

CLIMATE POLICY AFTER COPENHAGEN

At the UN climate negotiations in Copenhagen, 117 heads of state concluded that low-emissions development is necessary in order to combat climate change. However, they also understood that transition to a low-carbon economy requires the implementation of a portfolio of policies and programmes — a challenging endeavour for any nation. This book addresses the need for information about factors impacting on climate policy implementation, using as a case study one effort that is at the heart of attempts to create a low-carbon future: the European Union emissions-trading scheme (ETS). It explores the experience with the implementation of the ETS, including the role of vested interests, the impact of design details and opportunities to attract long-term investments. It also discusses how international climate co-operation can support the domestic implementation of low-carbon policies. This timely analysis of carbon pricing contains important lessons for all those concerned with the development of post-Copenhagen climate policy.

Karsten Neuhoff is Director of the Berlin office of Climate Policy Initiative, a global research organisation whose mission is to assess, diagnose and support the efforts of nations to achieve low-carbon growth. He is also Research Director for Climate Policy Impact and Industry Response at the German Institute for Economic Research (DIW Berlin). He was previously an economist at the University of Cambridge leading climate policy and energy research projects, and worked with Climate Strategies on projects related to the European Union emissions-trading scheme.



Climate Policy after Copenhagen

THE ROLE OF CARBON PRICING

Karsten Neuhoff





CAMBRIDGE UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom
One Liberty Plaza, 20th Floor, New York, NY 10006, USA
477 Williamstown Road, Port Melbourne, VIC 3207, Australia
314-321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi - 110025, India
103 Penang Road, #05-06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org Information on this title: www.cambridge.org/9781107401419

© Karsten Neuhoff 2011

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 2011

A catalogue record for this publication is available from the British Library

Library of Congress Cataloging in Publication data Neuhoff, Karsten.

Climate policy after Copenhagen: the role of carbon pricing / Karsten Neuhoff.

p. cm.

ISBN 978-1-107-00893-9 (hardback)

Emissions trading 2. Climatic changes – International cooperation. 3. Environmental protection – International cooperation. 1. Title.

HC79.E5N447 2011 363.738′746–dc22 2011004249

ISBN 978-1-107-00893-9 Hardback ISBN 978-1-107-40141-9 Paperback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication, and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.



For Julia



Contents

	List of figures	page 1x
	List of tables	xii
	List of boxes	xiii
	Acknowledgements	xiv
	List of abbreviations	xv
I	Introduction	I
2	The role of a climate policy mix	19
2.I	Putting a price on carbon	20
2.2	The role of technology policy	29
2.3	The role for targeted measures and regulation	41
2.4	Managing distributional implications	45
2.5	Conclusion	52
3	Implementing a carbon price: the example of cap and trade	56
3.1	The SO ₂ trading programme in the USA	58
3.2	The European Union emissions-trading scheme	61
3.3	Setting the cap: too many cooks spoil the broth	65
3.4	Distributing allowances: compensate or distort	72
3.5	Sectoral coverage of a carbon-pricing scheme	86
3.6	Conclusion	93
4	Shifting investment to low-carbon choices	97
4. I	The nature of uncertainty	98

