

# International Trade and Climate Change

*Economic, Legal, and  
Institutional Perspectives*



**THE WORLD BANK**  
Washington, DC



## C O N T E N T S

*ix Acknowledgments*

*xi Abbreviations*

### C H A P T E R 1

#### **1 Introduction and Overview**

4 Technology Options to Stabilize Greenhouse Gas Emissions

7 The Debate on Trade and the Environment Revisited

8 Focus and Results of This Study

10 Findings and Recommendations

16 Notes

### C H A P T E R 2

#### **18 Climate Change Policies and International Trade: Challenges and Opportunities**

19 Do Climate Change Measures Affect Competitiveness?

29 In Search of Carbon Leakage: Examining the Relocation of  
Energy-Intensive Industries to Developing Countries

35 Trade Measures

39 WTO and Kyoto Protocol: Exploring Synergies for Advancing Both Trade  
and Climate Agendas

41 Key Findings from Chapter 2

41 Notes

### C H A P T E R 3

#### **45 Beyond Kyoto: Striving for a Sustainable Energy Future in Developing Countries**

46 Global Emissions Scenarios through 2030

47 Clean Energy for the Future

52 Liberalization of Trade in Clean Energy Technologies

54 Clean Coal Technology

59 Wind Power Technology

62 Solar Photovoltaics (PV) Technology

68 Energy-Efficient Lighting

70 Conclusions

72 Key Findings from Chapter 3

72 Notes

## CHAPTER 4

**73 Opportunities for Win-Win-Win: Liberalizing Trade in Environmental Goods and Services**

- 74 Complexity Surrounding Environmental Goods (EG) Discussions
- 78 Linking of Current EG Discussions to Climate Change Mitigation
- 80 Options for Negotiating a Climate-Friendly Package within the WTO Framework
- 82 Lessons from Current EG Discussions for Negotiating a Climate-Friendly Package
- 87 The Way Forward on a Possible Agreement on Climate Change Mitigation Products
- 95 Key Findings from Chapter 4
- 95 Notes

## CHAPTER 5

**97 Conclusions and Recommendations**

- 97 Findings
- 99 Recommendations

**Appendixes**

- 105 **APPENDIX 1.** Kyoto Protocol: Countries Included in Annex B to the Kyoto Protocol and Their Emissions Targets
- 107 **APPENDIX 2.** Measures to Combat Climate Change
- 107 Regulatory Measures
- 109 Fiscal Measures
- 111 Market-Based Instruments
- 113 Voluntary Agreements (VAs)
- 114 Notes
- 117 **APPENDIX 3.** Model Specification and Results
- 123 **APPENDIX 4.** Industry-Specific Effects of Carbon Taxes and Energy Efficiency Standards
- 127 **APPENDIX 5.** Partial Equilibrium Trade Policy Simulation Model
- 129 **APPENDIX 6.** Maximum and Applied Tariff Rates on Select Climate-Friendly Technologies
- 133 *Bibliography*
- 139 *Index*

**Boxes**

- 2 **1.1** The Kyoto Protocol
- 6 **1.2** Summary List of Technologies Considered as “Wedges” for Climate Change Mitigation
- 9 **1.3** Environmental Aspects of Bilateral and Multilateral Trade Agreements
- 35 **2.1** Globalization of the Chemical Industry
- 48 **3.1** Approaches to Employing Technology Investments in Developing Countries

51	<b>3.2</b>	Regional and Country-Specific HS Nomenclature
55	<b>3.3</b>	Clean Coal Technologies
60	<b>3.4</b>	A Case of Other Barriers to Technology Diffusion: The China Study
66	<b>3.5</b>	Cambodia: Additional Duties Leading to Lower Diffusion
67	<b>3.6</b>	Lessons Learned in Designing Financial Incentives for Renewable Energy
69	<b>3.7</b>	Bundling Policies to Promote Energy Savings: The Case of South Africa
75	<b>4.1</b>	Main Issues in Liberalization of Environmental Goods and Services
88	<b>4.2</b>	Trade, Environment, and Biofuels

