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Towards a global carbon market?

Potential and limits of carbon market integration

Timo Behr and Jan Martin Witte

with Wade Hoxtell and Jamie Manzer

GPPi
global public policy institute

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Abbreviations

AAU	Assigned Amount Unit
ACESA	American Clean Energy and Security Act
ATA	Air Transport Association of America
ACCCE	American Coalition for Clean Coal Electricity
API	American Petroleum Institute
AOSIS	Association of Small Island States
CCS	Carbon Capture & Storage
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
COP	Conference of the Parties
CPRS	Carbon Pollution Reduction Scheme)
CO_2	Carbon dioxide
EC	European Commission
EITE	Emissions-intensive trade exposed industries
EPA	US Environmental Protection Agency
ERC	Emission Reduction Credit
EU	European Union
EU ETS	European Union Emissions Trading System
GDP	Gross domestic product
ICAP	International Carbon Action Partnership
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IPR	Intellectual property rights
JI	Joint Implementation
LDC	Least developed country
LULUCF	Land use, Land-use Change and Forestry
MAC	Marginal abatement cost
MRET	Mandatory Renewable Energy Target
MRV	Monitoring, reporting and verification
NAP	National Allocation Plan
NO_X	Nitrogen oxide
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
PoA	Program of Activities
R&D	Research and Development
RGGI	Regional Greenhouse Gas Initiative
SMEs	Small- and medium sized enterprises
SO_X	Sulfur dioxide
UN	United Nations

Abbreviations (cont'd)

UNDP	United Nations Development Programme (UNDP)
UNFCCC	United Nations Framework Convention on Climate Change
WCI	Western Climate Initiative

1. Introduction and Executive Summary

"As President, I will set a hard cap on all carbon emissions at a level that scientists say is necessary to curb global warming - an 80% reduction by 2050. […] In addition to this cap, all polluters will have to pay based on the amount of pollution they release into the sky. The market will set the price, but unlike the other cap-and-trade proposals that have been offered in this race, no business will be allowed to emit any greenhouses gases for free. Businesses don't own the sky, the public does, and if we want them to stop polluting it, we have to put a price on all pollution."[1]

President Barack Obama's campaign promise highlights two important trends. First, almost 20 years after the publication of the first Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), there is now almost universal recognition that climate change is a serious challenge that requires urgent policy action. While there remain disagreements about the precise share of anthropogenic forces in driving global warming, a consensus is emerging about the catastrophic consequences of a "business-as-usual" approach to greenhouse gas emissions.

Second, it also underlines the growing trust that policymakers around the world are placing in the potential of emissions trading regimes (also called cap-and-trade systems) for achieving large-scale mitigation of man-made greenhouse gas emissions, and especially of carbon dioxide (CO_2). Most prominently, the European Union (EU) has made emissions trading the centerpiece of its international negotiation strategy as well as its domestic mitigation efforts. The growing trust in emissions trading in realizing ambitious mitigation targets has been buttressed by a recent assessment of the IPCC which, in its Fourth Assessment Report of 2007, argued that "[…] carbon prices in the range 20–50 US$/tCO_2$ (US$75–185/tC), reached globally by 2020–2030 and sustained or increased thereafter, would deliver deep emission reductions by mid-century consistent with stabilization at around 550ppm CO_2-eq […] if implemented in a stable and predictable fashion."[2]

Cap-and-trade systems establish property rights to emissions, allocate them to actors that are included in the system, create a market in which those actors can trade these property rights and, finally, institute penalties for non-compliance. The purpose of these regimes is to either reduce energy demand or to change the way energy is produced (switching into non-carbon alternatives). Proponents of emissions trading suggest that such a market-based approach to emissions reduction constitutes the most effective and efficient mechanism to achieve ambitious mitigation goals. It should be noted in this context, however, that the achievement of both objectives on a large scale must work through a process of technological change and innovation.

One of the key targets of emissions trading schemes is the power sector. This makes sense. The power sector, in most countries firmly wedded to a fossil fuel-based energy paradigm, is responsible for close to 60 percent of worldwide emissions of CO_2. The goal of putting a price on emissions is to incentivize power producers to switch into low-carbon (or carbon-neutral) generation capacity. The challenge here is enormous. The International Energy Agency (IEA) estimates that between 2007 and 2030, more than US$26 trillion in new energy sector investment is necessary in order to keep up with world demand.[3] These investments, a significant portion of which will have to be realized in major emerging economies such as China and India, will determine emissions trajectories for decades to come. Under a business-as-usual scenario (i.e. without putting a price on carbon, either through emissions trading or some other suitable policy tool) much of that investment will go into the cheapest technology available. In many cases that would mean coal – the most damaging of all energy sources from a climate change point of view.

The growing popularity of emissions trading has led to a sprouting of cap-and-trade systems during the past decade. With the adoption of the Kyoto Protocol and the Marrakesh Accords, the international community established the first intergovernmental (government-to-government) trading system, running from 2008-2012. This system covers the emissions of some 37 countries (so called Annex I countries), together representing approximately 29 percent of global emissions. In its first year of operations alone, governments traded emissions allowances – so-called Assigned Amount Units (AAUs) – worth US$ 211 million.[4] The Kyoto Protocol also established two markets for carbon credits in the form of Joint Implementation (JI) and the Clean Development Mechanism (CDM) that allow developing countries (so-called non-Annex I countries) to profit from domestic carbon reductions. By 2008, the combined market volume of CDM and JI credits had risen to US$ 6.9 billion, far outweighing the trade in AAUs.

In parallel (and connected with the Kyoto structure) several local, national and regional carbon trading schemes have seen the light of day, while others are still being established. These schemes facilitate company-to-company trading of emission allowances.

Of these, the far most important has been the European Union's Emissions Trading System (EU ETS), which brings together the 27 EU states with additional smaller European states. With a trading volume of almost US$ 92 billion in 2008, the EU ETS dwarfs all other existing schemes and dominates the international carbon market.[5] A similar system exists in the Northeast of the US (the Regional Greenhouse Gas Initiative, or RGGI). The Western Climate Initiative (WCI) is another initiative at the state-level in North America, bringing together some US federal states and Canadian provinces with the intention to create a cap-and-trade scheme. New Zealand and Australia were both slated to launch emissions trading systems this year. However, in both countries the launch of the systems had to be delayed because of significant political opposition.[6] In June 2009, Canada announced plans for the introduction of an emissions trading scheme, and has published a proposal for a public comment period. Japan has also started to experiment with emissions trading, albeit on a voluntary basis. With the passing of the America Clean Energy & Security Act (ACESA) in the House of Representatives, the US (long one of the leading skeptics on climate change) has now also taken decisive steps towards establishing a cap-and-trade system that may eventually subsume the RGGI and the WCI.

However, for cap-and-trade systems to make a real dent into emissions, two important conditions need to be satisfied. First, emissions trading would have to be almost global in scope, both for reasons of environmental effectiveness as well as political feasibility. Emissions are geographically dispersed; thus, at the very least all major emitters would have to be signed up in order to cover a significantly large share of global emissions and thus to minimize the potential for "leakage". More significantly, perhaps, a global approach to emissions trading (or some other mechanism for burden-sharing) will be crucial from a political point of view. Domestic support for ambitious carbon mitigation (and its associated costs) can only be maintained if all major emitters are seen as contributing their fare share. Second, such a global approach to cap-and-trade would need to feature a sufficiently stringent cap on emissions in order to incentivize a shift from investment in fossil fuels into low-carbon or no-carbon alternatives.

Several important questions need to be considered in this context: What are potential pathways for the emergence of such a global carbon market? What are the key drivers as well as stumbling blocks on the way towards carbon market integration, and sufficiently stringent emissions reductions targets? What implications does the analysis have for climate policy strategies of both the public and the private sector in the years ahead? More specifically, what does all this mean for climate policy (un-)certainty and thus energy sector investment in the European power market? These are the key questions that will be addressed in this paper.

There are two avenues through which a global carbon market could eventually emerge, both of which will be considered in this analysis: a top-down approach and a bottom-up approach.[7] The top-down approach would expand and strengthen the currently existing multilateral approach to emissions trading – regulated under the 1997 Kyoto Protocol that is due to expire in 2012 – and thus prompt the emergence of a truly global cap-and-trade system based on government-to-government trading of emissions allowances. Such a system presupposes a comprehensive multilateral treaty that sets an overall cap on emissions, regulates a burden-sharing formula and determines an appropriate market governance structure for such a market to function effectively and efficiently.

The bottom-up approach would instead foster the growth of a global carbon market by progressively linking existing national and regional emissions trading systems (based on company-level trading architectures), either directly through a mutual recognition of emissions permits, or indirectly as a result of the fact that both allow entry of certain offset credits. The global carbon market that would emerge out of that process presupposes a harmonized approach to setting emissions caps (since emissions allowances would be freely tradable across different systems) and other key market governance features. It would also require a significant degree of regulatory oversight at the international level to ensure that global company-level trading system runs smoothly.

Given that they result in different trading architectures (one fostering government-to-government trading, the other company-level trading), the top-down and the bottom-up approach to building a global carbon market are not mutually exclusive. On the contrary, they are likely to be reinforcing. The conclusion of an ambitious multilateral agreement on emissions trading has the potential to trigger the further growth of national-level cap-and-trade systems based on company trading. The result would be a positive feed-back loop between top-down and bottom-up approaches.

This study provides an assessment of the political feasibility of building a global carbon market, either through top-down design or bottom-up integration. The focus of the analysis is on the political-economic conflicts that are associated with carbon mitigation generally, and emissions trading schemes more specifically. The analysis is based on

the recognition that any effort to bring about the scale of emissions reductions necessary to avoid catastrophic climate change will necessarily have massive distributional consequences and thus result in significant political conflicts, the outcomes of which determine the way costs and benefits of emissions trading are allocated, both within as well as across national economies. In that sense, this study fills an important gap in a growing literature that appears primarily concerned with technical and managerial challenges related to carbon market integration, and often ignores the underlying political-economic conflicts and challenges that will need to be resolved.[8]

Given the massive stakes involved, and the thorny distributional battles they engender, the paper concludes that the emergence of a global market for carbon either through top-down design or bottom-up linking is unlikely in the foreseeable future. With regard to top-down design, all indications suggest that an ambitious agreement at the Copenhagen Summit in December 2009 is unlikely to emerge. While some successor treaty to the Kyoto Protocol will probably be concluded, neither will it feature an ambitious overall cap, nor will it include significant emissions reductions commitments by all major emitters. In addition, while an institutional architecture based on government-to-government trading that is comprehensive (in terms of emissions covered) and equipped with an ambitious cap could has great emission reduction potential, it is unlikely that such a system would work effectively because of the likely prevalence of strategic trading, a lack of sufficient market transparency and the absence of a functioning price revealing mechanism.

An examination of variation in the political-economic bargains that underlie existing and prospective emissions trading regimes also suggests that the emergence of a global carbon market through bottom-up linking is a distant, if not entirely unrealistic, ambition. A political-economic analysis of emissions trading regimes in the EU, Australia and the US suggests that the "rules of the game" in these carbon markets – i.e. the ways in which costs and benefits are allocated – reflect carefully crafted political-economic bargains. The precariousness of these bargains in combination with international variation and the lack of a reliable global framework is one of the key drivers of political uncertainty that impacts, among other things, energy sector investments. Efforts to achieve such carbon market integration also carry the risk of generating perverse environmental effects since they have the potential to introduce a "race to the bottom" in terms of cap-setting and market governance of trading regimes.

Instead, this paper finds that the most likely medium-term scenario is the parallel existence of emissions markets with some fragile (indirect) links. Carbon prices will continue to differ across these markets, reflecting diverging caps and marginal abatement costs. In order to preserve the contribution national and regional cap-and-trade systems can make towards mitigation, preventing leakage, managing quality of offset credits and ensuring policy coherence in climate change policy packages will be the key challenges for policymakers in the years ahead. This finding also implies that the contribution of carbon markets towards mitigation of emissions is likely to be smaller than is widely assumed. While existing emissions trading systems (such as the EU ETS) can make a very useful and substantial contribution to emissions reductions, other tools and mechanisms need to be developed to engage emerging market economies such as China and India.

The consequences of this analysis for energy sector investment in Europe are difficult to predict, but likely negative. While on the one hand the recent reform of the EU ETS has established a significantly higher degree of policy certainty in European climate policy, the outcome of the Copenhagen Summit – in all likelihood consisting of a lackluster overall mitigation target, a politically contentious burden-sharing formula, and the shifting of key open questions regarding the new global climate policy regime into the future – has the potential to inject significant political uncertainty into the European climate policy regime, and may undermine much-needed political support for ambitious reduction targets in the future.

This paper proceeds as follows. Chapter 2 introduces the political economy of emissions trading systems, and highlights the political-economic battles that have had a major impact on the structure and shape of emissions trading systems in the EU, Australia and the US. Chapter 3 examines the scope for carbon market integration, either via a global deal or bottom-up linking strategies. Chapter 4 summarizes key findings, discusses policy implications and highlights implications for energy sector investments in the EU.

2. The Political Economy of Emissions Trading Systems

Any mechanism designed to reduce CO_2 and other harmful greenhouse gas emissions at scale will necessarily have significant distributional consequences, and it will create "winners" as well as "losers" along the way. Most estimates suggest that the economic adjustment necessary to stabilize atmospheric levels of CO_2 at 550 ppm or below is equivalent to hundreds of billions of dollars per year over the next 50 years.[9] How these resources are generated and how they are allocated is bound to trigger significant political-economic conflicts.

Such distributional conflicts over issues related to environmental protection are certainly nothing new. Proposals for environmental regulation have frequently caused vicious political battles, primarily because the costs (and benefits) of regulation tend to be concentrated, and "winners" and "losers" are thus easy to identify. As a consequence, regulatory politics tend to pit one interest group against the other in an attempt by all sides to minimize their economic exposure to potentially expensive environmental policies.[10]

Market-based policy schemes – including emissions trading systems -- are a more recent innovation in the environmental policy toolbox. While the theory of emissions trading suggests that such schemes should provide a more efficient way of addressing complex issues such as carbon pollution, it would be wrong to conclude that they avoid the distributional implications familiar from more traditional command-and-control approaches to environmental policy-making. As argued in this chapter, these distributional consequences of market-based emissions trading systems, while sometimes more difficult to discern, are still very real. Without a doubt they impact the way in which trading systems are designed and how they evolve over time.

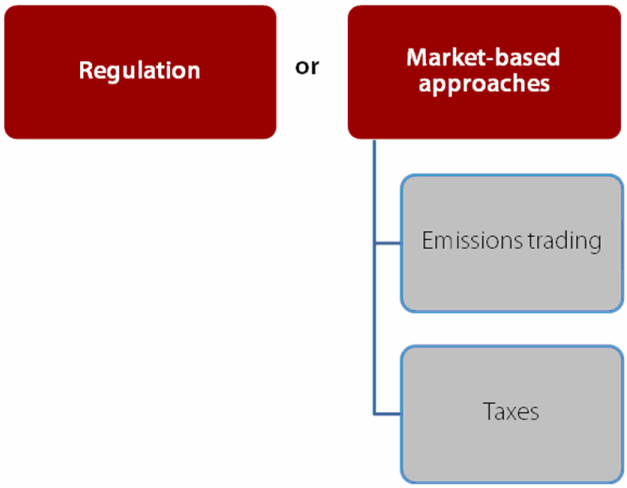
Based on a discussion of (existing and prospective) emissions trading regimes in the EU, Australia and the US, this chapter shows that the structure of these various carbon markets reflects political-economic "deals" struck in the respective countries and regions. They reflect the outcomes of political negotiations that assign to various stakeholders in the economy not only the costs but also the rents of a particular carbon mitigation policy. A good understanding of these political-economic dynamics is crucial for explaining various degrees of effectiveness and efficiency of carbon trading regimes. In addition, it provides a starting point for an analysis of how these trading regimes are likely to evolve in the future. Finally, and most crucially for the purposes of this paper, a thorough understanding of the political-economic dynamics that underpin emissions trading regimes is also essential for an evaluation of the prospects and limits for international integration of carbon markets, especially through bottom-up linking.

This chapter proceeds as follows: The following section provides a brief introduction to the concept of emissions trading. Section 2.2 highlights some of the basic political-economic battlegrounds that are likely to emerge in the development of an emissions trading system. Section 2.3 summarizes the results of a detailed comparison of carbon market regimes in the EU, Australia and the US, highlighting the different ways in which policymakers have resolved the key distributional conflicts associated with emissions trading systems. The final section concludes.

2.1 A short introduction to emissions trading

As indicated above, there are multiple mechanisms through which emissions can be reduced. These mechanisms can be grouped into two categories: regulatory approaches and market-based approaches.

Figure 2.1a. Regulation vs. market-based approaches



Source: GPPi

Traditionally, regulatory approaches have dominated in environmental policy-making. At least since the 1960s, industrialized economies have witnessed a flurry of regulatory activity designed to protect environmental resources and to regulate their use.[11] However, regulatory policies have their limits and in particular have been criticized for their supposed rigidity and lack of economic efficiency. In addition, it is widely assumed that command-and-control regulation is not very effective when it comes to the management of gases such as CO_2 that are emitted

from a large number of different sources.

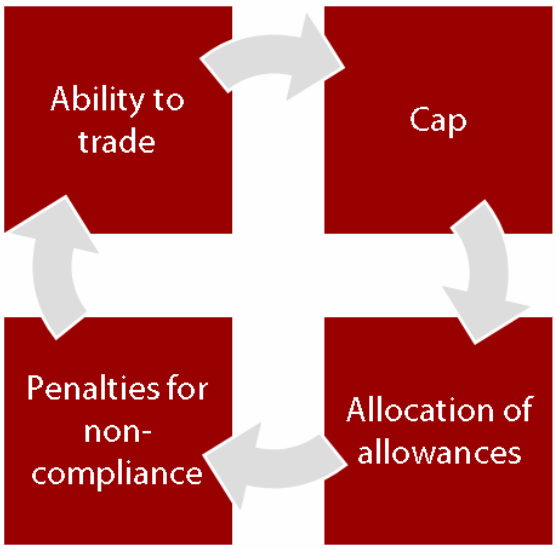
In response to the limits of environmental regulation, market-based approaches to environmental management have been advanced. These market-based mechanisms come in two principle forms: those designed to change relative price levels (e.g. through taxation) and those that assign property rights. A tax raises the relative price levels of products and services relative to their carbon-intensity and thus discourages their use. A tax in effect establishes a price for CO_2 emissions, the assumption being that such a price signal would eventually result in reduced emissions. The alternative to this is to give market participants property rights over CO_2 emissions. As with a carbon tax, such an approach seeks to provide price signals in the economy to reduce the carbon-intensity of an economy.

The principle idea behind the latter approach is that it allows covered entities (i.e. those that have been assigned property rights to a certain amount of emissions) that have emission units to spare – emissions permitted them but not used – to sell this excess capacity to entities that have exceeded their targets. Through this mechanism, a new commodity is created in the form of emission reductions or removals.[12] The main innovation of the approach is that emissions trading could offer a higher efficiency to CO_2 emission reductions than other mechanisms. Allowance trading, or the transfer of emissions credits from one entity to another, occurs because entities face different costs for reducing emissions. Those entities for which low-emitting technologies may be relatively inexpensive can sell their surplus allowances to entities that have relatively higher emission control costs. Through the provision of financial incentives for controlling emissions and the flexibility to determine how and when emissions will be reduced, the capped level of emissions is achieved, in theory, in a manner that minimizes overall program costs.[13] Supporters of emissions trading systems also usually highlight that it is technology-neutral, leaving investment decisions to the market rather than to policymakers.

Much of the pioneering conceptual work on emissions trading was done in the US in the 1980s; the US has also seen the first applications of cap-and-trade systems, most notably a mechanism to reduce sulfur dioxide (SO_X) emissions in the air, one of the key gases responsible for the so-called Acid Rain phenomenon.[14] At the most fundamental level, emissions trading systems must feature four elements, as highlighted in Figure 2.1b:

Figure 2.1b. Elements of a cap-and-trade scheme

Source: GPPi



- **A cap.** In emissions trading, the competent authority (e.g. the government) needs to set an overall limit on emissions for a given period. This cap is the sum of all allowed emissions from all parties covered by the cap-and-trade scheme.
- **Allocation of allowances.** Once the overall cap has been set, it needs to be broken down into individual emission allowances, which are issued by a competent authority. Each allowance authorizes the release of a specified amount of greenhouse gas emissions, the standard unit of measurement of which is one ton of carbon dioxide equivalent (CO_2e).[15]
- **The ability to trade.** Following the issuance of allowances, the competent authority needs to establish the basic market infrastructure to facilitate trade among covered entities.
- **Penalties for non-compliance.** Emissions trading systems need to feature penalties for non-compliance (e.g. in case covered entities exceed their emissions allowances.)

