT/DS58/AB/R. See chapter 2.

INTERNATIONAL TRADE AND CLIMATE CHANGE: Economic, Legal, and Institutional Perspectives

PRODUCT	STOCK #	PRICE	QTY	SUBTOTAL
International Trade and Climate Change: Economic, Legal and Institutional Perspectives **(ISBN: 978-0-8213-7225-8)**	D17225	US$20.00		
			Subtotal	
			Geographic discount*	
			Shipping and Handling**	
			Total $US	

** Geographic discounts apply – up to 75% depending on ship-to country. See http://publications.worldbank.org/discounts.*

*** Shipping and handling charges within the United States are US$8 per order. If a purchase order is used, actual shipping charges will be charged (available for institutional customers in the United States only).*

ORDER ONLINE AT www.worldbank.org/publications

Customers in the United States
Complete this form and mail it to World Bank Publications, P.O. Box 960, Herndon VA 20172-0969 or fax it to 703-661-1501. To charge by credit card, either order online or call 800-645-7247 or 703-661-1580.

Customers outside the United States
Contact your local distributor for information on prices in local currency and payment terms (http://publications. worldbank.org/booksellers). If you do not have a distributor, order online or fax this form to +1-703-661-1501 or mail it to World Bank Publications, P.O. Box 960, Herndon VA 20172-0969, USA.

MAILING ADDRESS

Name _____

Organization _____

Address _____

City _____ State _____ Zip _____

Country _____

Phone _____ Fax _____

Email _____

METHOD OF PAYMENT

☐ Charge my:

☐ Visa ☐ Mastercard ☐ American Express

Name _____ Card # _____

Signature _____ Exp. Date _____

☐ Enclosed is my check in US$ drawn on a U.S. bank and made payable to the World Bank.

THANK YOU FOR YOUR ORDER ***OFDGO7***

WORLD BANK Publications | ***The reference of choice on development***