vii



viii • Contents

4.2	Response to uncertainty with taxes and cap-and-trade schemes	100
4.3	Investment under uncertainty: contrasting different perspectives	105
4.4	Addressing requirements of strategic investors	109
4.5	Addressing requirements of project investors	115
4.6	Addressing the needs of financial investors	125
4.7	Conclusion	129
5	Co-operation among developed countries: a role for carbon	
	markets?	132
5.1	Using international co-operation to enhance domestic commitment	133
5.2	Transparent monitoring and reporting	140
5·3	Carbon-market-based international co-operation among	140
ر.ر	developed countries	143
5.4	The economics of carbon-market-based co-operation	-73
J.4	mechanisms	148
5.5	The political economy of carbon-market-based instruments	151
5.6	A global carbon tax	155
5.7	Conclusion	158
6	A world of different carbon prices	162
6 6.1	A world of different carbon prices Screening for high carbon costs	162 164
6.1	Screening for high carbon costs	164
6.1 6.2	Screening for high carbon costs Do international cost differences matter? Dimensions of trade	164 173
6.1 6.2 6.3	Screening for high carbon costs Do international cost differences matter? Dimensions of trade Corporate strategy: the longer-term view	164 173 178
6.1 6.2 6.3 6.4	Screening for high carbon costs Do international cost differences matter? Dimensions of trade Corporate strategy: the longer-term view The industry value chain: leakage versus substitution effect	164 173 178 181
6.1 6.2 6.3 6.4 6.5	Screening for high carbon costs Do international cost differences matter? Dimensions of trade Corporate strategy: the longer-term view The industry value chain: leakage versus substitution effect Policy options to address leakage Conclusion International support for low-carbon growth in developing	164 173 178 181 185
6.1 6.2 6.3 6.4 6.5 6.6	Screening for high carbon costs Do international cost differences matter? Dimensions of trade Corporate strategy: the longer-term view The industry value chain: leakage versus substitution effect Policy options to address leakage Conclusion International support for low-carbon growth in developing countries	164 173 178 181 185 198
6.1 6.2 6.3 6.4 6.5 6.6	Screening for high carbon costs Do international cost differences matter? Dimensions of trade Corporate strategy: the longer-term view The industry value chain: leakage versus substitution effect Policy options to address leakage Conclusion International support for low-carbon growth in developing countries Framework for international co-operation	164 173 178 181 185 198
6.1 6.2 6.3 6.4 6.5 6.6	Screening for high carbon costs Do international cost differences matter? Dimensions of trade Corporate strategy: the longer-term view The industry value chain: leakage versus substitution effect Policy options to address leakage Conclusion International support for low-carbon growth in developing countries Framework for international co-operation Financial needs for low-carbon development	164 173 178 181 185 198
6.1 6.2 6.3 6.4 6.5 6.6 7	Screening for high carbon costs Do international cost differences matter? Dimensions of trade Corporate strategy: the longer-term view The industry value chain: leakage versus substitution effect Policy options to address leakage Conclusion International support for low-carbon growth in developing countries Framework for international co-operation Financial needs for low-carbon development The role of carbon markets to provide support for	164 173 178 181 185 198 203 206 210
6.1 6.2 6.3 6.4 6.5 6.6 7 7.1 7.2	Screening for high carbon costs Do international cost differences matter? Dimensions of trade Corporate strategy: the longer-term view The industry value chain: leakage versus substitution effect Policy options to address leakage Conclusion International support for low-carbon growth in developing countries Framework for international co-operation Financial needs for low-carbon development The role of carbon markets to provide support for developing countries	164 173 178 181 185 198
6.1 6.2 6.3 6.4 6.5 6.6 7 7.1 7.2	Screening for high carbon costs Do international cost differences matter? Dimensions of trade Corporate strategy: the longer-term view The industry value chain: leakage versus substitution effect Policy options to address leakage Conclusion International support for low-carbon growth in developing countries Framework for international co-operation Financial needs for low-carbon development The role of carbon markets to provide support for	164 173 178 181 185 198 203 206 210
6.1 6.2 6.3 6.4 6.5 6.6 7 7.1 7.2 7.3	Screening for high carbon costs Do international cost differences matter? Dimensions of trade Corporate strategy: the longer-term view The industry value chain: leakage versus substitution effect Policy options to address leakage Conclusion International support for low-carbon growth in developing countries Framework for international co-operation Financial needs for low-carbon development The role of carbon markets to provide support for developing countries	164 173 178 181 185 198 203 206 210
6.1 6.2 6.3 6.4 6.5 6.6 7 7.1 7.2 7.3	Screening for high carbon costs Do international cost differences matter? Dimensions of trade Corporate strategy: the longer-term view The industry value chain: leakage versus substitution effect Policy options to address leakage Conclusion International support for low-carbon growth in developing countries Framework for international co-operation Financial needs for low-carbon development The role of carbon markets to provide support for developing countries Conclusion	164 173 178 181 185 198 203 206 210 220 234