The basic concept of an emissions trading system is thus straightforward enough. The implementation of such a scheme, however, is not a trivial exercise. The technical challenges in setting up a carbon market structure can be significant. These challenges include, but are not limited to a) the quality and reliability of emissions data used to determine the emissions cap; b) the necessity to strike a balance between cost-effectiveness and environmental targets when defining the scope of installations to be covered; c) the availability of a well-functioning trading infrastructure (including a registry system) as well as monitoring and verification protocols and procedures; and d) the requirement to devise provisions for linking to other schemes (e.g. the flexible

mechanisms as defined under the Kyoto Protocol), in case that is the intention of the market-regulating authority.

All this means that the establishment of a market for carbon requires the existence of a highly competent and sophisticated regulatory agent able to build and safeguard the necessary market infrastructure. Given the financial volumes that would be traded on an ambitious (in terms of the cap imposed) and sufficiently large carbon market, a transparent and effective marketplace is a sine qua non. A poorly designed (and/ or poorly implemented) emissions trading system will not only fail to achieve environmental targets; it also has the potential to inflict major economic damage.

2.2 The political economy of emissions trading

But more challenging than the technical complexities of setting up and managing a carbon market are the political hurdles involved. Carbon markets are not functionally equivalent to regular product markets as there is, significantly, no "natural demand" for carbon reductions. Instead, as indicated above, this demand is artificially created by assigning property rights to emissions allowances. The key to prices in any market is scarcity. In the case of a carbon market, the price for allowances depends upon the absolute quantity of emissions rights issued by the regulating authority (plus expectations about future volumes of emissions rights).

Thus, the creation and evolution of carbon markets is first and foremost dependent on political decisions, most significantly the size of the overall cap being placed on emissions. Consequently, carbon markets are highly political organisms where prices and volumes depend on political intervention. In defining the size of the overall cap, policymakers turn the lever for the price of carbon – and therefore determine the speed and scope of "decarbonization" of an economy.

In addition, in company-level trading schemes, by setting the cap and the other "rules of the game" for emissions trading policymakers determine the distribution of the costs and benefits of carbon mitigation across an economy. It thus should not come as a surprise that the formation as well as subsequent development of emissions trading systems is usually characterized by significant conflicts over the distributional consequences of market design. The outcomes of these distributional conflicts tend to have a defining impact on the structure of emissions trading systems, specifically (but not exclusively) regarding the following key design features:

Coverage of the emissions trading system. In order for an emissions trading system to generate the desired environmental results, it will have to cover a sufficiently large share of emissions in an economy. In addition, since emissions trading schemes are associated with a relatively high administrative burden (e.g. monitoring and verification of emissions, organization of registries, etc.) the number of installations covered by the scheme should be optimized. Thus, at least in the early stages, the focus of emissions schemes is likely to be on large emitters of CO_2 particularly in energy-producing and energy-intensive sectors. In addition to efficiency and effectiveness concerns, policymakers also need to weigh equity issues and, in particular, the imposition of equivalent measures on businesses (and households) not covered by an emissions trading scheme.

Depending on the stringency of the emissions cap, industries to be covered by the emissions trading scheme will either lobby hard to be exempted or, if that is unsuccessful, they will call for compensation in some form or another. The call for compensation will be all the louder from industries that face competition from companies in jurisdictions without similar carbon constraints and that find it difficult to pass on the additional carbon cost to consumers as a result. The same applies to domestic industries not exposed to international competition; they may find themselves unable to pass on the additional costs of carbon, e.g. because price levels in their markets are regulated. Overall, as with the determination of the size of the cap discussed above, decision-making on system coverage and compensation schemes will reflect the strength (or weakness) of special interest groups in influencing the political process.

Mode of allowance allocation. The mechanism for allowance allocation profoundly affects the distribution of the costs of meeting environmental goals across different industries.[16] Economic theory and experience with various emissions trading regimes (e.g. the NO_X/SO_X scheme in the US) suggest that auctioning is the most desirable mechanism from an efficiency and environmental effectiveness point of view. However, those proposing free distribution of allowances argue their case on the basis of "prior use" and point to the risk of producing "politically stranded" investments, particularly in the energy sector. Their argument is that the "right to emit" is a "prior use claim" that cannot simply be taken away by a new policy, especially in case the prior right to emit also included long-term investment in high-emitting technology (e.g. coal-fired power plants).[17]

However, most political debates regarding the allocation of allowances will represent a classic rent-seeking game in which special interest groups try to shift the burden of an emissions trading system to other parts in the economy. The stakes are substantial; windfall profits accrue to those who succeed in obtaining free allowances and pass on the added

cost of carbon to the market. In competitive and deregulated markets, covered installations would not just pass on the actual cost of allowances to consumers (which, under free distribution, would be zero), but in fact will price in the opportunity cost of those allowances (i.e. the value of the allowances as they could be sold on the emissions market). For those who are unable to pass on that (opportunity) cost (e.g. covered installations operating in a market with regulated prices or external competition that does not face similar emissions reduction mechanisms), carbon trading at least is cost-neutral.

Auctioning, in contrast, imposes direct and immediate costs on covered installations, not all of which can be recouped by passing on costs to consumers. Note, however, that the choice of allocation mechanism does not automatically have to affect the environmental effectiveness of a cap-and-trade scheme. No matter whether allocations have been given out for free or auctioned off, as long as the additional cost of carbon is reflected in prices, and thus sets the desired incentives for investments in low-carbon technology, the environmental objective of the emissions trading system have been accomplished.[18]

Use of offsets and other cost-containment measures. The decision of whether or not to allow covered installations the use of offsets (and if so, the extent to which such offsets can be used) or other measures designed to contain their mitigation cost is another issue that arouses substantial conflict. Offsets, such as for example project credits generated through the Clean Development Mechanism (CDM), are attractive to market participants since they promise to lower their mitigation cost. Rather than realizing carbon mitigation through the introduction of new technology in their own installations which will become progressively more expensive over time, CDM credits allow market participants to purchase emissions reductions in other countries at a smaller price. Given the global nature of climate change, abatement can and should happen anywhere, and advocates argue that it makes sense to start with the most cost-effective mitigation options. Offset advocates also usually add that such schemes introduce a price control mechanism that can help to smooth out "boom" and "bust" periods in carbon markets. Finally, and with specific reference to the CDM, offset advocates argue that the use of offsets provides a congenial way to engage the developing world in abatement and to facilitate much-needed technology transfer. Critics, however, claim that offsets, in practice, do not really deliver on carbon mitigation. Specifically with regard to the CDM, two prominent observers for example argue that the "[…] theoretical benefits of lower costs and broader engagement of developing countries through the extensive use of offsets are an illusion."[19] More broadly, critics maintain that offset schemes generally suffer from significant information asymmetries, distorted incentives, and transaction costs that make their large-scale use impossible. In addition, given the significant administrative structure required to operate large-scale offset schemes (whether at the national or international levels) critics point out that offsets are a poor response to price shocks in a carbon market.

Political-economic conflicts also arise with regard to other market design features with potential cost-reducing implications, such as for example price "safety valve" provisions. Price safety valves are a mechanism to reduce the cost of carbon imposed by the setting of the overall cap. For example, as a result of periodic increases in the price of allowances in the EU ETS, some have called upon the EC to impose an overall price limit on the scheme in order to keep the cost of the system under control. However, in the absence of serious market irregularities that may justify price regulation, such intervention may caricature the original intention of the emissions trading scheme. Borrowing of allowances has been called for in order to allow smoothing of costs for emissions reductions into the future; in theory, such borrowing may be sensible. In practice, some fear that borrowing may simply result in a build-up of emissions reduction obligations over time that may eventually provide a political pretext for a sustained lobbying campaign for relief. In any event, all of these market design features are reflective of the general theme laid out above, namely that market design issues will be affected by political-economic struggles over the distribution of the costs and benefits of carbon trading.

2.3 Emissions trading regimes in the EU, Australia and the US: A comparative perspective

As noted in the introduction, various countries and regions have started to experiment with the establishment of mandatory, company-level trading regimes in recent years. While they are all based on the same basic approach, they differ quite significantly in the ways in which the key political-economic fault lines outlined in the previous section have been addressed. The existing regimes differ not just with regard to the overall cap imposed on emissions but also with regard to some of the key design features of the trading systems that determine the distribution of its costs and benefits in the economy.

Adopting a comparative approach, this section highlights the way in which carbon markets have evolved in the EU, the US and Australia in recent years. The EU and the US have been chosen as case studies since they represent the most significant carbon markets in terms of volumes and values. Australia has been included as well since negotiations

for the introduction of the Carbon Pollution Reduction Scheme (CPRS) are relatively far advanced, and because Australia offers an interesting case due to its high dependence on coal.

Table 2.3a summarizes the key results from that comparative overview. The key design features for Australia are currently renegotiated; the data in the table reflects the latest proposal by the Australian government. For the US, the design features of the two different proposals debated in the US House of Representatives (passed on 26 June 2009), and the US Senate are included. The eventual final version will most likely represent a compromise between these two proposals.

As the table above shows, the various (existing or planned) regimes vary across a range of design features, including emissions targets, allocation modes and other market governance provisions. The discussion in section 2.2 has provided a basic framework for understanding the political-economic conflicts that shape these key design features of emissions trading systems. In practice, of course, the various fault lines and attendant bargains are more complex. The discussion below provides a detailed comparative overview of how these fault lines and attendant bargains thus far have played out in the EU, the US and Australia.

2.3.1 The EU ETS: Early compromises, enduring political-economic conflicts

Despite its significant economic and distributional implications, controversy around the EU ETS really only started after it opened for business on 1 January 2005. Compared to ongoing discussions in Australia and the United States, the initiation of the EU ETS proceeded surprisingly fast, and with relative ease. With the onset of carbon trading in Europe, however, significant political battles over the distribution of costs and rents of emissions trading star-

Table 2.3a. Overview of design features of existing and planned mandatory emissions trading regimes

	EU ETS	Australia (Status: June 2009)	US – ACESA (Status: June 2009)	US – Lieberman-Warner (Status: June 2009)
Launch date	2005	2011	2012	2012
Sector coverage	Power generation, oil refineries, coke ovens, metal production and processing, cement, glass, ceramic producers, timber and paper products. - ~46% of emissions	Power generation, transport, industrial processes, waste and forestry sectors -75% of total emissions	Electric power, industrial and transportation sectors - 85% of total US emissions	Electric power, industrial, and transportation sectors - 82% of total US emissions
Cap Target 2020	20% reduction based on 1990 levels (or 30% by 2020 if an international deal is reached)	5-15% reduction based on 2000 levels (or 25% if an international deal is reached)	17% reduction based on 2005 levels	15% reduction based on 2005 levels
Cap Target 2030	30% reduction based on 1990 levels, if an international deal is reached	30% reduction based on 2000 levels	42% reduction based on 2005 levels	39% reduction based on 2005 levels
Cap Target 2050	60%-80% reduction based on 1990 levels	60% reduction based on 2000 levels	83% reduction based on 2005 levels	70% reduction based on 2005 levels
Allocation mode	**Free Allocation:** 95% in trading period 1 90% in trading period 2 **Auctioning:** < 5% in trading period 1 <10% in trading period 2	**Free Allocation:** ~25% at launch **Auctioning:** ~75% at launch	**Free Allocation:** 85% at launch, slowly reducing towards full auctioning **Auctioning:** 15% at launch, slowly increasing to 100%	**Free Allocation:** 73.5%, steadily declining to 30.5% by 2031 **Auctioning:** 26.5% and steadily rising to 69.5% by 2031
Offset provisions	Total offsets (domestic and international) set to 3-4%	Unlimited access to international carbon credits through CDM and JI	Total offsets (domestic and international) limited to roughly 33% of the cap at launch[20]	Total offsets (domestic and international) limited to 30% of the cap at launch

ted. These conflicts centered on various key issues, including the implementation of the burden-sharing agreement between EU member states (embodied in the conflicts between the EC and member states over the National Allocation Plans (NAPs)), the decision to give away allowances for free to covered installations (rather than auctioning them off), as well as the subsequent enlargement of industry coverage of the EU ETS.

While the available evidence on carbon abatement achieved in the first trading period (which really was designed as a test run) is rather mixed, politically speaking the introduction of the ETS can be characterized as a qualified success. Rather than insisting on purity from the start, policymakers decided to make compromises early on to get the trading system going. Building on strong public support as well as flexibility on some key market design issues (free allocation of permits, limited industry coverage, generous use of offsets, etc.), they steered the ETS from proposal to reality in just a few years. While some of their early compromises impacted the environmental effectiveness of the scheme, in its reform of the ETS the EC was able to address at least some of the major flaws of initial market design. The European example shows that starting less ambitious and tightening the screws later can be highly effective.

2.3.1.1 A brief history of the EU Emissions Trading System

One important factor that paved the way for the adoption of the EU ETS is the significant attention, at least comparatively speaking, that climate change has received among the European electorate, which put pressure on policymakers to respond. This was due, in part, by the success of environmental advocacy groups that managed to put the issue front and center since the mid-1980s.[21]

During the 1990s, growing public concerns over climate change triggered legislative action both by the EC as well as individual member states.[22] In 1992, the EC proposed a bold step: Based on the Single European Act, the Commission called for the introduction of a European carbon tax.[23] Unsurprisingly, the proposal was met with fierce opposition, both by European industry as well as by the governments of most EU member states who had no intention to cede any sovereign rights on tax collection. European industry argued, quite predictably, that the introduction of such a tax would undermine its competitiveness vis-à-vis Japanese and American rivals in the global marketplace.[24] After two years of wrangling, European Heads of Government buried the tax proposal.[25] A few years later, when proposals for a carbon tax reappeared in the context of deliberations on how the EU could achieve its Kyoto targets, they again went nowhere on account of opposition from business groups and key EU member states.

During EU discussions over a carbon tax, various groups – including some companies and business associations –repeatedly pointed to the creation of a "carbon trading system" as a market-based alternative to a carbon tax and cited positive experiences in the US, e.g. in the context of regulating sulfur oxide (SO_X) and nitrogen oxide (NO_X) under the Acid Rain program. The EC initially resisted the shift in discussion from carbon tax to carbon trading (and indeed subsequently also fought proposals for the inclusion of a flexible trading mechanism in the Kyoto Protocol that was (quite ironically from today's perspective) put on the agenda by the US Government) and parts of European environmental movement viewed the emissions trading proposal with much skepticism.

Yet, after the ratification of the Kyoto Protocol by the EU, the EC had to find alternatives. Under the Kyoto Protocol, the EU had committed itself to reduce emissions of greenhouse gases by 8 percent compared to 1990 levels in the period 2008 to 2010.[26] As part of a so-called burden-sharing agreement (also called "European Bubble"), EU states had also agreed on how to divide up responsibility for reductions among the member countries. Thus, a potentially divisive issue was, at least in principle, already taken care off.[27] As a consequence, the EC shifted gears and outlined, in its strategy for Kyoto implementation, the designs of what would eventually develop into the EU ETS.[28] As Ellerman and Joskow note: "A cap-and-trade approach was chosen because it guaranteed a limit on a significant part of the EU's emissions, it was compatible with emissions trading provisions of the Kyoto Protocol […], and it was the only other instrument available."[29]

The reaction of the business community to these proposals[30] was rather low-key. As indicated above, some had advocated for a carbon trading system as an alternative to a carbon tax and now found it hard to back-peddle. In addition, public pressure to address climate change had grown so strong that all-out opposition, without proposals for viable and convincing alternatives for addressing emissions, was not feasible. Also, rifts were showing in the business community itself. Some companies emerged as supporters of decisive action against climate change, either because of a genuine concern over climate change or because they saw new business opportunities emerging, or both. In fact, many companies were already in the process of making a significant down-payment on mitigation.

Perhaps more importantly, the proposed industry

coverage of the suggested emissions trading scheme was also limited. As a result, the number of potential adversaries was small, and excluded large parts of the traditionally well-organized manufacturing sector.[31] In addition, and perhaps most importantly, the burden to be carried by the different sectors was supposed to be unevenly divided, with the power sector (due to its comparatively large carbon mitigation potential and relative lack of exposure to EU-external competition) carrying an unequal share of the burden for delivering emissions reductions.

But the reaction of member states, and subsequent changes to the Commission's design proposals for the ETS, also helped to ease fears. These changes included a significant decentralization of the system, with authority for the setting of member-state caps firmly resting with national governments. For business, this decentralization ensured their influence on the policy process through established channels at the national level.

Another significant change to the original EC proposal further altered the political balance, namely the decision to give away the large majority of allowances for free in the first trading period rather than auctioning them off. As a consequence, the question of whether or not the covered industries would actually suffer as a result of the ETS was not at all a given. It would ultimately be determined by a variety of other factors, most significantly the market structure (see discussion below). On top of that, the proposal for the EU ETS also allowed the generous use of offsets from the CDM, promising significant cost reductions for compliance.

A final reason for the swift and rather non-contentious passing of the EC Directive establishing the ETS clearly was the speed and skill with which the EC moved the proposal along. Their support for the ETS represented an extraordinary volte face for the Brussels bureaucrats. Only a few years after they had vehemently opposed carbon trading, they now turned into cheerleaders for emissions trading and declared the EU ETS the flagship of the European Climate Change Program. In October 2003, the European Council and the European Parliament gave a green light to the establishment of the ETS, to be launched for a first three-year trial period on 1 January 2005.[32]

2.3.1.2 EU ETS in operation: Key battlegrounds

The honeymoon for the EU ETS proved short-lived, however. As soon as trading began, significant fault lines emerged, frequently bursting into quite antagonistic political struggles over the distribution of the costs and benefits of carbon trading. These struggles played out both among EU member states (with members trying to strengthen the competitive position of their respective economies) and between different industry sectors.

Decentralization and "over-allocation"

The main bone of contention between the EC and member states was the negotiation of member-state caps, and the National Allocation Plans (NAPs) for the first two trading periods of the ETS. These conflicts led to allegations of "over-allocation" of emission permits by member states, and indeed in all likelihood resulted in a non-binding overall cap during the first trading period.

EU member states had agreed to overall emissions reductions goals as part of the Kyoto agreement, as well as the broad outlines of a burden-sharing agreement with the "European Bubble". That Bubble, however, did not automatically establish the precise size of EU member-state caps under the ETS. Under the rules of the ETS, the setting of these national caps (and the distribution of allowances) had been decentralized to the individual member states, which were then responsible for the development of the NAPs.[33] However, the EC had the right to reject a NAP in case it deemed it in violation with the Directive and member states would have to take the Commission to court in order to get its rejection thrown out.

In the first trading round, very few challenges were brought against the alterations that the EC demanded from member states with regard to their NAPs. As a consequence, many observers argued that member states got away with creating too many allowances, at least in part driven by the desire to mollify their national industries.[34] Some calculations suggest that this over-allocation resulted, at the end of the day, in a non-binding EU cap in the first trading period.[35] The modest cap, combined with the fact that banking of allowances between periods 1 and 2 was prohibited, also played a major role in the carbon price collapse of 2006.[36]

Partly as a consequence of the apparent over-allocation of allowances during the first trading period, the EC tried to tighten the screws on member states in the second round. The EC revised almost all of the submitted NAPs downward based on its calculations that member state proposals were insufficient to meet the EU's Kyoto commitments. Nine member states decided to challenge the EC in court and appealed to the European Court of the First Instance. All of these were Central and Eastern European member states who argue that the EC did not take their status as transition economies into account (in particular the fact that many of these countries still power their economies with old Soviet-era equipment). These lawsuits are still pending, and the outcome could significantly impact the potential of the

second round to deliver abatement in line with the EU's Kyoto commitments.