## Figures

4	<b>1.1</b>	CO <sub>2</sub> Emissions from Energy Use, 2002–30
31	<b>2.1</b>	World Crude Oil Price, 1990–2005
32	<b>2.2</b>	Import-Export Ratio of Energy-Intensive Products in High-Income OECD Countries and Low- and Middle-Income Economies
32	<b>2.3</b>	Import-Export Ratio of Energy-Intensive Products in the United States and EU
33	<b>2.4</b>	Import-Export Ratio of Energy-Intensive Products in Low- and Middle-Income East Asian and Pacific Economies and China
33	<b>2.5</b>	Import-Export Ratio of Energy-Intensive Products in Low- and Middle-Income Economies in Various Regions
46	<b>3.1</b>	CO <sub>2</sub> Emissions from Energy Use, 2002–30
54	<b>3.2</b>	Energy Production in China and India, 2004
57	<b>3.3</b>	Clean Coal Technology Import-Export Ratio in High-Income versus Low- and Middle-Income Countries
62	<b>3.4</b>	Wind Power Generation Import-Export Ratio in High-Income versus Low- and Middle-Income Countries
64	<b>3.5</b>	Solar Power Generation Import-Export Ratio in High-Income versus Low- and Middle-Income Countries
69	<b>3.6</b>	Import-Export Ratio of Fluorescent Lamps in High- and Low-Income Countries
88	<b>4.1</b>	Traditional Environmental Goods versus Environmentally Preferable Products
94	<b>4.2</b>	Considerations for a Win-Win-Win Package on Trade and Climate Change

## Tables

21	<b>2.1</b>	Existing Measures to Combat Climate Change in Annex I Countries
23	<b>2.2</b>	Status of Carbon Tax Regimes in Selected OECD Countries
25	<b>2.3</b>	Existing Energy Efficiency Standards for Select Products in OECD Countries
26	<b>2.4</b>	Predicted Competitiveness Impacts of Carbon Taxes and Energy Efficiency Standards
28	<b>2.5</b>	Impact of Carbon Taxes and Energy Efficiency Standards on Export Competitiveness

- 39 **2.6** Impact of an EU “Kyoto Tariff” on U.S. Exports
- 47 **3.1** Potential Contribution to CO<sub>2</sub> Increase, 2002–30
- 53 **3.2** Change in Trade Volumes in High-GHG-Emitting Developing Countries from Liberalizing Clean Energy Technologies
- 57 **3.3** Top 10 Trading Countries for IGCC (Clean Coal) Technology Components
- 58 **3.4** Applied Average Tariffs and NTBs for IGCC (Clean Coal) Technologies in the 18 High-GHG-Emitting Developing Countries
- 61 **3.5** Top 10 Trading Countries in Wind Energy
- 63 **3.6** Applied Average Tariffs and NTBs for Wind Technology in 18 High-GHG-Emitting Developing Countries
- 64 **3.7** Top 10 Trading Countries in Solar Photovoltaics
- 65 **3.8** Applied Tariffs and NTBs for Solar Photovoltaic Technology in 18 High-GHG-Emitting Developing Countries
- 68 **3.9** Top 10 Trading Countries for Fluorescent Lamps
- 69 **3.10** Average Applied Tariffs and NTBs on Fluorescent Lamps in 18 High-GHG-Emitting Developing Countries
- 80 **4.1** Trade in Climate-Friendly Technologies of Both High-Income and Low- and Middle-Income WTO members
- 84 **4.2** Fuel Subsidies in OECD and non-OECD Countries
- 118 **3A** Results from the Competitiveness Analysis: Effects of Climate Change Measures on all Relevant Industries
- 119 **3B** Results from the Competitiveness Analysis: Effects of Climate Change Measures on Energy-Intensive Industries
- 120 **3C** Results from the Competitiveness Analysis: Effects of Climate Change Measures on Industries Subject to Higher Efficiency Standards
- 124 **4A** Impact of Carbon Taxes and Energy Efficiency Standards on Export Competitiveness (Energy-Intensive Industries)
- 124 **4B** Impact of Carbon Taxes and Energy Efficiency Standards on Export Competitiveness (Industries Subject to Higher Energy Efficiency Standards)