Figures

2.1	Relationship between the energy intensity of an	
	economy and average energy prices	page 22
2.2	Estimated price elasticities of demand for various commodities	s 24
2.3	EU-25 emissions attributed to steel and cement	
	production in 2005, and expected emissions reduction	27
2.4	Stages of technology innovation and use	31
2.5	Installed wind power per year in MW	40
2.6	Global greenhouse gas abatement cost curve beyond	
	business-as-usual (v. 2.1) to 2030	42
2.7	Power prices versus fuel/CO ₂ costs in Germany	46
2.8	Estimates of carbon tax impacts and redistribution policies	49
2.9	Three pillars of climate policy	53
3.1	Evaluation of prices under USA's SO ₂ trading scheme	60
3.2	Structure of the European Union emissions-trading	
	scheme	62
3.3	Price of EU emissions allowance for phases I and II	
	(European Energy Exchange and European Climate	
	Exchange)	66
3.4	Power sector illustration of distortions from free-	
	allowance allocation	73
3.5	Comparison of new entrant allocation	79
3.6	Pyramid of distortions of the EU ETS	81



x • List of figures

3.7	Importance for sectors of differences in energy taxes,	
	regulations and carbon pricing	88
4. I	Generation share of different technologies in the UK:	
	1960–1997	98
4.2	Marginal damage and mitigation costs, and the impact	
	of uncertainty (Weitzman framework)	101
4.3	Mitigation-cost curve steeper than damage-cost curve	102
4.4	Roles of different technologies over the next four	
	decades using long-term emissions targets	106
4.5	Renewables targets and the role of different renewable	
	technologies	107
4.6	Impact of carbon price projections for agents involved	
	in investment decisions	108
4.7	Ex ante and ex post costs of UK policies	111
4.8	Components of a low-carbon perspective	114
4.9	EU-25 emissions projections for 2008–2012 based on	
	verified emissions in 2005	117
4.10	Put options on the price of carbon	123
4.11	Market categorisation of risk determining finance	
	structure, access and cost	126
5.1	Extremes of setting climate policy targets	136
5.2	Time frames used for the definition of policy targets	
	and differentiation between input-based and	
	output-based metrics	142
5.3	Three main channels for linkage between countries	146
6.1	Potential channels for leakage	165
6.2	The economics of leakage along the production channel	167
6.3	Value at stake for main manufacturing sectors v. UK	
	trade intensity from outside EU at €20/tonne CO2	169
6.4	Value at stake for construction materials v. UK trade	
	intensity from outside EU at €20/tonne CO2	171
6.5	Industrial activities with the highest cost increase from	
	carbon pricing and their contribution to UK GDP	172
6.6	Determining premium for domestic products and	
	trade-related costs for imports	174
6.7	Can local premium and trade costs (import costs)	
	compensate for asymmetric carbon costs?	176
6.8	Impact of carbon pricing on demand and trade	
	flows for EU	170



List of figures • xi

6.9	Illustration of value chain with potentials for efficiency	
	improvements, substitution and leakage	181
6.10	Value chain of concrete production	182
6.11	Value chain of steel production using basic oxygen	
	furnace process	184
6.12	Policy options to address leakage concerns	186
6.13	International co-operation could define limitations for	
	the use of border adjustment	197
7.1	Distribution of regional per capita greenhouse gas	
	emissions in 1990 and 2007	204
7.2	Concept for actions that allow for a transition in	
	individual sectors or technologies	207
7.3	Economic potential for greenhouse gas emissions reduction	
	in non-OECD, non-EIT countries relative to baseline	
	emissions Special Report on Emissions Scenarios B2	223
7.4	European emissions trajectories with and	
	without off-sets	225