In the future, the problem of a potentially non-binding cap within the Union will likely become much less pronounced, for at least two reasons. First, the EC now has access to verified emissions data for all covered installations that can be used as a benchmark to determine allocation across member states. "Cheating" thus becomes more difficult. And second, it is expected that more aggressive overall caps imposed on the ETS (required to meet the EU's overall emissions reductions targets as agreed by the European Council in April 2009) will make the possibility of a non-binding cap less likely.[37]

Coverage of the system and competitiveness

Whereas the debate on the implications for competitiveness of the ETS for European industry was comparatively muted before its launch, soon after it picked up momentum. It was driven in part by companies that were directly covered by the ETS and exposed to international competition (e.g. the aluminum industry), but also by energy-intensive industries not covered by the ETS but who blamed rising electricity (and thus input) prices on the newly established carbon trading scheme. Since then, much research has gone into the question whether the ETS has created an uneven level playing field for European companies competing internationally. The results of that research suggest that the ETS has indeed had competitive implications for European business, but that these have been largely confined to a few limited industry sectors (especially the aluminum and cement industries).[38]

In politics, however, perception matters at least as much as empirical reality. The pressure on policymakers to either reduce emissions targets or to compensate the apparent "losers" of carbon trading increased significantly. Various proposals were made by European industry to address the supposed competitive constraint imposed on them by the ETS. This included measures to reduce the actual carbon constraints on energy-intensive industries (in effect to reverse the targets the EU had committed itself to in the Kyoto Protocol); the provision of subsidies as compensation; border cost adjustments for imports; EU import quotas for energy-intensive products; and others.[39]

Thus far, no decisive steps have been taken on any of these fronts. However, the pressure will keep up and is likely to increase significantly, especially if no significant progress is made on global emissions reductions targets at the Copenhagen Climate Conference in December 2009. The debates surrounding the reform of the EU ETS for the post-2012 period, especially with regard to the overall target cap but also the extension of industry coverage (e.g. the chemical industry), have given a good indication of the kinds of lobbying campaigns the EC will likely see under such a scenario.[40] The current "mix" thus represents the potentially precarious results of hard-won battles that should not be taken for granted.

Mode of allowance allocation

The mode of allocation of allowances chosen by the EU ETS provoked another significant conflict once the system became operational. Soon after the ETS went into business, "windfall profits" as a result of the free allocation of allowances became an issue. Targeted specifically at the European power sector, critics pointed out that utilities ratcheted up electricity prices to reflect the newly added cost of carbon, without actually having to pay for allowances. Power companies were therefore depicted as profiteers, raking in huge profits without (it was suggested) taking any decisive action on abatement. These arguments found a receptive audience in many European member states, both among energy-intensive industries as well as a broader population incensed by higher electricity price.

The reality, however, is more complex. There can be no doubt about the existence of windfall profits; indeed, as noted above, they were intended by design. However, they did not apply across the board, and were probably more limited than is often suggested.[41] Yet, research does suggest that free allocation appears to have had a damaging effect on the abatement potential of the ETS, since "windfall profits" also accrued to inefficient, coal-fired power plants. Studies suggest that this not only discouraged investment in clean energies but arguably could have also provided incentives for utilities to continue using less efficient technology.[42] In addition, the new entrant and closure rules on allowance allocation, which the EC had set for the ETS, further undermined the abatement potential of the regime. Under the rules, member states were allowed to keep a reserve of new allowances to be distributed for free to new market entrants. In addition, those exiting the market would have to give up their allowances. As a consequence, the rule provided market participants with incentives to create more production capacity than really needed, with negative implications for emissions.[43]

Two things need to be kept in mind, however. First, even if auctioning is introduced, issues of rent-seeking are unlikely to go away but will simply express themselves differently. Second, the European decision to opt for free allocation can also be interpreted as a political trade-off required for winning the support of member states and key industries for moving forward on an aggressive timetable for ETS implementation.[44]

Reform of EU ETS: Achievements and open issues

In 2007, European leaders agreed on ambitious new climate targets, including a commitment to reduce the emission of greenhouses gases by 20 percent by 2020 (compared to 1990 levels). These ambitious targets, coupled with the lessons learned from the first two trading periods, made an overhaul of the EU ETS a virtual necessity.

The EC, in a report issued in November 2006, offered a series of sweeping reform suggestions.[45] In the ensuing negotiations for the reform of the ETS, the EC was able to retain some of its most significant proposals. The eventual climate-energy package adopted by the European Parliament and the European Council confirmed the centralization of the ETS (i.e. the setting of an EU-wide cap), the gradual end to the free distribution of allowances, as well as the long-term reduction goals that had already been set in 2007. Overall, the role of the EC as manager and overseer of the system was fundamentally strengthened. This should mean more efficiency and transparency for the ETS. Also, the EC managed to expand the coverage of the system to include aviation and the chemical industries, against significant opposition from these industries. Most importantly, the climate package spells out a long-term and thus predictable mitigation target that will guide cap-setting in the ETS, thus providing market participants with longer and more predictable planning horizons.[46] These can be interpreted as major successes for the EC, and reflect the EU's continued commitment to pursuing an aggressive climate policy.

However, the EC needed to give up on some of its ambitious reform goals. Among other things, the path from free distribution to full auctioning of allowances has been punctured with at least temporary derogation options for some countries. In addition, the amended Directive contains specific criteria for identifying industry sectors confronted with "leakage" problems (i.e. industries where higher production costs in the EU, as a result of the EU ETS, will result in relocation of production); those industries are eligible to continue receiving allowances for free. Finally, the level of project-based credits that some installations are allowed to use in meeting their allowance targets has been increased, thus lowering compliance costs but also raising additional questions about the reliability of such offsets.

It is important to recognize that these reforms – as far-ranging as they are – will not fundamentally alter the political-economic dynamics that underpin the ETS. With regard to cap-setting and allowance distribution, the forum in which distributional fights will play out has been shifted from the EU member states to Brussels. In this context, questions are likely to be raised whether Brussels is sufficiently prepared for the expected onslaught of lobbying it will face. At the very least, the institutions regulating the growing European carbon market need to be strengthened.[47]

2.3.2 Striking a grand bargain? Promises and pitfalls of the Australian Carbon Pollution Reduction Scheme

The politics of climate mitigation in Australia have featured numerous twists and turns in recent years. The latest surprise has been the decision of the Rudd Government in early May 2009 to postpone the introduction of an emissions trading system originally scheduled to become operational in 2010, apparently due to the deepening global economic recession.[48] The launch of the system has now been delayed until 2011 but even this date may be revisited depending on the development of overall economic conditions. Most recently, it appears that the debate in Australia about the introduction of an emissions trading system could even trigger new elections.[49]

While Australia may in many ways be unique (it only emits 1.1 percent of global CO_2 emissions, but as a result of its strong domestic reliance on coal has one of the highest per capita emissions in the world), the debates and political wrangling that has surrounded the country's response to climate change provide an insightful case study on the political economy of emissions trading regimes. In contrast to the European example discussed above, many of the key fights over the distributional consequences of the proposed Carbon Pollution Reduction Scheme (CPRS) are being fought before the scheme even begins operations. The cap-and-trade system, as currently designed, is ambitious not so much with regard to the proposed cap but with regard to its broad coverage and the commitment to full auctioning of allowances. From the start, the current CPRS proposal foresees an inclusion of almost three quarters of all Australian emissions and thus encompasses all major sectors including transportation. Rather than providing for free allocation of permits and a generous use of offsets, the system includes a comprehensive compensation scheme to pay off those who lose from the carbon scheme. The implications of these compensation schemes for the effectiveness and efficiency of the CPRS are unclear at this stage. However, it is likely that the main political battles will focus on the details of this compensation scheme rather than the emissions trading system itself.

2.3.2.1 A brief history of climate change policy in Australia

Between 1996 and 2007, Australia was governed by a conservative government led by Prime Minister John Howard. One of the seeming contradictions of Australian climate policy was the decision of the Howard Government not to ratify the Kyoto Protocol, while still declaring at each possible opportunity that the country was on track to meet its Kyoto targets.[50] The only reason Australia is indeed on track to meet these targets is because of a concession the Howard Government obtained from other negotiating parties that it could include the emissions from land clearing (a net source of greenhouse gas emissions in Australia) into its 1990 baseline levels.[51] As a result, before the Protocol had even been signed, Australia's emissions had fallen by almost 10 percent.[52]

Domestically, the Howard Government promoted a number of efforts to address climate change, in particular programs to foster technology development. In 1998, the Howard Government created the Australian Greenhouse Office to coordinate the government's actions on carbon mitigation. One of the flagship programs was the Mandatory Renewable Energy Target (MRET), launched in 2001.[53] The MRET is a baseline-and-credit scheme that requires all Australian power retailers and wholesale customers to purchase a specified fraction of their electricity needs from renewable resources. The initial target set by the Howard Government was that, by 2010, at least 2 percent of all electricity generated in Australia should come from renewable targets. In a 2004 White Paper on energy, however, the Howard Government announced that the MRET would be discontinued after 2010.

The Howard Government's stance on climate change provoked significant political clashes with environmental groups and the political opposition. For a time it appeared that the Howard Government's environmental policy was decidedly shaped by a group of lobbyists from power companies and energy-intensive industries that dubbed themselves the "greenhouse mafia."[54] Environmental groups also tried to weigh in, in part by mobilizing public opinion, but did not accomplish a major change in the government's basic stance on climate policy. However, the opposition turned effective action into one of the key issues in the election campaign in 2007.[55] In fact, the questions of whether or not the country should sign up to the Kyoto Protocol (a question of more symbolic value than anything else) figured prominently in the debates.

2.3.2.2 Striking a grand bargain? The political economy of the Australian emissions trading scheme

The elections in November 2007 were decided in favor of Kevin Rudd who came into office as Australia's new Prime Minister. One of the first acts of the new Labor-led government was to make good on a campaign promise: ratification of the Kyoto Protocol. In substantive terms, that ratification did not mean much, and did not cost the Australian Government a penny. After all, the "Australia Clause" still meant that the country did not really have to take any action to meet its emissions targets.

However, the largely symbolic act of ratification was only a prelude for a whirlwind of political action on climate change that soon followed. Encouraged by a landslide victory and public opinion polls showing that a large share of the Australian population supported decisive action on climate change, the Rudd Government got down to business. One of its first decisions was to extend the MRET and set the more aggressive target of achieving a 20 percent share of renewable energy in power generation by 2020.

The centerpiece of the Rudd Government's new climate policy program, however, was a proposal to establish an emissions trading scheme, the so-called Carbon Pollution Reduction Scheme (CPRS). Just a few months after taking office, in July 2008, the Australian Government published a Green Paper that sketched out the broad elements of a national emissions trading system.[56] The paper, while lacking in details, presented the outlines of an aggressive cap-and-trade scheme with extensive industry coverage, the inclusion of all six greenhouse gases, an exclusion of offsets, and an auctioning of allowances. The green paper refrained from setting an overall cap level; at the time, however, Australia's official longer term goal was to reduce emissions by 60 percent compared with 2000 levels by 2050.[57] In public, the Rudd Government also presented the CPRS as a necessary step towards the building of a global carbon reduction regime that would also include China and other emerging economies and thus contribute to fair global burden-sharing.

Even before the government had published a detailed outline for the CPRS, a fierce public debate started. Both business as well as the environmental lobby started to push for concessions. The business community, sensing the inevitability of the introduction of an emissions trading scheme, criticized the design specifications of the proposed scheme and urged compensation for the "losers" of carbon trading.[58] Mainstream environmental groups were pleased with the new government proposals. Some hardliners, however, questioned the effectiveness

of market-based mechanisms.[59]

The Rudd Government had anticipated that its proposals for the introduction of a carbon emissions trading scheme would be controversial. Rather than watering down the outlines for the proposed CPRS, however, the Rudd Government pursued a different path. The eventual proposal that laid out the detailed framework for the Australian emissions trading scheme (the White Paper published in December 2008[60]) did not just include the details on the CPRS. Instead, the proposal also laid out various compensation and side-payment arrangements designed to ease the introduction of the emissions trading regime for affected stakeholder groups. In terms of the basic outline for the CPRS, the Australian Government presented an ambitious proposal:

- **Timeline**. The White Paper was published in December 2008 and launch of the CPRS was suggested to be sometime in 2010. Even compared to the EU's timeline, this was an ambitious timeframe.
- **Level of cap.** Similar to the EU, the Australian Government proposed an adaptable emissions reductions target. In the White Paper, it committed itself to a reduction of 5 to 15 percent of carbon emissions by 2020 (based on emissions levels in 2000), and a long-term target of 60 percent below 2000 levels by 2050. However, assuming a global agreement with aggressive cuts and acceptable burden-sharing commitments would be achieved under the UNFCCC umbrella, the Australian Government would raise that target to 25 percent reduction of emissions until 2020 (based on 2000 emissions)
- **Coverage**. Based on the proposed scheme, the CPRS would feature extensive industry coverage, including stationary energy, transport, fugitive emissions, industrial processes, waste and forestry sectors, thus including up to 75 percent of all Australian emissions. The government has also pledged to work out a system to include agriculture if a cost-effective mechanism can be found. On the transport side, the scheme also proposes upstream obligations for suppliers of transport fuels. Only installations with emissions of more than 25,000 tons of CO_2 would be included, roughly 1,000 installations in all of Australia. In addition, the scheme would include all greenhouse gases, not just CO_2.
- **Mode of allocation**. The White Paper proposes to auction off the "majority" of emissions allowances (but see also discussion below).
- **International linkages**. In contrast to the proposals contained in the Green Paper, the White Paper suggests that there would be a ban on the export of Australian allowances in the initial years. However, the scheme proposes unlimited access to international carbon credits through the flexible mechanisms of the Kyoto Protocol (presumably as an additional measure to keep carbon prices low but also to lower the overall costs of meeting Australia's emissions reduction targets).
- **Price cap**. The CPRS would feature a "transitional" price cap of AUS$40 (approximately US$32) for five years (increasing by 5 percent each year). This cap has been introduced to provide a "safety valve" for the Australian carbon price, which, due to the small overall size of the Australian market and the proposed linkages of that market to the international system, would otherwise likely be determined abroad (i.e. Australia would be a price-taker).

While the ambitiousness of the overall cap for the scheme has been questioned, there can be no doubt that the proposed CPRS made a number of tough choices with regard to industry coverage and allocation mechanism. As a result, the CPRS was bound to trigger significant opposition from affected industries. Some of these concerns were voiced in a consultation process that following the publication of the government's Green Paper in July 2008 (it triggered close to 1,000 submissions).[61] Interestingly enough, however, few of the submissions during that consultation process take issue with the major design features of the proposed CPRS. Instead, they primarily focus on the provisions for compensations and partial exclusions for affected industries and households. These compensatory schemes consist of the following three elements:

- Assistance for emissions-intensive trade exposed industries (EITE).
- Assistance to strongly affected industries.
- Household assistance measures.

The details for each of these schemes have been laid out in the White Paper and cannot be treated in any detail here. The basic idea behind the EITE compensation program is, on the one hand, to reduce the incidence of carbon leakage and on the other to "provide transitional support" to industries that are exposed to competition from jurisdictions that do not face any administrative carbon constraints.[62] The principle way of assistance is through the free allocation of allowances to these industries at the beginning of each compliance period through a regulator. The White Paper contains significant details about the criteria that industries need to meet in order to qualify for assistance.[63] Overall, the govern-

ment estimates that, as a result of this assistance program, up to 25 percent of all allowances will be handed out for free to affected industries at the start of the CPRS. The continuation of the program will be assessed every five years by an expert panel.

The program for "Assistance to strongly affected industries" has been specifically designed for power producers that rely on coal-fired electricity generation.[64] In addition to various other existing programs designed to reduce emissions from coal-fired electricity generation (e.g. the National Low Emissions Coal Initiative or the Global Carbon Capture and Storage Initiative), this assistance scheme also provides for the free allocation of permits to coal-fired electricity plants (6 percent of all allowances, valued at AUS$3.9 billion, or US$3 billion).

Finally, various measures have been included in the CPRS package to limit the negative impact of carbon trading on households. Most importantly, the government plans a reduction of the excise tax on fuel in order to limit the price increases sparked by the inclusion of the transport sector in the CPRS.[65] In addition, the Rudd Government has decided to use the receipts from the sale of the remaining 69 percent of allowances to compensate low-income household.

All these measures, and in particular the EITE, are generally well-defined and are supposed to be transitional. However, there is a strong likelihood that these schemes will countervail some of the potential emissions reductions impact expected of the CPRS. Moreover, once compensation schemes are in place it is usually extremely difficult, if not impossible, to abolish them. Experience suggests that small groups that receive transfers are highly effective in lobbying for the continuation of assistance programs.

Overall, the scope and size of these assistance programs has in all likelihood played a significant role in easing the political tensions that the Rudd Government had to deal with while it was developing the CPRS. The real political achievement for Australia's political elite may thus be not the passing of the CPRS, but the calibration (and eventual easing out) of the various assistance schemes that have been created as part of the package and that may have a negative impact on the environmental effectiveness of the emissions trading scheme.

2.3.2.3 The bargain unraveling – what future for the Carbon Pollution Reduction Scheme?

If the real name of the game in Australia has become "compensation" rather than "emissions trading," what explains the decision of the Rudd Government in early May of 2009 to postpone the launch of the CPRS?

An argument could be made that the launch of the CPRS before the conclusion of the Copenhagen climate change talks would have not been prudent anyway. The Garnaut Report for example states: "There would be considerable benefit in avoiding the unproductive interaction between the early period of a new trading system and Australia's participation in crucial global negotiations. Otherwise, this period will be one in which every new development in the international negotiations, encouraging or adverse, could have a disproportionate and unhelpful effect on the domestic permit price in an unconstrained market."[66]

However, the Rudd Government's change of heart was likely not the result of last-minute strategic thinking about the upcoming climate talks but rather a consequence of two factors: a dramatically deteriorating economic situation in Australia due to the global economic crisis that started in 2008, combined with the fact that the Rudd Government needed all the votes of the Green Party as well as some from the opposition to pass the necessary legislation. Despite the fact that the government had introduced massive compensation schemes, those opposed to the emissions trading scheme obviously saw a political opportunity in the economic crisis to lobby for a delayed start to the scheme. Conservatives pounded on the government, arguing that the CPRS would result in massive lay-offs in energy-intensive industries. They pointed in particular to public announcements by global mining giant Xsatra stating the company would fire about 1,000 employees if the scheme went into operation as planned and would also have to cancel AUS$7 billion in investment. Similar pronouncements were made by the aluminum producer Alcoa that threatened to lay off 1,800 employees. Xsatra's particular grievance was that they would not be covered by any of the compensation schemes under the CPRS.

2.3.3 Towards a federal carbon market in the US? Key political-economic battlegrounds

As in Europe and Australia, distributional issues are at the heart of political debates around the establishment of a carbon trading regime in the US. Issues such as the stringency of the cap, the use of offsets, the mode of allowance allocation and others are being heavily debated, and have seen significant lobbying, as various bills are considered in the US Congress.

The legislative "frontrunner" at the moment is the American Clean Energy and Security Act (ACESA) which was, on 26 June 2009, passed by the House of Representatives after a significant debate. ACESA will move on to the Senate as supporters look to have legislation passed by December 2009 when the Copenhagen Climate Summit convenes.

However, passage of the bill is certainly not guaranteed and it remains to be seen what compromises will be reflected in the final version. The significant "watering down" of the bill in the Energy and Commerce Committee, the Agriculture Committee as well as on the House floor has already reflected some of these key compromises and thus provides a good case study for analyzing the political economy of cap-and-trade in the US.

2.3.3.1 A brief history of climate change policy in the US

While Europe has emerged as the main proponent of climate change mitigation through the reduction of emissions, the debate in the US has been off and on for almost three decades. In 1980, the Global 2000 Report to the President on environmental challenges presented President Jimmy Carter with a stark warning that rising CO_2 levels in the atmosphere could lead to global warming.[67] The incoming Reagan Administration, however, largely ignored the report.[68]

The subsequent Bush Administration also chose to snub the Global 2000 report. Yet, in 1990, George H.W. Bush passed the seminal Clean Air Act which sought to eliminate smog and air pollution and which created the world's first cap-and-trade system, the Acid Rain Program, for mitigating emissions (see Box 2.3.3.1a below).[69]

Nonetheless, for more than a decade, the issue of climate change lay dormant in the US. The 1992 Earth Summit in Rio de Janeiro and the ensuing negotiations leading towards the negotiation of the Kyoto Protocol in 1997 brought the issue back on the US political agenda. With a Democratic Administration in charge, there were high hopes in the environmental community that the US would emerge as one of the international leaders on climate change and would adopt aggressive domestic measures to curb CO_2 emissions. Indeed, the Clinton Administration played an active role in the negotiations, pushing, among other things, for the inclusion of market-based approaches ("flexible mechanisms") in the Kyoto Protocol. However, while the Clinton Administration was active in the negotiations leading up to the Kyoto Protocol and even signed it once complete, the Protocol was never sent to the US Senate for ratification.[70] Also, in 1997, the Senate unanimously passed the Byrd-Hagel Resolution which stated that the US would not sign the Kyoto Protocol if there were not binding targets for de-

Box 2.3.3.1a. The US Acid Rain Program

While it is generally assumed that the US is "late in the game" with regards to emission trading, the idea of cap-and-trade is, in fact, a quintessentially American one. In 1980, rising public concern about the extensive health and environmental impacts of acid rain prompted the US Congress to commission a ten-year study on its causes and effects. The result of these studies led directly to the introduction of the Acid Rain Program under Title IV of the 1990 Clean Air Act Amendments, which called for major reductions in the emissions of sulphur dioxide (SO2) and nitrogen oxides (NOx)—the key components of acid rain – through the usage of a cap-and-trade program.

The Clean Air Act Amendments of 1990 set a goal of reducing annual sulphur dioxide (SO2) emissions by 10 million tons below 1980 levels and NOx emissions by 2 million tons from 1980 levels. To achieve the reductions in SO2 emissions, the US adopted the first ever market-based approach to environmental protection in the form of a cap-and-trade system. Phase 1 of the program, which began in 1995, included mostly coal-burning electric utility plants located in 21 eastern and Midwestern states. Phase 2 of the program, which began in 2000, tightened the annual emissions limits imposed on large, higher emitting plants and also set restrictions on smaller, cleaner plants fired by coal, oil, and gas.

As with carbon markets, the allowances in the Acid Rain Program are the currency with which compliance with the SO2 emissions requirements is achieved. Through this market, entities regulated under the Acid Rain Program decide the most cost-effective way to comply with the requirements of the Clean Air Act. Units that reduce their emissions below the number of allowances they hold may trade allowances with other units in their system, sell them to other utilities on the open market or through EPA auctions, or bank them to cover emissions in future years.

In comparison to the huge costs and technological challenges of reducing CO2 emissions, retrofitting coal plants to reduce SO2 and NOx emissions was a much less cost-intensive process which was implemented through technologies which had already been developed. Carbon Capture & Storage (CCS) technology, in comparison, still does not exist for large-scale commercial application and the process of retrofitting plants (and transporting and storing the carbon) is a much more complex and, therefore, expensive process. Nevertheless, the widely acknowledged success of the acid rain program essentially introduced the concept of cap-and-trade as an efficient and cost-effective strategy for reducing emissions.

veloped as well as developing countries and if it would result in serious harm to the economy of the United States.[71] The Clinton Administration at that point did not have significant additional political capital to spend on the issue.

Despite growing public awareness of climate change as a significant threat and accumulating scientific evidence pointing to its anthropogenic sources, Clinton's successor decided not just to ignore the issue, but to dispute its significance and scientific base. Furthermore, the George W. Bush Administration was often accused of tampering with the results of scientific reports and the rejection of climate science. While President Bush often emphasized the development of clean coal, nuclear, ethanol and hydrogen power technologies, public R&D funds towards energy technology stagnated during his terms as President.[72] The Administration also made it clear that any emissions reductions programs should be voluntary. This position was exemplified by the Bush Administration's initiative to form the Asia Pacific Partnership on Clean Development and Climate, which was widely touted as an alternative to the Kyoto Protocol.[73]

Despite a lack of impetus from the Bush Administration, the leadership of the US Senate prompted action among legislators which led to bills being introduced in both Houses of Congress. The first (and only) of these initiatives to be put to a vote in the Senate was the Climate Stewardship Act introduced in 2003 by Senators Joseph Lieberman and John McCain. While the measure failed by a vote of 43 to 55, the vote demonstrated growing bipartisan support for a genuine climate change policy.[74] With this failure to launch a federal system during the Bush tenure, different regions in the US moved forward with the development of regional cap-and-trade schemes for reducing carbon emissions, namely the Regional Greenhouse Gas Initiative (RGGI) and the Western Climate Initiative (WCI) (see Box 2.3.3.1b. below).

2.3.3.2 Emerging contours of a federal carbon market

After winning the election in November 2009, President Obama quickly put forward plans to lead the US out of a potentially debilitating recession by providing a "down payment" for building a "green economy".[75] The centerpiece of that broad initiative has been a proposal for the development of a cap-and-trade system for greenhouse gases.[76] While the pushing through of climate legislation in the US seemed an impossible task in the past, the combination of a Democratic majority in Congress as well as the more tangible political driver for a cap-and-trade system, namely, income to decrease the federal budget deficit, has made this goal much more likely. However, it is notable that despite Obama's financial commitment to building a green economy

Box 2.3.3.1b. Existing and planned US regional cap-and-trade schemes

The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort by ten Northeast and Mid-Atlantic States to limit greenhouse gas emissions and is the first mandatory, market-based CO2 emissions reduction program in the United States. These states will cap CO2 emissions from the power sector and then require a 10 percent reduction in these emissions by 2018. To reduce emissions of greenhouse gases, the RGGI participating states are using a market-based cap-and-trade approach that includes: establishing a cap that will decrease gradually until it is 10 percent lower than at the start; requiring electric power generators to hold allowances covering their emissions; providing a market-based emissions auction and trading system where electric power generators can buy, sell and trade CO2 emissions allowances; using the proceeds of allowance auctions to support low-carbon-intensity solutions, including energy efficiency and renewable energy; and employing offsets to help companies meet their compliance obligations. The initiative was launched in September 2008 and, other than the EU-ETS, is the only currently operating emissions trading scheme for carbon. Should the US adopt a federal cap-and-trade system, the RGGI would be merged into this scheme.

The Western Climate Initiative (WCI) was formed in February 2007 by the governors of Arizona, California, New Mexico, Oregon, and Washington. Since then, Montana and Utah and the Canadian provinces of British Columbia, Manitoba, Ontario, and Quebec have also joined. The WCI Partners are recommending the implementation of a market-based cap-and-trade program as a component of a regional effort to reduce emissions by 15 percent below 2005 levels by 2020. If approved, the WCI would cover nearly 90% of the region's emissions of all six main greenhouse gases, including those from electricity, industry, transportation and residential and commercial fuel use. Together, the seven states and four provinces represent over 70 percent of the Canadian economy and 20 percent of the U.S. economy. The first phase of the cap-and-trade program begins on 1 January 2012, covering emissions from electricity, including imported electricity, industrial combustion at large sources and industrial process emissions for which adequate measurement methods exist. The second phase begins in 2015, when the program expands to include transportation fuels and residential, commercial and industrial fuels not otherwise covered.

and his ardent support for an emissions trading scheme in the US, he did not introduce his own cap-and-trade legislation to Congress or conduct any serious campaign to influence the final bill. Rather, he has thus far played only an advocacy role while leaving the policy details and negotiations to legislators.[77]

A number of proposals for a federal emissions trading scheme are currently under consideration in the US Congress. The Climate Security Act (the Lieberman-Warner proposal) remains the primary proposal under consideration in the Senate, while the American Clean Energy and Security Act of 2009 (the Waxman-Markey proposal) has already passed through the House. However, due to a number of uncertainties (including, among others, the outcomes of the Copenhagen talks, the availability of foreign credits, the availability and cost of CCS etc.) the final form of US federal climate change legislation is still under heavy debate.[78] Rather than analyzing the elements of the specific proposals introduced in the House and Senate, this section will focus on the main battlegrounds, with respect to key design elements of the systems.

The stringency and timetable of the cap

As discussed above, the stringency of the cap will have to strike a balance between both environmental effectiveness and political feasibility. For any cap-and-trade proposal to be political feasible, compromises will be needed to make the proposal palatable to policymakers, industry as well as the public.

The Lieberman-Warner bill, the main bill in the Senate at present, would set the cap for the period beginning in 2012 with 5.775 billion allowances (the number of CO_2 equivalents of emissions that the facilities covered emitted in 2005), with annual reductions of 1.8 percent. The size of the 2050 cap would thus be 1.732 billion allowances, a roughly 70 percent reduction based on 2005 levels. Coal facilities would be allowed to discount from their submission requirement the number of metric tons of CO_2 that they geologically sequester. Entities would also receive an allowance back from the Environmental Protection Agency (EPA) for each ton of CO_2 equivalent of greenhouse gas that they either destroy or use at as a feedstock in a matter that prevents its release to the atmosphere.[79] The Lieberman-Warner bill would cut emissions by roughly 15 percent by 2020, considerably less than the EU-ETS, which seeks to cut 20 percent of emissions by 2020 based on 2005 levels.

With the 70 percent reduction by 2050 based on 2005 levels[80], the EPA estimates that in 2030 the Lieberman-Warner law would cost between US$238 billion and US$983 billion in gross domestic product (GDP) losses for that year.[81] Necessarily, this estimate makes assumptions about a number of unknowns, including industry and consumer response, international climate efforts, and the viability of new technologies, mainly CCS technology.

In comparison, the Waxman-Markey bill, the bill which passed through the House, would reduce emissions to 97 percent of 2005 levels by 2012, 80 percent by 2020, 58 percent by 2030, and 17 percent by 2050, thus a slightly more ambitious long-term goal than the Lieberman-Warner bill in the Senate. However, revisions of the bill which emerged after deliberations by the US House Energy and Commerce Committee in May 2009 reduced the 2020 goal to 83 percent based on 2005 levels[82], with the 2012, 2030, and 2050 targets remaining the same.

This reduction was the result of significant debate among policymakers as well as heavy lobbying. The fact that the bill grew from roughly 650 pages in its original form, to almost 1000 pages following passage out of the Energy and Commerce Committee, and finally to roughly 1300 pages following its passage through the House demonstrates the influence of scores of amendments by state representatives to win benefits for their states.[83]

Significantly, Rep. Rick Boucher, a Democrat from Virginia (a key coal producing state) led an effort to protect coal-fired utilities and mining firms. He persuaded Waxman and Markey to accept a more modest reduction in emissions overall and to set aside 35 percent of allowances to help residential and industrial consumers of coal-fired power. He also won agreement for extra allowances and money – about US$1 billion a year – to develop CCS projects. The key impetus for the extra allowances and money for CCS was likely the result of heavy lobbying by the American Coalition for Clean Coal Electricity (ACCCE), a Virginia-based collection of 48 mining, rail, manufacturing, and power-generating companies with an annual operating budget of about US$45 million, almost three times larger than the coal industry's old lobbying and public relations groups combined.[84] However, prior to Committee discussions on the Waxman-Markey draft, the ACCCE announced that it "[…] supports the timely adoption of a mandatory federal carbon management program […] and believes that we can fashion a national greenhouse gas emissions reduction policy that 1) achieves emissions reductions, 2) creates jobs, 3) preserves fuel diversity as a means of promoting greater energy independence, and 4) focuses on driving down compliance costs as a means of protecting consumers against unnecessarily higher energy costs."[85] In fact, a statement by the ACCCE following the passage of the bill out of the Energy and Commerce Committee indicated its support of the bill.[86] However, following the passage of the bill through the House of Representatives, ACCCE with-

drew its support of the bill.[87] ACCCE is still lobbying Congress seeking a cap on the cost of allowances as well as a delay of the start of the program to after 2012.[88]

Opposition to this cap is widespread among industry representatives but also from environmentalists hoping for more stringent terms. The US Chamber of Commerce, one of the world's largest business federations representing more than three million businesses and organizations, argues that any action without full international compliance, including developing countries, would harm the US economy.[89] The American arm of Greenpeace, on the other hand, says it cannot support the bill in its current weakened state, arguing that "[…] this bill has been seriously undermined by the lobbying of industries more concerned with profits than the plight of our planet."[90] Moreover, while the bill faced virtually unified opposition of Republicans in the Committee and on the House floor, it also faced skepticism from the other side of the aisle, especially moderate democrats from the Rust Belt, coal states and the South who lined up to make changes to the legislation before Waxman and Markey could unveil it.[91]

Leakage and the distribution of compliance costs

While the main legislative proposals in the House and the Senate differ to some degree, the distributional consequences of the cap on industry and consumers are similar with both schemes. At present, both the Senate bill and ACESA propose measures to address leakage concerns. The Lieberman-Warner bill contains a proposal to tax imports from countries not making similar greenhouse-gas reductions of their own. It would also require importers of energy-intensive goods to eventually purchase permits. ACESA also would require importers of energy-intensive goods to buy permits if other measures in the bill fail to prevent leakage.[92]

In addition, the adoption of a comprehensive climate change policy and the costs associated with the stringency of the cap would have significant distributional effects on consumers. Any cap-and-trade policy would increase the price of energy-intensive goods, of which the majority, if not all, of this price increase would ultimately be passed on to consumers. The burden of these price increases would disproportionately affect low-income consumers, who spend a larger percentage of their income on energy-related expenditures. In this context, an analyst for the non-partisan Congressional Budget Office conceded in testimony before the House that a 15 percent cut in CO_2 emissions could cost the average household on average US$1,600 per year.[93] However, this estimate did not include the provision of rebates to households stemming from the proposed auctioning of 15 percent of the allowances currently planned under ACESA. The testimony also concluded that these costs could be offset if revenues from the allowances were returned to consumers and that lower-income households could actually be better off as a result of the policy.[94]

Allowance allocation and rents

The US, in its debate on allocation mechanisms, has closely followed developments in the EU, and especially the discussion on free allowance allocation and windfall profits.[95]The Lieberman-Warner bill would auction 21.5 percent of emissions allowances (with an additional 5 percent of the 2012 account having been allocated for early auctioning) in 2012, with this percentage rising steadily each year until a plateau at 69.5 percent from 2031 through 2050. The rest would be freely distributed to regulated entities based on a formula that determines which sector receives what percentage of the overall freely distributed emissions allowances.[96]

In the debate on the Lieberman-Warner bill in the US Senate Environment and Public Works Committee in December 2007, which eventually led to the passage of bill out of Committee and to the Senate floor, the discussion on allocations is interesting to note. Senators Hilary Clinton (D-NY) and Bernie Sanders (I-VT) proposed an amendment which would have led to 100 percent auctioning of emissions allowances; however, the amendment was handily defeated (13 votes to 6, with 4 democrats and independent Lieberman joining the Republicans in a "no" vote) in the Committee, with Senator Lieberman calling the amendment "[…] a poison pill…substantively wrong…this will not only kill the bill, but kill a lot of companies as well."[97] The bill eventually failed in the Senate for a number of reasons. First, the introduction of a bill which would raise energy costs at a time when increasing oil prices were causing pain at the pump for many consumers was simply bad timing. Second, the provisions in the bill were more stringent than most Democrats were willing to accept.[98]

On the House of Representatives side, the original Waxman-Markey bill has given way to some compromises. In the revised version of the bill passed by the US House Energy and Commerce Committee in May 2009 and, subsequently the House of Representatives in late-June 2009, legislators cut a deal to allocate as much as 85 percent of the credits for free (43.8 percent to electricity companies, 9 percent to natural gas companies, 2 percent to trade vulnerable industries, 14 percent to investments in climate technologies, 2 percent to oil refiners and the rest divided up among a number of various recipients) with the remaining 15 percent being auctioned. Eventually, the free credits would phase out in favor of a full auctioning of allowances.[99]

While industries such as the power sector would receive free allowances amounting to billions of dollars, other industries, in particular oil and gas, complain they are "losing out" on the distribution of free allowances. The bill, as it now stands, would freely allocate 2 percent of the allowances to the oil and gas industry, one that represents about 30 percent of the nation's emissions. The electric utility industry, on the other hand, is slated to receive about 35 percent of the cap-and-trade program's allowances, which is roughly equal to the 40 percent contribution to U.S. greenhouse gas emissions. Not surprisingly, American Petroleum Institute President and CEO Jack Gerard complained that the legislation short-changes his industry.[100]

The use of offsets to ease compliance costs

Industry wants a larger share of offsets in order to reduce the overall cost of emissions reductions. At the same time, a number of reports are coming out that are skeptical of the impact of offset programs such as the Kyoto Protocol's CDM.[101] The original version of the Waxman-Markey bill in the House contained huge opportunities for buying offsets. In its original form, the bill allowed for up to 2 billion tons of emission reductions to be generated through the purchasing of offsets. If a suitable supply of domestic emissions offsets is unavailable, the limit on the use of international offsets may be raised to 1.5 billion tons annually at the discretion of the Administrator of the EPA. The extensive use of these international and domestic offsets could significantly impact the effectiveness of the cap, as it is extremely difficult to measure the overall carbon savings resulting from offset projects.

In the revised form of the Waxman-Markey bill, the offset provisions were changed significantly. According to the EPA analysis of the revised bill, changes to several provisions increase the use of offsets, especially domestic ones, which consequently could lower the cost of allowance prices by roughly 7 percent in each year. Furthermore, the revised bill allows up to an additional 500 $MtCO_2e$ of international offsets, a change which has the potential to lower allowance prices significantly further than the 7 percent reduction.[102]

The Lieberman-Warner bill allows offsets from domestic projects for up to 15 percent of the annual emissions cap. This would include offsets for international projects for up to 5 percent of the cap, and up to 10 percent for international forest carbon offsets. If these limits are not met, allowances from other international trading systems may be used. However, the total number of offsets is limited to 30 percent of the annual cap. To provide some perspective, the EPA analysis of the bill estimates that allowance prices would rise by 34 percent without international offsets, while barring all offsets would increase the price by 93 percent.[103]

The bill would give the EPA authority to decide which offset projects are allowable through an independent, nine-member Offsets Integrity Advisory Board. However, various sectors looking to take advantage of offsets for meeting reductions commitments are seeking more specific language in the Bill.[104] In order for the bill to reach the House floor, it had to pass out of the Agriculture Committee whose members were demanding these offset concessions in order to ease the burden. Eventually, Waxman and Agriculture Committee Chairman Collin Peterson (D-Minn) signed off on a plan that puts the Agriculture Department rather than EPA in the lead for management of the offset program that pays farmers and other landowners to conduct environmentally friendly projects.[105]

In this context, in ongoing discussions regarding a US climate change policy, industry sectors are looking to receive offset credit for any type of activity that could potentially lead to a reduction in emissions down the product chain. For example, firms will want credit for designing and producing energy-efficient products or for past emissions reductions activities; large oil and gas corporations will want credit for their clean energy investments in order to compensate for their oil and gas emissions; and coal companies will seek free credits for the development and deployment of clean coal technologies. As the Waxman-Markey bill moves to the Senate, many anticipate that the offset provisions will once again be watered down in order to obtain more support.[106]

Coverage of the cap

Both the Lieberman-Warner bill and the ACESA cover all six primary greenhouse gases by major sources and by sector, in power generation, manufacturing and transportation. In the Lieberman-Warner bill, all facilities in the power sector and in manufacturing emitting more than 10,000 metric tons of CO_2e would be covered by the scheme (the EU-ETS, as shown above, covers only those entities which release more than 25,000 tons annually), as well as entities producing or importing fuel. Furthermore, any facility that uses more than 5,000 tons of coal in a year is a natural gas processing plant or that produces natural gas in the State of Alaska, or any entity that imports natural gas (including liquefied natural gas) would also be covered. This would represent roughly 87 percent of all U.S. emissions.[107]

In the ACESA, electricity generators, liquid fuel refiners and blenders, and fluorinated gas manufacturers are covered starting with emissions in 2012. Industrial sources that emit more than 25,000 tons of CO_2e per year are covered starting with emissions

in 2014. Local distribution companies that deliver natural gas are covered starting with emissions in 2016. This would include industries such as ethanol production; food processing; glass production; hydrogen production; iron and steel production; lead production; pulp and paper manufacturing; and zinc production.[108] In the first phase of the scheme from 2012, roughly 68 percent of total US emissions would be covered, with this coverage rising to 75.7 percent in 2014 and 84.5 percent in 2016. Coverage would include entities whose emissions exceed 25,000 tons annually.[109]

As climate policy legislation has picked up steam and as the ACESA slowly inched its way towards passage through Congress, the number of interest groups seeking to influence the bill have increased. The Center for Public Integrity stated that its review of Senate disclosure records showed that more than 880 businesses and interest groups have registered to lobby on climate change in the first quarter of 2009 -- up more than 14 percent over the same time last year.[110] Industries that would be potentially covered by a US climate policy have much to win or lose, depending on the outcome of negotiations.[111] In addition, as the Waxman-Markey bill has gone through Committee, the Air Transport Association of America (ATA) has chimed in, stating that "[…] the airlines – and the transportation sector, in general – would be saddled with significant cost burdens through higher fuel prices…[and] that the [Waxman-Markey bill] could be counterproductive to the U.S. air carriers' ongoing efforts to reduce their carbon output…"[112] They also argue that while costs to the aviation sector are unknown due largely to the fact that the draft legislation does not address how emission allowances will be distributed, these costs will cripple efforts to improve efficiency which, due to the competitive nature of the U.S. airline industry provide a strong and inherent incentive for airlines to increase efficiency, burn less fuel and emit less carbon.