Tables

3.1 Emissions-trading-scheme emissions cap as proposed by		
	Member States and accepted by EU Commission	page 71
4. I	Main determinants of investment choices across sectors	109
6.1	Instruments to address leakage for production of	
	different commodities	190
7.1	Financial mechanisms to contribute to investment and	
	operation	215
7.2	Financial mechanisms to facilitate access to finance	216

xii



Boxes

2.I	Prices, cost-pass through: power-sector example	page 46
4.I	Tax versus cap and trade	101
4.2	Government-issued put options to guarantee a price floor	123
5.1	Experience with policy indicators	142
6.1	Leakage channels	165

xiii



Acknowledgements

I would like to thank David Newbery, for his continued insistence and ideas on ensuring a robust analytic analysis, and Michael Grubb, for the introduction to climate change policy and guidance on how to capture and communicate the complexities. For all the detailed input, constructive comments on drafts, and edits I would like to thank Alex Henney, Alexander Vasa, Andreia Meshreky, Anne Neumann, Anne Schopp, Angus Johnston, Andreas Tuerk, Arttu Makipaa, Axel Michaelowa, Cameron Hepburn, Chantal Morel, Chris Beauman, Dallas Burtraw, Damien Demailly, David Nelson, Denny Ellerman (also for data for Figure 3.1), Ferdinand Vieider, Gerri Ward, Heleen de Coninck, Hermann F. Amecke-Gen-Monnighoff, Ines Neubert, Jill Duggan, Jon Ward, Jonathan Mirrlees-Black, Kate Loveys, Kath Rowley, Michael Lührs, Michel Colombier, Misato Sato, Peter Wooders, Roland Ismer, Sam Frankhauser, Sarah Lester, Seabron Adamson, Terry Barker, Thilo Grau, Tim Laing, Umashankar Sreenivasamurthy, Victoria Roberts.

I am grateful to Cambridge University, DIW Berlin, Climate Policy Initiative, Climate Strategies and the Economic and Social Research Council grant Towards a Sustainable Energy Economy (RES-152-25-1002) for funding the research for the book and for the underlying projects.



Abbreviations

AAU	assigned amount unit
BAT	best available technology
BAU	business as usual
BOF	basic oxygen furnace
CCGT	combined-cycle gas turbine
CCS	carbon capture and sequestration
CDM	clean development mechanism
CER	certified emission reduction
CfD	contract for difference
COMETR	Competitiveness Effects of Environmental Tax Reforms
COP	Conference of the Parties
EAF	electric arc furnace
EBRD	European Bank for Reconstruction and Development
ECX	European Climate Exchange
EEX	European Energy Exchange
EIT	economies in transition
EPA	Environmental Protection Agency
EU ETS	European Union emissions-trading scheme
EUA	European Union Allowance
GDP	gross domestic product
GEF	Global Environment Facility
GHG	greenhouse gas
IEA	International Energy Agency



xvi • List of abbreviations

IFC	International Finance Corporation
IFI	international financial institution
IISI	International Iron and Steel Institute
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPR	intellectual property rights
JI	joint implementation
LPSA	Local Public Service Agreement
MIGA	Multilateral Investment Guarantee Agency
MOP	Meeting of the Parties
NAMA	nationally appropriate mitigation action
NAP	national allocation plan
ODA	Overseas Development Agency
OECD	Organisation for Economic Co-operation and Development
PRSP	Poverty Reduction Strategy Paper
RGGI	Regional Greenhouse Gas Initiative
SRES	Special Report on Emissions Scenarios
UNFCCC	United Nations Framework Convention on Climate
	Change
VAT	value-added tax
WB	World Bank
WCI	Western Climate Initiative
WTO	World Trade Organization