2.3.3.3 Where to from here?

As noted above, The ACESA passed through the House of Representatives on 26 June 2009. However, many expect the bill to be further weakened as it moves through the legislative process, especially once sent over to the Senate. It remains to be seen what sort of action the Senate will take, either through the reintroduction of the Climate Security Act, the adoption of ACESA or new legislation taking elements from both. At present, many believe that there are not enough votes in the Senate to pass cap-and-trade legislation as it stands now and it remains to be seen what sort of compromises will be necessary for supporters to push the legislation through.

2.4 Conclusion

The purpose of this comparative analysis was not to provide an in-depth technical comparison of existing and proposed emissions trading systems in the EU, Australia and the US. Instead, the main aim was to illuminate the key political-economic conflicts and dynamics that underpin these various systems. While the key design features of the various emissions trading systems are the same, different recipes have been devised in each of the countries to make the introduction of emissions trading systems a political feasibility. This includes, most significantly, differential commitments on overall caps; varying degrees of industry coverage; different modes of allowances allocation; and a divergence in rules on the use of offsets.

As the previous sections have made clear, these are not merely technical design issues. Instead, they crucially affect the distribution of costs and benefits of emissions trading across an economy, and are thus subject to significant political haggling. Also, in all these countries the existing deals are not static. The European experience shows that, over time, progress in terms of building a more stringent emissions trading system with more mitigation potential is possible. The Australian and American examples illustrate, however, how shaky such deals can be, and how quickly the political support they rely on can fall apart. In terms of political strategy, the European experience seems to suggest that starting with a less than perfect system may not be optimal from a climate protection point of view, but effective as a means to get a system up and running quickly. The assumption is that once an emissions trading system exists it is hard to dismantle altogether.

3. Top-down and Bottom-up Integration Scenarios

As noted in the introduction, carbon trading has moved to the center stage of international greenhouse gas mitigation efforts in recent years. Yet, for carbon markets to make a real dent on greenhouse gas emissions, they would have to be global in scope and feature an ambitious overall cap.

Advocates point to the potential economic, environmental and political benefits of such a global system.[113] A globally integrated carbon market would be the most economically efficient approach to mitigation since it would offer much wider opportunities for abatement and thus reduce the overall cost associated with emission mitigation. For example, a recent report commissioned by the British Prime Minister concludes that "[…] under the right conditions, global carbon trading could reduce emissions reduction costs by up to 70%. These efficiencies could potentially allow the world to reduce global emissions by an additional 40-50% at the same cost and provide substantial financial flows to the developing world to support the move to a low carbon economy with sustainable growth."[114] In addition, an integrated global carbon market would also reduce price volatility. A global carbon market would furthermore be the most environmentally effective approach to mitigation since it would cover a larger (and ultimately all) global greenhouse gas emissions and at the same time reduce (and eventually eliminate) potential leakage problems. Finally, advocates argue that there are also strong political benefits to carbon market integration since it would help to ramp up domestic political support for mitigation efforts.

As noted earlier, there are two different approaches for achieving a global carbon market – from the top-down and from the bottom-up. The top-down approach is pursued within the context of a multilateral decision-making process under the auspices of the United Thus far, however, existing carbon markets – with the notable exception of the EU ETS – remain rather small and fragmented. The table above provides a sense of the development of volumes and values of existing emissions trading schemes at the national, regional and international levels in recent years.

Nations Framework Convention on Climate Change (UNFCCC). It is a centralized process, overseen by the UNFCCC secretariat, and has as its ultimate aim the establishment of a global carbon market based on emissions trading between governments. The bottom-up approach, on the other hand, implies the establishment and linking of different national and regional emission trading systems based on emissions trading between companies. As already highlighted in the introduction, these two approaches are by no means exclusive and positive feedback mechanisms are sometimes assumed to exist between them.[115] Both also have their own distinctive advantages, disadvantages and implications for the institutional architecture of carbon markets.

In this chapter, we will consider the specific advantages, as well as the obstacles, inherent in these ap-

Table 3a: Volumes and values of existing carbon markets

	2007		2008	
	Volume ($MtCO_2e$)	Value ($MtCO_2e$)	Volume ($MtCO_2e$)	Value ($MtCO_2e$)
EU ETS	2,06	49,065	3,093	91,91
New South Wales	25	224	31	183
Chicago Climate	23	72	69	309
RGGI	n/a	n/a	65	246
AAUs	n/a	n/a	18	211
Total	**2,108**	**49,361**	**3,276**	**92,859**

Source: World Bank (2009), State and Trends of the Carbon Market 2009) Washington, DC: World Bank).

proaches towards carbon market integration. In conducting this analysis, we draw on our understanding of emissions trading systems as described in the previous chapter, namely as political-economic bargains which reflect the outcomes of intense negotiations and thus represent carefully crafted compromises. Section 3.1 will consider the top-down approach and speculate about the likely outcome of the upcoming Copenhagen summit in December 2009. It will also briefly evaluate the likely effectiveness of a global carbon market based on government-to-government trading, should negotiations be successful. Section 3.2 will more closely investigate the case for bottom-up approaches and their potential implications and environmental impact. Section 3.3 concludes.

3.1 Negotiating a global deal: The top-down approach

A global deal implies that every country in the world will adopt a binding carbon reduction target that covers the greenhouse gas emissions of its entire economy. Such an international agreement would facilitate trading between governments, and could also include additional flexible offset mechanisms, such as the current Kyoto Protocol does. In addition, a global carbon market based on government-to-government trading of allowances would also require some basic rules of the game in terms of market governance as well as a mechanism for compliance management. A top-down approach to building a global carbon market does not necessarily imply that individual countries that are signing on to such an agreement would have to setup company-level trading schemes in order to comply with their commitments. However, it would be likely that a global deal would result in a mushrooming of such company-to-company trading schemes.

This section argues that by far the most significant problem of a global deal, without doubt, remains the political difficulties involved in cutting it in the first place. Negotiating global burden-sharing in a multilateral process remains especially difficult due to the number of players (and thus veto points) that are involved. As carbon caps can have large distributional consequences, the political-economic conflicts that characterize these global negotiations are colossal. Moreover, there exists large transaction costs involved in emissions trading which might on their own inhibit a global deal. Thus, the establishment of national emission registries and complicated monitoring, reporting and verification (MRV) systems are likely to go far beyond the existing capacities and the resources of even emerging economies, leave alone developing countries.

Also, even if a global deal on emissions trading could be reached, it is by no means certain that such a global market for emissions would be stable or highly efficient. Various characteristics of a global market characterized by government-to-government trading raise important questions about its likely effectiveness in terms of emissions mitigation.

The following section (3.1.1) provides brief background on the historical evolution and institutional context for multilateral negotiations on climate change more generally, and emissions trading (the Kyoto Protocol) more specifically. Section 3.1.2 weighs the current status of global negotiations and provides an assessment of likely political outcomes of those negotiations. Section 3.1.3 discusses the likely economic and political implications of a global carbon market characterized by government-to-government trading, in the unlikely event that a comprehensive political deal can be reached.

3.1.1 The UNFCCC process: From voluntary measures to the Kyoto Protocol

The long-term objective of the UNFCCC[116] is to stabilize atmospheric concentrations of greenhouse gas emissions. The Convention originally called for emission reductions to be achieved via voluntary abatement goals for developed countries, which were to reduce emissions to 1990 levels by 2000.[117] The Convention differentiates between developed countries (hereafter, Annex I countries)[118] and developing nations (non-Annex I)[119]; under the scheme, Annex I countries have greater responsibility for reducing greenhouse gases in the near term while Annex II had none. The UNFCCC coined the phrase “common but differentiated responsibility” to reflect the undisputed reality that industrialized (Annex I) countries have caused much of the current buildup of greenhouse gases in the atmosphere and, as such, should carry primary responsibility for mitigation efforts. The distinction between Annex I and non-Annex I countries thus may seem fair, but nevertheless has resulted in tensions at the negotiating table during the various Conferences of the Parties (COPs).

This should not come as a surprise, considering the costs of mitigation. Some estimates estimate annual costs of abatement to be as much as US$200 billion in China alone.[120] To avoid political and economic backlash at home, Annex I countries have been hesitant to enforce controversial climate policies as long as non-Annex I countries are not required to reign in their emissions. These conflicts over what constitutes fair “burden-sharing” have been – and remain – the key sticking points in global climate change negotiations, and undermine the political feasibility of a global deal.

The first COP was held in Berlin, Germany in the spring of 1995 the outcome of which, the Berlin

Mandate, recognized the inadequacy of the original voluntary measures at emissions mitigation proposed under the convention and opened negotiations for comprehensive options through which countries could address climate change that made political, economic and environmental sense for their specific national contexts. Work on the Kyoto Protocol began soon thereafter.[121] While the majority of UNFCCC signatories agreed that voluntary emissions reduction targets were an ineffective way of cutting greenhouse gas emissions, however, most Annex I countries remained extremely hesitant to set and enforce concrete and ambitious emissions targets realizing the likely economic consequences and potential political outfall.

The Protocol, concluded after two years of negotiations in 1997, commits industrialized (Annex I) countries to reduce their overall greenhouse gas emissions by 5.2 percent by 2012 (based on 1990 levels), a relatively modest target that was further punctured by several exceptions for countries such as Australia that lobbied hard for measures that would reduce their mitigation burden. The burden-sharing agreement stipulated that national commitments to mitigation range from 8 percent for the EU, to 7 percent for the US, 6 percent for Japan and zero for Russia. Indeed, the agreement also allowed some Annex I countries (in particular Australia and Iceland) to increase their emissions.[122] The Kyoto Protocol also features three so-called "flexible mechanisms", i.e. domestic emissions trading, Joint Implementation (JI), and the Clean Development Mechanism (CDM)).

Domestic emissions trading allows for carbon trading within individual country borders. As was noted above, several countries and regions have begun to, or have already employed emissions trading schemes to meet their targets. The second approach, Joint Implementation, is supposed to support technology transfer and foreign direct investment (FDI) by giving developed countries the opportunity to invest in emissions-reducing activities in other developed countries (typically countries with economies in transition who are not considered "industrialized" under Kyoto) to get credit toward their own domestic reduction requirements. The final flexibility mechanism offered under Kyoto is the CDM. CDM is designed to encourage Annex I investment in developing nations as a part of the developing countries' commitment to sustainable development. Similar to the JI, Annex I investment results in reduction credits to the investing country that it can put toward their Kyoto commitments.[123] Thus far, CDM is by far the biggest offset scheme with 2554 projects validated as of 2009 and a total of 4995 projects having sought eligibility in total.[124]

In order to fund components of the Kyoto Protocol which assist non-Annex I nations to achieve their own sustainability objectives, an elaborate system of financing for adaptation and mitigation efforts was created. Though the design of these schemes and other operational details are contentious, the funding schemes (a number of which are still in the planning phases) seek to aid poor countries that are particularly vulnerable to the effects of climate change, including island nations and many equatorial African states. For the purpose of financing adaptation (primarily efforts by poor and vulnerable countries to manage natural disasters and emergencies resulting from climate change) the country categorization under Kyoto has been further distinguished and now includes an Annex II grouping of developed countries. The Annex II categorization is a subgroup of Annex I which consists of the 23 industrialized economies, plus the EU separately, charged with financing adaptation efforts for developing or non-Annex countries.[125]

Though often criticized, the Kyoto Protocol has several key accomplishments. First, it represents the first international agreement to address climate change, which is no small feat. Second, information gathering with regards to emissions has improved under the agreement. Its various mechanisms require developed countries to report their annual emissions from all sectors of its economy using strict UNFCCC guidelines. Third, the three flexibility mechanisms created under Kyoto aptly support developed country efforts to meet their Kyoto commitments without requiring a complete overhaul of their domestic industrial and transport sectors – ultimately making efforts to mitigate climate change more economically and politically feasible.

However, despite these successes, it is apparent that the Kyoto Protocol not only set a fairly un-ambitious emissions reduction target, but also failed to meet these minimal targets. The key failure of the Kyoto Protocol, resulting largely from political and economic constraints, is that countries are not meeting their CO_2 emissions reductions targets. On average, Annex I country emissions are on the rise rather than the decline. Data from 2007 shows global emissions of CO_2 up by 38 percent relative to 1990 levels since the UNFCCC was signed.[126] Table 3.1.1a below summarizes progress towards Kyoto targets.

One clear observation is that even some of the relatively wealthy and industrialized countries have not managed to reach the agreed-upon targets.

Additionally, and equally significant, Kyoto does not address the significant emissions rates of some emerging economies such as China (now the world's largest emitter), India and Brazil.[129] Meanwhile, the world's second largest emitter, the

United States, and thus a key player at the climate negotiation table, never ratified the Protocol.[130] Yet, ironically, it was the strong rhetoric of the US that compelled parties to weaken the original emissions requirements under the Kyoto Protocol in the first place.[131] Of those who did ratify the Treaty, many successful emissions cuts were not a result of strict climate policies, but rather a result of the rapid deindustrialization that followed the political disintegration of the formerly Communist states.[132]

Table 3.1.1a. Kyoto signatory commitments and progress to date[127]

Country	Kyoto Commitment	Ratified the treaty?	Progress toward Commitment (2007)	On track to meet target?
Australia	8%	No	30%	No
Canada	-6%	Yes	26%	No
European Union 15[128]	-8%	Yes	– 5%	Yes
France	0%	Yes	-5.8%	Surpassed
Germany	-21%	Yes	- 22.4%	Surpassed
Japan	-6%	Yes	13%	No
Russia	0%	Yes	-34%	Surpassed
Spain	25%	Yes	+52.6%	No
United Kingdom	-12.5%	Yes	-18%	Surpassed
United States	-7%	No	20%	No

Source: See European Environment Agency (2009), Annual European Community greenhouse gas inventory 1990-2007 and inventory report 2009, op. Cit, p. 11.

Also, there are various elements contained in the Kyoto Protocol that have never been fully clarified and thus have not been implemented – a clear reflection of the tenacity of negotiating and implementing a global climate deal with 192 negotiating parties. The four most important issues include arrangements regarding mitigation, adaptation financing, technology transfer and carbon offsets. These same four issues remain critical for ongoing negotiations for a post-Kyoto treaty.

Adaptation Financing. Adaptation financing is one of the key issues left unaddressed by the Kyoto Protocol. The World Bank estimates that approximately US$ 10-40 billion will be required annually for "climate proofing" investments in developing countries.[133] The United Nations Development Programme (UNDP) estimates that incremental investment needed for adaptation could amount to US$ 86 billion per year as of 2015.[134] As it stands now, Annex II countries are supposed to fund adaptation programs for non-Annex I countries.[135] However, Annex II countries have yet to put up the necessary funds, citing concerns related to the questions raised above.[136]

Technology Transfer. The UNFCCC also seeks to promote the diffusion of new, climate-friendly technologies. Developed countries are required under the UNFCCC to share these technologies with developing countries to aid them with their own emissions reductions based on the understanding that these states cannot support advanced technology investments. Recognizing this as a serious issue, the UNFCCC has developed a group dedicated to addressing technology transfer concerns and issues related to competition. The Expert Group on Technology Transfer has had limited success thus far, however. Strategies for transferring technology and managing competitiveness concerns have thus far remained unresolved and are again a centerpiece of negotiations in Copenhagen in December 2009.[137]

Carbon Offsets. Carbon offsets continue to be one of the most effective avenues for developed countries to achieve their emissions reductions commitments under the Kyoto Protocol. Basically, countries can earn credit toward their total reduction target by investing in carbon reduction projects in other countries and thus reduce the cost of compliance. Each carbon credit earned abroad gives the investing country the right to emit more carbon domestically. However, this has raised red flags because the environmental integrity of these flexibility mechanisms is difficult to assess. Results are difficult to measure and require strong financing frameworks

to implement them. The use of offsets also allows countries to delay necessary domestic reductions in emissions from high emissions sectors such as energy and transportation.

A particularly interesting, but highly contentious means of gaining credits toward emissions reductions is "Land use, Land-use Change and Forestry" (LULUCF). Included under Kyoto, LULUCF covers emissions and removals of greenhouse gases that resulted from direct human-induced land use, land-use change and forestry activities.[138] Land use, land-use change and forestry sector emissions taken together accounted for a roughly 30 percent share of carbon emissions between 1989 and 1998.[139] As such, projects to manage the LULUCF sector, including replanting, soil regeneration or other projects, have long been acknowledged to aid in climate change mitigation. LULUCF, then, is considered a key component to achieving a post-Kyoto climate deal in Copenhagen in December 2009. However, LULUCF accounting rules are inconsistent between different implementing and receiving countries. LULUCF encompasses a range of different sectors, from forestry to grazing land management. While Kyoto requires that all LULUCF emissions or emissions reductions be counted toward the country's total, the sectors accounted for in these totals are different for some countries – so one country that achieves a net "sink" might actually be a net "source" for another country.[140]

3.1.2 Negotiating Copenhagen: Towards a post-2012 climate structure

Advocates of the Kyoto Protocol have long argued that a weak agreement on climate change is better than no agreement. What matters, so the argument goes, is precedent and a basis from which to extend and strengthen multilateral action on emission mitigation in the years ahead.

With the Kyoto Protocol expiring in 2012, negotiations are now underway to replace the Protocol with a new climate policy regime. As with the Protocol, the two key issues at stake are agreement on an overall cap on emissions as well as agreement on a burden-sharing formula that would commit all signatory states to certain levels of emissions reductions. In addition, negotiations focus on mechanisms for adaptation financing, technology transfer and the reform and upgrading of offset schemes (in particular the CDM). Even with the new US Administration taking a more cooperative stance in climate negotiations, an ambitious and comprehensive global deal seems very unlikely, the expectation that the "precedent" of the Kyoto Protocol would eventually provide a building block to a more ambitious global climate regime may thus be proven wrong, at least for now.

There are two key blocs in current negotiations, namely Annex I and Annex II countries on the one hand and non-Annex I countries on the other. However, smaller alliances also exist. Moreover, there are varying and widely different country positions subsumed within each bloc. Amongst the Annex I countries, the US, Japan, Australia, New Zealand, Russia and the Ukraine have been the most reluctant to accept ambitious binding targets, advocating a more technology-driven approach. The EU, meanwhile, emphasizes the role of binding emissions targets, but maintains close ties with the other group (and others) in protecting their technology and favoring conservative adaptation funding policies. The EU, moreover, frequently has to deal with internal divisions.

Diagonally opposed to this coalition of developing countries are the non-Annex I countries, primarily represented by the G77 and China. However, a number of other subgroups also tend to play a role, including the African group, the LDCs, and the Association of Small Island States (AOSIS). While these countries have successfully checked developed countries' demands for binding reduction targets for all (including non-Annex I) major emitters, they tend to differ on a number of issues. Thus, recent COPs have witnessed a serious rift forming between the G77 and China. Specifically, the least-developed countries among the G77 feel that some UNFCCC rules (e.g. CDM requirements, financing and distribution) favor the most advanced developing countries, such as China – the main beneficiary from CDM. At the same time, Saudi Arabia and other oil exporting countries have largely split with the G77 and China bloc because strict emissions restrictions threaten petroleum demand worldwide and, as such, their main source of income.

The United States, the EU and the G77 and China are the pivotal players at the negotiating table leading up to the COP-15 in Copenhagen. No deal is possible at Copenhagen without a compromise between their different interests. The EU is the frontrunner that tries to set the pace. The United States has been the laggard when it comes to climate change. More recently, climate advocates have pinned great hopes on the ability of the new US government to infuse the process with a new dynamism. The G77 and China are reluctant to agree to any deal that might threaten their economic development and regard climate change as a problem caused by the West. In their attempt to strike a deal at the international level, especially the EU and the US will be limited by the political-economic bargains on climate change they have engaged in at home.

Table 3.1.2a provides a short elaboration on proposals from the US, the EU and the G77 and China on

the four key issues itemized above in an effort to discern whether or not a global, top-down climate deal can be concluded at Copenhagen.

Table 3.1.2a. US, EU and G77+China proposals for the upcoming COP

Country	USA	EU	G77+China
Adaptation Financing	Pledged US$ 400 million. No additional commitments specified until G77+China report their climate efforts in a measurable, reportable and verifiable way. Insists the private sector will and should fill any continuing financing gaps.	Currently not committing to specific fund amounts or expansion of current funds. Considers existing financing institutions effective. Most EU countries want adaptation financing to count toward their Official Development Assistance Requirements (ODA).[141]	Call for 0.5-1.0 percent of annual GDP from Annex II countries to go toward all current financing funds. Calls for "new and additional" funding from A-II countries and a new financing mechanism and governance framework under the UNFCCC umbrella (in addition to official development assistance the G77+China already receives). LDCs have asked for US$ 267 billion annually.
Mitigation	Considering emissions stabilization (zero reductions) compared to 1990 levels by 2020. US to reduce emissions by 80 percent on 2005 levels by 2050. Proposed unspecified, but "comparable" developing country commitments. Current domestic legislation would result in 4 percent emissions reduction on 1990 levels.	EU to reduce – 20 percent by 2020 on 1990 levels EU, 30 percent reduction by 2020 if other countries commit to "significant" reductions. EU to press for aggregate reductions of 30 percent by 2020 and aggregate reductions of -50 percent by 2050 on 1990 levels for Annex I & II states. Non-Annex -15-30 percent of business as usual emissions. LDCs require no emissions reductions.	Proposed Annex I & II countries reduce emissions by 40 percent from 1990 levels by 2020. G77+ China refusing reduction targets for 2020 (potential to negotiate post 2020 reductions depending on financial support from Annex II countries). LDCs and AOSIS[142] states seek reductions of 45 percent from Annex I states. India proposed 79.2 percent reductions for some Annex I states. Oil producing states split from G77, concerned about strict emissions reductions.
Technology Transfer	Committed to increasing domestic investments in technology development. No specific plans for technology transfer under the UNFCCC. History of cautious and protective IPR policies in all areas, likely to continue for climate-based tech transfer.	EU says there is sufficient funding for technology transfer and technology acquisition by developing nations. Sidestepping issue of G77 countries "buying out" IPR. Not interested in developing new indicators for monitoring or evaluating technology transfer frameworks	New body for green technology development, to guide COP on IPR and to make decisions in the COP New fund for joint R&D projects that could buy IPRs and make technology public Want indicators to assess and monitor technology transfer framework
Carbon Offsets	Currently 100 percent of carbon reductions can come from offsets. Legislation in the pipeline to allow for offsets of up to 2 billion tons/ year. The U.S. count carbon market offsets as meeting their domestic emissions reductions commitments and as covering their legal obligation to finance developing country cuts.	EU proposed phasing out CDM for advanced, developing countries and highly competitive economic sectors to be replaced by carbon trading schemes and later linked with the EU-ETS. EU-27 reduction in use of offsets to 3-4 percent after phase II of EU-ETS. Currently countries can negotiate for increased national offsets under EU aggregate.	Build domestic capacities to reduce carbon via REDD.[143] Push for more CDM projects with more diversification; expanded funding and institutional reform for CDM. Various G77 states have put forth proposals for improving CDM effectiveness. Most focus on financing

The European Union: "The Forerunner". EU climate change policy is closely aligned with the recommendations of the IPCC. As such, the EU consistently emphasizes the need to limit climate-change related temperature increases to 2 degree Celsius in the mid-term. This implies that significant

reductions in global emissions need to be achieved by 2020, in order to prevent considerable environmental and economic damage.

To this effect, the EU is the only major negotiating bloc within the Annex I and II blocs that has proposed significant emissions cuts both domestically and internationally while taking a much softer line on developing country contributions. The EU sets the standard for action on climate change and in this way plays a mediating role between the US and the G77 and China. For itself, the EU has committed to a 20 percent CO_2 reduction by 2020 on 1990 levels and has pledged to increase this to 30 percent if "significant reduction commitments" are made by developed countries and if more advanced developing countries contribute "adequately according to their responsibilities and respective capabilities".[144] The EU also seeks to ensure that a majority of these reductions are achieved domestically, by limiting the use of offset credits to 3-4 percent of allowances after 2012 (currently the EU allows 13.6 percent).

However, despite its emphasis on emissions cuts amongst developed countries, the EU tends to be less vocal on the issues of adaptation financing and technology transfers; a position its shares with other Annex I partners. The EU has not officially committed to specific funding amounts, nor has the Bloc endorsed expanding current funds. In fact, some of its member states have proposed counting adaptation funding as Official Development Assistance (ODA) – hoping to limit its overall financial obligations. The EU does not want to see major reforms of the adaptation financing mechanisms, nor has the Annex I bloc committed to providing additional funds to the existing totals. The EU has stated that it does not believe additional funds are needed for supporting technology transfer mechanisms and has yet to address the G77 and China's call for a system in which Intellectual Property Rights (IPR) can be purchased using technology funds. Additionally, the EU declined a proposal by the G77 and China to develop new indicators that would monitor and evaluate the technology transfer process.

During the negotiations, the EU is likely to press for aggregate reductions of 30 percent for EU member states by 2020 and aggregate reductions of 50 percent by 2050 on 1990 levels for Annex I and Annex II states. Relative to other Annex I members, the EU has not pushed developing countries to set comparable mitigation targets. However, they have proposed a 15-30 percent reduction of business as usual emissions for emerging economies, excluding LDCs. In the long term, the EU has proposed phasing out CDM for advanced, developing countries to be replaced by sectoral agreements, which are more effective in preventing leakage. These sectoral agreements are also seen by the EU as potential building block for full-fledged carbon trading schemes to be later linked with the EU-ETS.[145]

Being the poster child of climate change carries a price tag. However, estimates vary considerably in line with the health of the EU economy and the resulting demand. Taking June 2008 estimates, carbon abatement of 20 percent would cost approximately €309 billion. Using February 2009 GDP estimates to rerun the cost model, those costs for the same target amounted to only €152 billion. To reach a 30 percent reduction target using the same two GDP estimates would imply costs €408 billion based on 2008 data and €205 billion, based on 2009 data (a difference of €203 billion).[146] As a consequence of the economic recession and gloomy growth predictions for the EU, price forecasts for carbon have also dropped, as have total compliance costs.

The United States of America: "The Laggard". Ever since the inauguration of the new US administration under Barack Obama, climate change has become a high-profile issue. The new administration has pledged fast and decisive action on climate change and the introduction of a nation-wide trading scheme for greenhouse gas emissions. However, in reality US commitments are likely to remain much more limited than the current rhetoric suggests.

Under the latest piece of climate change legislation (the ACESA outlined in chapter 2), in effect proposes a 4 percent reduction in 1990 emissions levels by 2020. With China pushing for a 40 percent US reduction target and the EU's 20 percent target, resolving a global, top-down deal by December with serious mitigation commitments might be difficult – to say the least. President Obama recognized the small short-term commitment and has promised he will make up for a slow start with steep cuts of 80 percent by 2050 based on 2005 levels. While world leaders at the G8 summit in Aquila united around the goal of 80 percent reductions by 2050, this promise alone is unlikely to be seen as enough by the EU, which has emphasized the need for immediate action.[147] The US and EU also diverge regarding the use of carbon offsets in meeting their abatement goals. Under the ACESA, offsets would be able to make up roughly 100 percent of US reductions. More contentiously, it is likely that the US will require some comparable mitigation commitments from developing countries before agreeing to any binding domestic reduction targets. Thus far, the US has stressed that commitments from the G77 and China be "measurable, reportable and verifiable."

The US and the EU share similar positions with regard to technology transfer and additional adaptation financing. As mentioned previously, adaptation

for developing countries is projected to cost tens of billions of dollars per year. However, as of now, the UNFCCC reports that their Adaptation Fund, designed specifically to support vulnerable states with climate proofing, will only have approximately US$400 million available by 2012.[148] While the contributions from Annex II countries are expected to be significant, no official financing pledges have been made. Though, the US does contribute to the GEF, as does the EU, these funds are overshadowed by projected costs. The Omnibus 2009 federal budget designated US$10 million to the Least Developed Countries Fund under the GEF framework as a first installment on what the US says will be more to come.[149] However, despite their contribution to the GEF, the US (and EU) has argued that private sector investment for adaptation and technology transfers should make up any serious funding gaps rather than more public financing that would be in addition to the Official Development Assistance. Finally, while the US has committed itself to invest in domestic clean energy projects, it has yet to seriously support technology transfers to developing countries. The US has submitted a more comprehensive climate proposal to the UNFCCC in June, but the contents have not been made public.[150]

According to the consulting firm McKinsey & Company, the US could reduce 3-4.5 gigatons of CO_2e per year in 2030 using what they call tested approaches and hi-potential emerging technologies.[151] The report suggests that the US can afford to make these reductions while maintaining comparable levels of consumer utility. However, costs and benefits of abatement will be unequally shared among stakeholders. Also, the transition to a lower carbon economy will result in significant visible costs with savings to come into effect only later. According to the McKinsey report, incremental capital costs when assuming an economy-wide effort to curb carbon emissions for capturing 3 gigatons of carbon would cost approximately US$50 billion annually through 2030 (or US$ 1.1 trillion cumulatively). Because these investments would likely be concentrated in the energy and transport sector, these incremental capital investments would put upward pressure on electricity prices and costs of vehicles – a serious political concern and policy trade-off.

The G77 and China: "The South". The G77, formed in 1964, remains the largest intergovernmental organization of developing countries in the United Nations and is the means through which countries of the South can articulate and promote their collective economic interests and enhance their joint negotiating capacity. The G77 has since expanded to include China and a total of approximately 130 other member states.[152]

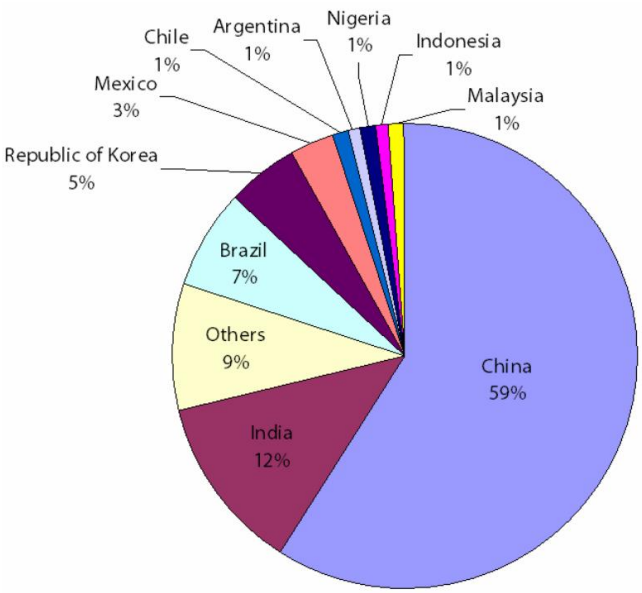
The G77 and China hosts a range of countries with extreme variations in global economic standing, which results in tensions between member states. The G77 and China insists on some of the toughest emissions reductions targets for Annex I countries (between 40-79 percent) and some of the strongest calls for the highest possible amount of adaptation and mitigation funding. At present, the bloc refuses to set rigid targets for itself. However, there is some talk that China and possibly others will negotiate their own domestic reductions outside of the UNFCCC arena. The G77's call for more funding and higher incentives for adaptation and mitigation frustrate some Annex I states because it is believed China and other advanced developing economies can fund many of its own projects without risking economic growth.

The G77 also looks to the developed world to support their immediate and longer term adaptation needs. The large emerging economies, namely China, India and Brazil are working to make serious adaptation gains using a combination of public and private R&D. However, other G77 nations are almost exclusively dependent on financing through a UNFCCC framework because they either lack the domestic capacity to invest capital in their programs, and/or it is difficult to draw R&D to their markets. To date, the G77+China has publicly refused voluntary or binding targets due to the historical responsibility of heavy polluting industrialized countries. However, it is likely that there will be some compromise. The G77 and China receive a lot of financing via Kyoto's flexibility mechanisms (CDM, JI and AAUs) and stand to lose it if no deal can be reached in Copenhagen.

Due to the difficulty of many G77 countries to lure private R&D to assist with adaptation and mitigation goals, they have called on Annex II countries to finance both adaptation programs and technology transfer. LDCs, for example, have asked for US$267 billion annually, calls for "new and additional" funding from Annex II countries, as well as a new financing mechanism and governance framework under the UNFCCC umbrella (in addition to official development assistance the G77 and China already receives).[153] Anticipating support, the G77 has also proposed a new body under the UNFCCC to bolster green technology development, to guide COP discussions through IPR discussions and to potentially make decisions within the COP on these issues. The G77 also proposed a new fund for joint R&D projects that would also be eligible to purchase IPRs and make technology public. To ensure that the transfer mechanisms are functioning, the G77 suggested the UNFCCC develop new indicators with which to assess and monitor the technology transfer framework.[154]

As highlighted previously, the G77 and China currently benefit from Kyoto's flexibility mechanisms, especially the CDM. As such, despite serious implementation and operationalization problems, the G77 would like to see more projects under the CDM, more funding for like projects and institutional reforms that would make the system more effective. The CDM and other flexibility mechanisms are very complicated and resource intensive. Data control and monitoring requires capacities not all LDCs or G77 nations have. As such, many of the schemes in place to support these non-Annex I countries are considered unsuccessful. This is the primary reason why the G77 and China are calling for reforms. However, there is a split within the G77 about the shape any reforms would take, as LDCs and the AOSIS have benefited minimally from the CDM while China has received nearly 60 percent of all approved CDM projects to date.[155]

Figure 3.1.2a. Expected average annual CERs from registered projects by host party (Total: 305,107,750)



Source: http://cdm.unfccc.int/Statistics/Registration/AmountOfReductRegisteredProjPieChart.html, (accessed 10 June 2009).

Box 3.1.2a: China's domestic approach to climate change

China maintains a guarded and noncommittal posture in UNFCCC negotiations and many observers and participants interpret this to mean China does not and will not take measures to green their domestic policies. Publically, China consistently argues that climate change mitigation is the sole responsibility of developed nations and developing nations should not be bound to emissions reductions. China maintains this position in international negotiations to safe-guard its independent decision-making and insulate itself from external meddling in this sensitive policy area. Despite appearances, China does take domestic action to reduce emissions, but does them on its own terms.

Mitigation motives - In recent years, China's domestic approach to climate change has become considerably more differentiated, more active and more effective. Several factors facilitate this shift towards an intensified emission reduction commitment: First, the rising concerns about energy supply security and dependence on foreign oil advance efforts to increase energy efficiency. Second, the increasing importance of environmental degradation as a source of social dissatisfaction and unrest catapulted pollution reduction to the top of China's political agenda. Third, due to a growing awareness of China's special vulnerability against the detrimental impact of climate change in the form of extreme weather conditions, climate change is increasingly perceived as a veritable threat to China's long-term economic development. Fourth, the growth of the global market for green technology resonates strongly with China's industrial sector by promising profit-making opportunities for China's manufacturers.

Policy measures - Driven by these overarching trends, China has considerably accelerated its climate change mitigation efforts. China's leadership has not only formulated a number of ambitious climate change targets, e.g. in its 11th Five-Year-Plan (2006-2011) or the National Climate Change Program of 2007, but also followed up these targets with corresponding public investments and legislative stipulations. In the area of renewable energy, the Chinese government formulated a target of increasing the renewable portion of the overall energy mix from 8 percent in 2007 to 15 percent in 2020. To reach this goal, China spent US$12 billion in 2007, only second to Germany, and is expected to increase this amount to over US$30 billion annually. In addition, China's Renewable Energy Law of 2006 stipulates mandatory purchases of renewable energy for power grid providers, subsidized tariffs as well as significant tax-breaks for users of renewable energy.

Regarding the efficiency of energy usage, China formulated a target of reducing energy intensity by 20 percent between 2006 and 2010. China has already lowered its energy intensity by 60 percent since 1980. To enhance energy efficiency, China has spent approximately US$6 billion per year on energy saving measures. In recent years, strict energy saving regulations for China's industry have been put into place, to save the equivalent of more than 100 million metric tons of coal. A number of energy efficiency regulations have

Box 3.1.2a: China's domestic approach to climate change, continued

been enacted including building efficiency design codes and labeling standards for home appliances on par with most industrialized nations. Fuel efficiency standards for vehicles in China have continuously been tightened, reaching 36.7 miles-per-gallon in 2008 which is significantly stricter than standards in the US, Australia or Canada.

Implementation gap – There are many limitations to the climate change mitigation efforts described above. Perhaps the most significant barrier is the implementation gap that derives from irreconcilable divergences of interest between the central government and local authorities, which will often favor competitive advantages of local industry over long-term ecological concerns. Low compliance, made possible by deliberately inadequate enforcement by local bureaucracies and insufficient monitoring and control capacity on the central level, significantly decrease the overall effectiveness of China's emission reduction measures.

Emissions trading – China's domestic climate change measures are in many cases disconnected from the international framework of climate change negotiations. However, one very visible connection between China's domestic approach and the mechanisms of the UNFCCC exists: the Clean Development Mechanism (CDM). China has dominated the global CDM market for several years, completing transactions for emissions reductions of over 900 million metric tons with a market value of over US$ 10 billion. In 2007, China supplied 73 percent of all global CDM emissions reductions. However, due to China's increasing domestic mitigation efforts, it becomes very difficult to establish the additionality of CDM projects, leading many experts and policy-makers to the conclusion that the potential of CDM in China is close to being exhausted.

Although the overall effectiveness of the CDM as an instrument for emission reduction has come under debate, the introduction of a carbon crediting system in China has succeeded in building local awareness of carbon reduction as a tradable good and source of income. CDM also increased the related monitoring and evaluation capabilities in China, which is particularly important in the light of the described implementation gap. On the basis of the experiences and capacity gathered through the CDM process, China initiated attempts to establish its own emission trading schemes. China National Petroleum Corporation and the Chicago Climate Exchange established a comprehensive emissions trading system in the city of Tianjin in September 2009. Shanghai, Beijing and other Chinese cities have established similar schemes. In addition, several initial proposals for a national emissions trading system are currently under consideration.

Most abatement costs for the G77 countries and China will be covered by Annex II countries simply because most lack the capacity to fund and implement their National Adaptation Programs of Action (NAPAs) devised under the UNFCCC.[156] As such the "costs" associated with G77 and China's UNFCCC climate goals are directly linked to funding proposals, mechanisms and pledges that largely remain unspecified. The specific funding totals and the corresponding costs to Annex II countries vary according to the nature of the project or program, e.g. funding for immediate adaptation costs or for new storage technologies. The proportion of funding to be derived from the public and private sector continues to be debated within climate negotiations. What is clear, however, is that LDCs and AOSIS nations lack the capacity to fund and implement their NAPAs devised under the UNFCCC framework. Annex II countries were charged with funding these programs, estimated to cost €1.5 billion up front for "urgent and immediate" action, however, only €150 million has been pledged to date.[157]

3.1.3 Implications and the pitfalls of government-to-government trading

The Climate Secretary for the UNFCCC, Yvo de Boer, said that climate negotiators in Copenhagen will try to reach an agreement on what might well be one of the most complicated international treaties ever negotiated. Climate negotiations are contentious because, while an issue of the environment, abatement implies cross-cutting and potentially significant policy reversals. Meanwhile, all countries, whether developed or developing, want to preserve their right to develop economically and socially. Developed countries seek to maintain and build upon their consumption-based lifestyle, while developing countries still need to raise millions of people out of poverty through economic expansion. Serious emissions reductions likely would constrict developed countries' current consumption-based lifestyle by limiting industrial expansion and restricting the energy and transport sector. However, without these reductions developing nations face the immediate and long-term effects of climate change that reduce their capacity for long term economic development through which to support their populations.

As was seen in the negotiating section above, major country blocs differ significantly on key issues and it is unlikely that they will depart from their current positions enough to usher in a meaningful international climate deal that would trigger the emer-

gence of a truly global carbon market with ambitious reduction targets. For example, the US and China will have to compromise on a 36 percent differential on calls for the United States' emissions reduction in order to conclude an agreement. Still, some sort of climate deal will likely be made, but as of now all signs suggest it will be watered down and minimally controversial. The lackluster Kyoto Protocol is an ideal example. Relative to the EU and G77 and China's push for a significant deal, the language of the Protocol was weak, commitments minimal and the sanctioning power of the UNFCCC non-existent. A large part of progress made was primarily a result of rapid deindustrialization of post-Soviet states, not aggressive climate policies. Meanwhile, the United States, who pushed for the weak Kyoto rhetoric, never actually ratified the Treaty. And finally, the details of Kyoto, though signed in 1997, were still being finalized in the early 2000s, and even now, some 12 years later, key issues remain unresolved. This suggests that even if a deal is finalized in Copenhagen, the manifestation of commitments, the operationalization of financing and other supportive frameworks will certainly not enter into force immediately, and there is no clear timeframe for when that would occur.

But even assuming that an ambitious agreement will be concluded setting a stringent cap for carbon emissions for all countries around the world, what are likely to be the key distinctive features of the emerging global carbon market based on government-to-government trading? Clearly, in terms of environmental effectiveness, a global deal would be optimal, since it would cover all countries and all sectors and there would be no risk of leakage. However, when it comes to economic efficiency, a global deal is likely to have a more mixed impact. In principle, a global deal should lead to the establishment of a uniform price for carbon emissions and allow for reductions to be made where they are most cost-effective. However, in practice this is unlikely to occur. Based on a skewed distribution of allowances, some countries will enjoy considerable market power under a global deal and are likely to engage in strategic trading. Similarly, market transparency is likely to be low, given the dominance of 'over-the-counter' deals. This might prevent the adoption of a uniform abatement price.[158] Finally, information asymmetries and the absence of a functioning price revealing mechanism might make it difficult for governments to adopt an optimal trading position on international markets.[159] As a result of all this, a global deal might lead to large efficiency losses and some volatility in abatement costs.[160]

It is likely that China and other advanced developing states will agree to minimal reduction targets. It's also likely that the Obama Administration will sign onto a Copenhagen agreement barring any extreme measures or serious requirements for financing and reductions. The G77 and China stand to gain from a new agreement. Indeed, technology transfer and adaptation financing can only help them achieve much-wanted domestic development goals. The EU will remain an advocate of swift and effective action, but will make compromises to keep both the US and the G77 at the negotiating table. Some parties, in anticipation of minimal progress leading up to and including Copenhagen, have begun discussing alternatives to a top-down deal, to the UNFCCC process. Obama and other heads of state from 17 of the worlds' largest economies met recently at the Major Economies Forum to discuss global warming. Informal dialogue amongst observers suggests that this alternative setting fosters dialogue between China and Annex I countries that is not possible within the UNFCCC. Clearly, once the dust settles from the Copenhagen meeting, the key stakeholders will have to think hard about future strategies for fostering decisive international action on climate change.

3.2 Alternative to a global deal: The bottom-up approach

The previous section provided ample indication that this year's Copenhagen summit will likely fail to establish a comprehensive global climate deal, and within its framework, a global carbon market. Indeed, even a more limited OECD-wide market for emissions trading seems an unlikely outcome at this stage. Too many significant differences remain in the negotiating positions of the main players to allow for the establishment of such a market in the short term. Moreover, given the precarious economic situation of the world's major economies, it is unlikely that sufficient political will can be generated to overcome these differences.[161] Even though a well regulated 'top-down' Global Carbon Market is unlikely, alternative options remain.

As noted earlier, recent years have witnessed a veritable sprouting of different regional, national and sub-national emission trading schemes around the globe. Carbon markets in Australia, New Zealand, Switzerland and others are likely to join Europe's ETS. Most significantly, the recent adoption of the American Clean Energy and Security Act (ACESA) by the US Congress has for the first time moved the establishment of a nation-wide US cap and trade system within arm's reach. The result of this process will be the creation of a highly fragmented global market for carbon trading. Different trading schemes, with significantly different caps and diverging approaches to market governance will operate side by side without much coordination.

However, many analysts consider that there will be

considerable incentives for these different markets to link up with each other. According to Judson Jaffe, "[…] linking occurs when the regulatory authority that maintains a tradable permit system allows regulated entities to use emission allowances or emission reduction credits from another system to meet their domestic compliance obligations."[162] Though small in scale, linking has occurred between the EU ETS and emissions trading schemes in Norway, Liechtenstein and Iceland.[163] Others are likely to be established.[164] Moreover, some form of indirect linkage between different trading systems is also likely to emerge, due to their use of common credit systems in the form of CDM and JI. If links between different trading schemes continue to proliferate, this might in time lead to the establishment of a de facto global carbon market from the 'bottom-up'.

Establishing a bottom-up carbon market is, however, fraught with significant complications. The current debate on bottom-up approaches has often focused primarily on the technical problems that would arise from linking different carbon trading schemes.[165] Implicit in this debate are two important assumptions. First, as will be discussed below, it is commonly assumed that considerable economic and political gains can be made from linking different carbon markets, without compromising their environmental effectiveness. Second, by focusing primarily on the technical design elements of different emissions trading schemes, much of the literature concludes that "[…] to encourage bilateral linking of different ETS, a further degree of harmonization may need to be encouraged."[166] As a result, dialogue and coordination are seen as valuable tools to overcome regulatory differences.

A closer look, however, suggests that these assumptions at best are highly contentious. First, as the debate in our previous chapter revealed, the implicit "rules of the game" of different carbon markets are the result of complex political-economic bargains made at the domestic level. Linking various carbon markets would therefore first require an "untying" of these different existing deals. Much more than being a technical issue easily solved by tinkering with existing regulations, such untying requires a renegotiation of complex, preexisting political-economic deals. Linking different emission schemes will therefore prove to be a considerable political challenge. As a result, we can expect that the domestic hurdles encountered by policy-makers negotiating a bottom-up approach will largely mirror those preventing a global deal.

Second, from a purely environmental standpoint, it is not at all clear that a bottom-up approach is preferable to market fragmentation, at least in the medium term. While there are large economic efficiencies to be reaped from a more integrated market, linking different schemes presupposes a harmonization of market rules. Much will depend on the direction of this harmonization: will it result in a race to the top or a convergence around the lowest common denominator? If badly implemented, there is a clear risk that linkage will result in less ambitious caps as well as new loopholes that may limit the potential of emissions trading systems to deliver on mitigation. Finally, even if a bottom-up approach is successful (i.e. if a renegotiation of national deals succeeds), we are still faced with a massive regulatory challenge. A bottom-up linking of different emissions trading schemes is likely to lack a strong and credible regulator that assures the smooth operation of the linked markets. Thus far, the regulatory consequences of linking have received too little consideration.[167]

All of this implies that a bottom-up global carbon market remains not only unlikely in the short-term, but is also far away from being the silver bullet through which to create a more integrated global carbon market.

3.2.1 Beyond Fragmentation: The Case for Linkage

Because a global deal is unlikely to materialize in the near future, the discussion has increasingly shifted towards options for linking different carbon trading schemes that are evolving. Three options for linking these independent emission trading schemes can be identified:

Unilateral Linkage: A unilateral or one-way direct link between two trading systems implies that allowances only flow in one direction between the two linked systems. Establishing such a link makes most sense in cases where a higher price allowance system links to a system with lower prices, allowing the former access to new low-cost abatement options and reducing its emission prices.

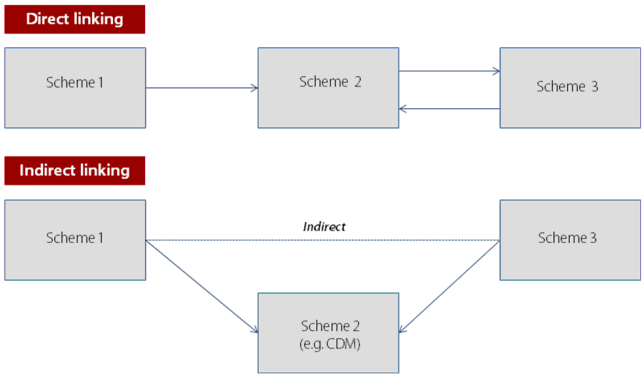
Bilateral Linkage: A bilateral or two-way direct link between two systems implies that allowances can be traded both ways. It is generally assumed that absent any quantitative restrictions under bilateral linkage, allowance prices will automatically converge on a common, intermediate price. However, the direction of this convergence is highly dependent on the relative size of the two markets and tends toward the larger one.

Indirect Linkage: An indirect link will be established when two systems do not recognize each other's allowances but are both linked to a common third system – generally a baseline credit system. As a result of trading with the common system, developments in one of the indirectly linked systems can affect the supply and demand for allowances in the other system. Hence changes in the allowance price

and emissions level in one system can affect the allowance price and emissions level in another system that is indirectly linked.[168]

Of these options, indirect linkage remains the most probable, as most Kyoto parties already subscribe to the so-called Kyoto 'flexibility mechanisms' in the form of CDM and JI. While indirect links, as will later be discussed, might serve as an intermediate step, an effective global carbon market will only materialize if full, bilateral links are established between a sufficient number of emission trading schemes.

Figure 3.2.1a Bottom-up integration options



Source: Adapted from Tuerk, et al (2009) Linking Emissions Trading Schemes, Climate Strategies, p. 3.

It is widely assumed that this bottom-up approach, which seeks to draw as many ETS schemes as possible into a common system, represents the second best option for integrating global carbon markets and offers some distinct advantages. Indeed, most analysts have argued that linkage allows for considerable economic, political and environmental benefits that far outweigh their costs. The potential economic benefits of linkage are considered to be threefold, and parallel those of a global carbon market created top-down:[169]

Economic Efficiency. It is assumed that emissions reductions can be achieved more cost effectively by expanding the size of the market for emission allowances through linkage. A market that combines different emissions trading schemes will contain a greater diversity of emissions sources and therefore allow for more abatement options. Increased market liquidity will allow market participants to allocate their resources to the "least-cost" abatement measures and therefore increase market efficiency. This leads to lower overall compliance costs for all market participants.

Reduced Volatility. Another benefit derived from linkage is that the resulting increase in market liquidity should work against price volatility. Price volatility represents a well established economic cost to market participants (as it requires hedging). Moreover, price volatility also represents an obstacle to new investments in the short-run and can therefore be a barrier to the introduction of new, carbon-reducing technologies.

Competitiveness. In the absence of any quantitative restrictions on the amount of allowances exchanged between different emissions trading schemes, linkage will eventually result in a total convergence of abatement prices. This harmonization of prices between two different systems will eliminate any competitive distortions that might otherwise arise due to a difference in carbon prices. As a result, there will be no economic or carbon leakage between two linked systems.

While the economic advantages that derive from linkage can be compelling, some have argued that there are added political benefits that would result from linking different systems. According to Andreas Tuerk, "[…] bilateral talks […] focusing on integrating national trading schemes may establish an additional and potentially synergistic arena for negotiations".[170] Global talks conducted by the UNFCCC and involving a large number of players have many veto points and are easily deadlocked. Finding an agreement will therefore be easier in a small, bilateral setting. Moreover, by providing an additional forum for dialogue, bilateral talks might also reenergize global negotiations. Linkage can also send a clear signal to market participants that emissions trading systems will endure beyond current commitment periods, thereby increasing the predictability of climate policy and facilitating private investment decisions.

Perhaps most importantly, many policymakers and analysts see linkage as a quintessential tool for global "burden-sharing". Deprived of a broader global-deal, a bottom-up approach is based on the promise that all major emitters will be drawn into a common system. Such a system might begin small, combining the EU ETS with a few like-minded countries, before eventually being widened to include the US and later China and India (in case those countries do indeed introduce company-level emissions trading systems). Without the promise that such a system might one day include all major emitters, the political support for emissions trading could deteriorate rapidly, ultimately leading to weakened caps and eventually, the collapse of existing trading schemes. On the surface, then, the bottom-up approach appears as the best way of establishing effective global burden-sharing.

When it comes to the concrete environmental benefits of linkage, however, the case is much less clear cut. Most analysts have ascertained that linking carbon trading systems has no environmental costs.[171] Emission reductions that would be made in one place are simply made elsewhere, not affecting the

absolute amount of reductions different parties previously agreed upon. Some have also argued that there could be some potential benefits from linkage because linking different schemes might reduce overall leakage.[172] The extent to which this holds true remains uncertain, however, as leakage may continue in countries outside the linked system. Overall, it is generally assumed that the environmental impact of linkage will be neutral, while there are considerable economic and political gains to be made.

Given the considerable assumed benefits of linkage, it is unsurprising that linking different emissions trading schemes have received widespread support. Currently, the EC is the leading advocate for a bottom-up approach to addressing global climate change. The directive establishing the EU ETS specifically states that "[…] agreements should be concluded with third countries listed in Annex-B to the Kyoto Protocol which have ratified the Protocol to provide for the mutual recognition of allowances between the Community scheme and other greenhouse gas emissions trading schemes".[173] Moreover in its "linking directive," the EU established a link between the EU ETS and the CDM and JI programs of the Kyoto Protocol, although it maintains some considerable quantitative restrictions on these links.[174] Other emerging emission trading schemes have made similar provisions for linkage.[175]

The EC has further committed itself to an internal "road-map" for the establishment of a bottom-up global carbon market. In this vein, the EC has pledged to build an OECD-wide carbon market by 2015, by linking the EU ETS with other comparable cap-and-trade systems. This OECD-wide market is meant to serve as a nucleus from which the EC hopes to expand to include the "major emerging economies" by 2020.[176] To further this goal, the EC together with other US partners provided the impetus for the foundation of the International Carbon Action Partnership (ICAP) in 2007. According to the ICAP Political Declaration, "[…] the International Carbon Action Partnership (ICAP) will create an international forum of governments and public authorities that are engaged in the process of designing or implementing carbon markets. ICAP will establish an expert forum to discuss relevant questions on the design, compatibility and potential linkage of regional carbon markets".[177]

In other words, by engaging all relevant parties, ICAP is meant to serve as a tool to overcome the regulatory differences between various cap-and-trade systems, in effect establishing linkages that will draw all of the major emitters into a common system. The EC has further advocated for an EU-US working group on carbon markets that would prepare the eventual establishment of a transatlantic carbon market – a significant first step towards a global market.[178] In all of this, the EC behaves much in line with its often noted tendency to act as a "normative Empire" seeking to impose its regulatory standards on others.[179]

However, the EU's ability to draw these different players into a common system using this normative approach remains in question. Establishing a direct link with an emerging US cap-and-trade system, not to mention a potential future Chinese carbon trading system, will be invariably more complicated than linking with Norway or Iceland. While many of the problems involved in linking with these systems might appear technical in nature, the next section identifies the main obstacles to carbon market linkage as political. Moreover, the potential environmental costs of pushing too hastily for linkage could be considerable.

3.2.2 Direct Linkage: Pipedream or Reality?

With a global deal at Copenhagen slowly drifting off the radar screens, but emissions trading systems likely to emerge in a number of countries, a large body of theoretical literature has grown around the issue of linkage.[180] Much of that literature cautions that there are considerable institutional and regulatory difficulties involved in linking different carbon trading systems, but remains hopeful that these differences can be reconciled in the long run.[181] These difficulties arise from the drastically different rules and regulations that different emission trading regimes are adopting. Attempting to link two systems that adhere to radically different "rules of the game" will inevitably cause considerable ruptures that will make it difficult for the involved parties to maintain that linkage.

In order for linkage to endure and be beneficial, the linked systems must adhere to certain principles. According to a recent study commissioned by the EC, there are four standards against which every potential linkage should be evaluated: environmental integrity; institutional compatibility; economic efficiency; and equity.[182] Only where all of these principles are maintained is linking a feasible long-term option. To ensure this, a considerable degree of consistency between the different systems is imperative. This means that the underlying "rules of the game" applied by both systems have to be similar. If not, there is a risk that linking different carbon systems may result in an overall increase of carbon emissions or a significant transfer of wealth from one system to another.

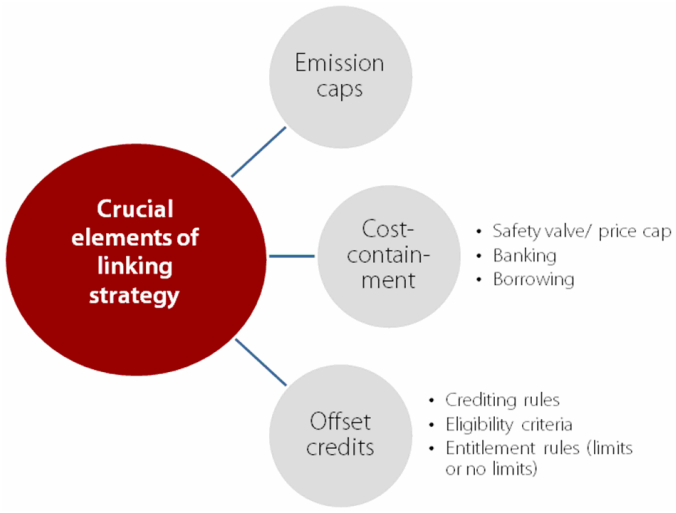
To prevent this, a number of institutional and regulatory factors must be considered when engaging in bilateral linkage. While some of these are easily reconciled or ways can be found to accommodate reg-

ulatory differences, there are some essential elements that will have to be met in order to make linkage feasible and to prevent adverse effects. These three essential elements are summarized in Figure 3.2.2.a below.

First, the emission caps of the two systems must be comparably stringent. Similar carbon reduction targets indicate that the scale of the mitigation efforts – and therefore the cost of reducing emissions – is going to be similar. Without this being the case, it can be expected that allowance prices will vary considerably between the two schemes. In this situation, establishing an unregulated bilateral link will lead to a significant transfer of wealth from the system with the stricter cap to the system with the more lenient cap. As these outflows would be the result of regulatory differences, rather than real environmental gains, they would be a hard political sell.[183]

Moreover, not only do both systems need comparable caps at the time of linkage, they will also need to have a firm agreement on how their caps should evolve in the future. Game theory analysis shows that there exists a real incentive for players to relax their cap once they have linked to allow them to sell the resulting allowances into the other system.[184] Without a strong regulatory authority enforcing the common "rules of the game" of the linked markets, there is a risk that caps will be progressively softened. The problem is that such an authority is unlikely to emerge under a bottom-up approach. Making compromises in order to accommodate a partner with a weaker cap would also be inadvisable, since it would not only set a negative precedent, but also reduce the system's overall environmental impact.

Figure 3.2.2a. Essential elements for linkage



Source: GPPi

Second, both systems need to adopt a similar set of rules when it comes to cost-containment measures. These measures range from rules concerning banking and borrowing to price caps and safety valves.[185] While it might be possible to accommodate some differences when it comes to these issues, it is particularly necessary for common rules to be established for price caps and safety valves. A price cap seeks to ensure that allowance prices remain at a certain level, by distributing additional allowances into the system once prices rise above a certain threshold. While this is an effective way of controlling prices, it compromises the stringency of the emissions cap. When a trading system with a price cap is linked to other trading systems, the price cap will effectively apply to all linked systems and undermine their environmental integrity.

Cost containment mechanisms can also suppress innovation by preventing the necessary investment in low-carbon technologies. A recent McKinsey report has estimated that the deployment of new carbon-saving technologies, such as Carbon Capture and Storage (CCS), requires long term carbon prices in the range of € 30-50 per ton.[186] Keeping allowance prices within politically defendable margins will therefore stem innovation and reduce the environmental effectiveness of the trading system. In a linked system the price level that is politically feasible will effectively be set by the lowest common denominator for the entire system.

Third, in order to enable a link between different emissions trading systems, it is advisable that they adopt similar rules on baseline credit systems. Offset credits can come from both domestic sources (foreseen under RGGI and ACESA), or from international credit systems (such as CDM and JI). In effect, offset credits are another form of price containment measures, but in the case of international credit systems they are also supposed to have an additional development impact.[187] Trading in carbon offsets has developed into a multi-billion dollar market and for the time being many Annex I countries rely on offsets in order to meet their compliance criteria under Kyoto. Without any agreement on common offset rules, linkage will automatically lead to the adoption of the rules set by the lowest common denominator. In order to avoid this situation, countries have to align their legislation in three specific areas.[188]

Crediting Rules. In order to have some environmental impact, offset programs need to make carbon reductions that are additional to the reduction that would have otherwise occurred. Evaluating the additionality of offsets has been contentious for some time. In the absence of common regulations on this matter, the party with the lowest additionality requirements will set the common rules of the linked system.[189]

Eligibility Criteria. Considerable disagreements ex-

ist about the kind of offset programs for which credits should be accepted. Thus, while some parties recognize offsets produced from forestry and carbon storage projects, others have contested the environmental validity of these types of projects. In a linked system, eligibility criteria will again be effectively set by the lowest common denominator.

Entitlement Rules. Finally, there are considerable differences in the entitlements that different systems provide for offsets towards compliance obligations. While some impose strict quantitative limits on the percentage of offset credits that can be used toward compliance, others might allow for all reductions to be met by offsets. Again, linkage will compromise the entitlement rules of the more stringent system.[190]

There are numerous other factors that can influence a decision on linkage, including verification measures, the recognition of trading units, or temporal flexibility.[191] However, without some harmonization of the essential elements – emission caps, cost-containment measures and offsets – the potential for linkage remains very low, even if compromises can be found on these more peripheral issues. The real problem is that, as shown in chapter 2, these essential elements are the outcome of complex political-economic bargains that have been struck at the domestic level. Harmonizing the "rules of the game" between different parties would therefore require an "untying" and renegotiation of these existing bargains with considerable distributional consequences.

The central issue in all of this is and remains the politically feasible price of carbon emissions. Unless there is an agreement on what this price should be, the establishment of a global carbon market through the bottom-up approach seems as unlikely as striking a global deal. For the time being however, there continues to be little agreement on this issue. As demonstrated by Box 3.2.1a (see below), there are currently considerable differences on all of the essential elements between the EU ETS and the ACESA bill. Should a direct link be established, nevertheless, the effect would be a considerable transfer of wealth from the EU to the US, the adoption of US regulations on offsets for the two linked markets and a likely weakening of the EU commitment to emissions reductions, through a de facto lowering of the EU-wide cap.

In general, establishing direct links between cap-and-trade systems with significantly different "rules of the game" should be avoided. Here, the size of the parties involved can make a difference. Linking to a small party even without having undertaken any considerable harmonization might have little impact on the bigger partner. This is likely to be different when it comes to a party of a similar size (as in case of the EU and the US). Although there might be considerable economic efficiency gains to be made from establishing a direct link between two such systems, they carry real environmental drawbacks as the common rules of the new system will be determined by the lowest common denominator and there is now an added economic incentive for both to reduce their cap. The political argument for linkage seems equally unconvincing, as it is unclear why countries would be willing to make commitments at a bilateral level that they have previously rejected in a multilateral forum.

As a result, the development of direct links that leads to a process of market integration from the bottom-up appears unlikely in the short-run; even within the relative long time horizon adopted by the EU. This is not to say that further links between carbon markets will not be established. As mentioned, the EU ETS is about to link with Switzerland. Further links with New Zealand and potentially WCI or RGGI after 2012 might also become feasible. However, these are still relatively small markets without much overall weight. On the other hand, nothing indicates that a direct link between the EU

Box 3.2.2a. Towards a Transatlantic Carbon Market?

Together, the EU and US account for roughly 80 percent of all OECD emissions and 60 percent of the emissions of all Annex I countries. Consequently a linked transatlantic market would be almost synonymous with a global carbon market, at least under current conditions. What are the prospects that such a market will be established within the ambitious timeframe set by the EC (2015)? As indicated above, it is essential that carbon markets be harmonized around three elements in order to make linkage feasible. Comparing the "rules of the game" adopted by the EU ETS and a potential US ETS (along the lines of the ACESA) reveals that significant differences remain.

When it comes to the comparable size of their caps, there are still significant differences. The EU is committed to a 20 percent reduction by 2020 compared to 1990 level – likely to be changed to a 30 percent reduction after Copenhagen[192]. The US on the other hand is unlikely to go beyond its current commitment of a 17 percent reduction by 2020 compared to 2005 levels. This means that US emissions will be roughly at 1990 levels in 2020, while EU emissions will potentially be 30 percent below that. The result will be a considerable difference in allowance prices. According to the EC, carbon prices have to rise to €39 by 2020 to

Box 3.2.2a. Towards a Transatlantic Carbon Market? Continued.

achieve intended emissions reductions of 21 percent.[193] The Carbon Trust estimates prices between €20-50 by 2020. Climate Strategies predicts prices at the lower end of a €20-40 range, while New Carbon Finance just lowered its forecasts from €55 by 2020 to €40, due to the current economic crisis.[194] The most recent EPA estimates for the ACESA predicted US allowance prices to be US$13 by 2015, considerably below any forecasts for the EU ETS. Establishing a linkage under these circumstances would mean that allowance prices by 2020 would be significantly below the €39 forecasted by the EU and there would be a considerable flow of resources to the US to take advantage of lower abatement costs.

The current US proposal includes a floor for US allowances at US$10, as well as a ceiling for prices at US$28. If US carbon prices would rise above that level, additional permits will be released to the market. This would effectively compromise the stringency of the US cap and the cap of any other system linked to the US. While it remains uncertain whether the ceiling for US prices would be lifted, it remains unlikely that prices considerably above that level would be politically feasible – at least in the US. Moreover, lifting an already implemented ceiling will be difficult for any administration. Given that the EU ETS currently has no ceiling, the US ceiling would also apply to the EU.

When it comes to offsets, differences remain in all relevant areas. EU proposals for Copenhagen indicate stricter rules on additionality than US proposals. US rules on offsets are much broader and include the use of LULUCF activities that are contested in the EU.[195] When it comes to entitlement criteria, again there are considerable differences. The EU derived from the Kyoto Protocol the principle of supplementary, under which credits reflecting emissions reductions under Kyoto should only supplement domestic action. The initial assumption for Phase II of the EU ETS was that offsets would be limited to 10% of allocated allowances. Due to some flexibility granted to member states this has risen to 13.6 percent. Following EU ETS reforms, this has been lowered further to only 3-4 percent. ACESA will be considerably more generous on the use of offsets, allowing the use of 2 billion tons CO2e per year (compared to EU ETS 1.4 billion over the period 2008-2012), which means that 100% percent of emission reductions in the US could be met by offsets until the year 2026. As a result of linkage, US rules would apply to the EU ETS.

Despite these differences, some analysts remain surprisingly upbeat about the prospects of an EU-US linkage. As Wolfgang Sterk remarked, "[…] the recent Waxman-Markey discussion draft strongly improves the prospects for a near to medium term bilateral link to the EU ETS compared to earlier draft US legislation", even though "[…] any full bilateral link […] is probably still some time away".[196] Given the above comparison, this seems perhaps a bit too optimistic. Indeed, with Senate approval far from assured, the bill is likely to be watered down further. This makes the establishment of a transatlantic market by 2015 appear highly unlikely, unless European policymakers decide that the symbolic value of such a market is higher than the considerable costs to the environment it would likely involve.

Table 3.2.2a. Comparison of EU ETS and potential US carbon market

	EU	US
Emission Reductions (2020)	20%-30%	17%
Cost Containment	No price cap	Price cap at US$28 likely
Offset Entitlement	3-4% of allowances	100% of reductions
Offset Eligibility	No LULUCF	LULUCF

Source: GPPi

ETS or an emerging US ETS would be feasible or even beneficial. Finally, the prospect of linking with Chinese or Indian ETS markets in the distant future most likely implies diluting existing caps to such an extent that there would remain few environmental gains to be made.

3.2.3 Indirect Linkage: Stepping Stone or Stumbling Block?

As previously discussed, an indirect link between two cap-and-trade systems appears when both establish a unilateral link to a third system. In most cases, this indirect link will be the result of different systems linking to a common baseline credit system, such as the Kyoto Protocol's CDM and JI. Indeed, as most of the emerging cap-and-trade systems in the US and elsewhere include provisions allowing for the use of offset credits in order to meet domestic reductions targets, the establishment of an indirect link between these different systems seems a foregone conclusion. What will the likely effect of such a link be? Could indirect linkage, as some seem to suggest, lead to a gradual convergence of different emissions trading systems and therefore foster the establishment of a global market?[197] Or do current offset schemes, like the CDM, in fact present an obstacle to the creation of a more integrated global carbon market?[198]

The most important credit system today – in terms of overall volume of offset credits generated – remains the Kyoto Protocol's Clean Development Mechanism (CDM).[199] CDM allows Annex I countries to undertake emissions reductions projects in non-Annex I countries to counteract their own emissions. Each project undertaken generates so-called Certified Emission Reduction (CER) units that can be traded and sold on international markets. This mechanism is supervised by an Executive Board (EB) that issues CERs and ensures emission reductions from offset units are "additional" to reductions that would otherwise have taken place. In order to verify the "additionality" of CDM projects, the EB accredits so-called Designated Operational Entities (DOEs) that assess these projects on their effectiveness.[200]

There are currently some 4,200 CDM projects in the pipeline, including projects that are already registered and those requesting approval. Together, these projects represent a total of 2.9 billion tons of carbon dioxide equivalent in reductions by 2012.[201] Recent years have seen the establishment of a fast-growing global market in CERs.[202] With the current crisis, this growth has been somewhat dented, but there continues to be a strong upward trend in the secondary CER market. Predicting the future development of the market for CDM offsets remains difficult, but a recent study by Point Carbon estimates that there might be as much as 1.6-3.2 billion additional CERs that will become available until 2020.[203]

Still, CDM remains fraught with significant problems. Most daunting of all, as indicated earlier, assessing the additionality of CDM projects remains a highly hypothetical undertaking. As assessments are based on projections about what would have occurred in the absence of CDM, it is close to impossible to estimate the real impact of CDM on carbon reductions. Moreover, by buying relatively cheap CERs, Annex I countries in theory are able to meet their Kyoto targets without any significant domestic emissions reductions. Of greatest importance, perhaps, is the fact that the CDM provides a disincentive for non-Annex I countries to engage more broadly in climate change actions. As David Victor argues, "[…] the CDM works mainly by encouraging countries to avoid broader commitments and thus rewards the opposite behavior that should govern the long-term efforts to build an effective regime for regulating emissions of greenhouse gases".[205] Indeed, non-Annex I countries may hesitate to take domestic action, if they believe that this might limit their future access to CDM financing and the corresponding international investment.[206] Finally, institutional problems have lead to significant bottlenecks in the CDM process.[207]

Given these serious problems, certain reforms of the CDM regime in Copenhagen can be expected. The EC has advocated a branch-and-root reform of the CDM system.[208] However, even if Copenhagen should fail to address the current shortcomings of

Table 3.2.3a. Annual Volume and Values for Project Based Transactions[204]

	2007		2008	
	Volume (MtCO2e)	*Value (MUS$)*	*Volume (MtCO2e)*	*Value (MUS$)*
Primary CDM	552	7,433	389	6,519
JI	41	499	20	294
Voluntary Market	43	263	54	397
Sub-Total	636	8,195	463	7,21
Secondary CDM	240	5,451	1,072	26,277
Total	876	13,646	1,535	33,487

Source: World Bank (2009), State and Trends of the Carbon Market 2009) Washington, DC: World Bank), pp.31-32.

CDM, it is still going to serve as an indirect link between different emission trading systems that are accepting CERs as equivalent to domestic credits. According to the literature on linkage, indirect links – much like direct links – have the potential to lead to a certain convergence in both allowance prices and some of the rules and regulations of the linked systems.

Price convergence in indirect linkage works similarly to direct linkage. When a link is established between an emissions trading system and a credit system, prices between the two systems will converge, in the absence of any quantitative restrictions. If a second emissions trading system then links to the same credit system, both will have to compete for the same allowances, leading to a certain convergence in allowance prices. According to Judson Jaffe, "[…] if there is a sufficient supply of credits at a price below the least stringent cap-and-trade system's allowance price, links between cap-and trade systems and a common credit system can cause allowance prices of all of the linked systems to converge even though the systems are not directly linked with one another".[209] In case indirect linkage leads to a full convergence of prices between the linked systems, the obstacles to subsequently establishing a direct link will have decreased significantly.

Convergence of rules and regulations, on the other hand, will remain somewhat more implicit. This convergence derives from the fact that it will be the emissions trading systems with the lower standards that set the rules for the common credit system. As long as there is only one cap-and-trade system linked to a credit system, the credit system is effectively governed by its rules on offsets and additionality. However, when another system with less stringent rules links to the credit system, it will at least in part determine the rules of the system and thereby determine the incremental emissions reduction measures brought about from the use of credits by the former system.[210] In case of an indirect linkage, common rules on additionality, as well as monitoring and verification requirements, should then be negotiated beforehand.

To some extent, indirect linkage can have the same impact as direct linkage – leading to a convergence of allowance prices and a lowering of environmental standards near that of the lowest common denominator. Does that mean that indirect linkage might lead to the establishment of a global carbon market through the backdoor? Again, this seems highly unlikely, if we consider the realities of the CDM market and the restrictions on the use of CERs that are being enforced by different cap-and-trade systems.

Christian Flachsland, Robert Marschinski and Ottmar Edenhofer pointed out that the level of convergence resulting from the linkage of two cap-and-trade systems to a common credit system will be determined by the supply curves for credits, cap levels, marginal abatement cost (MAC) curves and quantity limits on the import of credits.[211] This suggests that in reality the level of convergence will be highly correlated to factors such as the available amount of offset credits the system is generating and the limits, different countries impose on the import of these credits.

Based on this, it is possible to make some tentative speculations about the potential impact of an indirect link between the EU ETS with a future US ETS via the current CDM. Is it possible that such an indirect link could lead to a convergence of the two systems, foreshadowing the establishment of a future transatlantic carbon market – the potential stepping stone of a global carbon market? There are good reasons to be cautious about indirect linkage having such a wide-ranging effect. Considering the offset rules imposed by the two systems, as well as the future characteristics of the CDM market, a full-blown convergence seems unlikely.

When it comes to import restrictions on CERs, there are significant differences between the current EU ETS and a future US ETS that would be based on the ACESA bill. The current ACESA bill would allow for the use of a maximum of 1.5 billion tons of international offsets per year. This is roughly equivalent to 28 percent of US total emissions in 2005 and would imply that no domestic reductions would have to be made in the US until about 2026.[212] The EU, on the other hand, has been relatively more stringent on the use of international offsets and has limited their use under EU ETS II to 13.6 percent of allocated allowances. Data recently released showed that EU installations used only 6 percent of offset credits available for the 2008-2012 compliance period. Moreover, the reform plans of the EC foresee that the use of offsets will be limited to only 3 percent of member states total emissions in the future.[213]

Even more limiting perhaps will be the future supply of credits. According to recent projections by Point Carbon, the market potential for CDM projects will be 1.6-3.2 billion tons at prices of €20 per ton until 2020.[214] While this is only an estimate, it seems to indicate that the supply of credits alone will remain an obstacle to price convergence. Following Jaffe, there is neither a sufficient supply of credits (given a potential demand of 1.5 billion tons per year in the US alone), nor are the credit prices forecasted to be below the least-stringent cap-and-trade system's allowance price (the current ACESA ceiling is roughly equivalent to €20).

Overall, this means that indirect linkage between the EU ETS and the US ETS is likely to lead to only a

very moderate (if any) convergence in allowance prices. Moreover, there seems to be little potential that CDM market reforms and EU-US regulatory dialogue could bring about changes that would enable greater convergence to take place via the CDM. At the end of the day, the offset rules both have adopted are cost-containment measures and as such reflect the domestic political-economic bargains that have previously been concluded.

As a result, indirect linkage seems to be an insufficient stepping stone towards the establishment of a global carbon market. Not only is it very unlikely that indirect linkage will fail to bring about sufficient convergence between Annex I countries allowing their integration in a common system, but current international offset mechanisms also discourage non-Annex I countries from making a greater contribution, or establishing their own cap-and-trade systems. This means that in their current form, international offset markets represent more of a stumbling block for a global carbon market and urgently need to be reformed.

3.3 Conclusions

As the discussion in this chapter has shown, the creation of a fully-integrated global carbon market remains highly unlikely in the near future. Indeed, neither the top-down, nor bottom-up approaches to market integration are likely to have a considerable impact for the time being. The primary obstacle to the creation of such a market remains existing differences over the politically feasible price of carbon emissions. These differences are based on the political-economic bargains that have been struck in different countries. Untying these bargains remains politically difficult, due to their large distributional consequences. In other words, there is simply insufficient political will to encourage a renegotiation of domestic deals that would enable a more effective international burden-sharing scheme.

Unless there is a radical change of circumstances, a "global deal" leading to the creation of a world-wide cap-and-trade system will remain a political utopia long after Copenhagen. More likely, current climate change negotiation will lead to a moderate expansion of the core group of countries that have accepted binding targets and possibly the reform of some of the Kyoto flexibility mechanisms. A very modest 'voluntary' target for major developing countries to reduce emissions below business as usual – as proposed by the EC – also remains on the card. However, achieving this goal at Copenhagen will require considerable concessions and negotiating skills from the Annex I countries. Beyond this, Copenhagen is unlikely to function as a catalyst for further market integration.

The bottom-up approach will not provide a silver bullet that would allow for the creation of a global carbon market through the backdoor. Attempts to directly link a large number of cap-and-trade systems are likely to be thwarted by the same domestic alliances that have prevented a global deal in the first place. While the EU ETS will gradually expand further and we might witness the creation of a US ETS that similarly draws some smaller trading systems in its orbit in the medium term, strong links between these two markets remain unlikely, due to differences in their overall caps. Integrating these two markets would only be feasible around the lowest common denominator (here the US) and would therefore have a negative impact on the environmental effectiveness of the linked market.

On the contrary, indirect links via the Kyoto flexibility mechanisms will soon become a daily reality. However, these indirect links are unlikely to lead to any significant convergence of the prices and rules of these different systems. Indeed, if unreformed, current international offset programs will only present a further obstacle to drawing major developing countries into a more integrated global carbon market structure.

This means that for all intents and purposes global carbon markets will remain highly fragmented for the foreseeable future. Accepting this reality, the immediate task at hand is to create the mechanisms and institutions that will allow policy makers to govern fragmentation – an issue we will return to in the following chapter. The key challenge under fragmentation will be to maintain the political support for carbon reductions amongst the more ambitious developed countries, while laying the groundwork for the establishment of a more equitable global system in the future.

4. Key Findings and Implications for Energy Sector Investment in Europe

As this report has shown emissions trading, for better or worse, has emerged as the centerpiece of climate policy responses internationally, as well as within many countries and regions.

Enthusiasts of emissions trading ceaselessly argue that cap-and-trade systems will be able to reduce global greenhouse gas emission in the future. As noted at the outset, for that to happen, at least two things need to be in place: First, emissions trading systems need to cover a sufficiently large share of total global emissions. And second, these trading regimes need to feature sufficiently ambitious caps in order to result in serious mitigation. Based on the analysis in the preceding chapters, what are the prospects of such a global carbon market emerging in the years ahead? If, as this paper suggests, the most likely medium-scenario is a co-existence of national and regional emissions trading regimes with different caps and underlying "rules of the game", what are the implications for climate policy generally, and mitigation strategies more specifically? Finally, what can reasonably be said about how these findings affect the environment for power sector investment in Europe?

This conclusion briefly summarizes the key findings from the previous chapters (4.1), then discusses potential mechanisms for governing fragmented carbon markets (4.2), and finally moves on to develop qualitative scenarios that project implications of our analysis for power sector investments in Europe (4.3).

4.1 Key findings

The analysis began from the observation that emissions trading – as any mechanism designed to reduce greenhouse gas emissions at significant scale – has important distributional consequences that will trigger political conflicts regarding the allocation of the costs and benefits of carbon trading. In this context, chapter 2 showed that the key political battlelines in setting up company-level emissions trading regimes include not just the setting of the overall cap (that determines the overall cost of the mitigation effort for an economy), but also rules on burden-sharing (i.e. which sectors are covered and which are not), the method for allowance allocation (free allocation, updating, or auctioning), the use of offsets (or other mechanisms for cost containment) as well as other "rules of the game" that determine the distribution of costs and benefits of carbon trading across different stakeholders in an economy.

As the analysis of emerging and existing emissions trading systems in the EU, Australia and the US demonstrated, countries deal differently with these distributional battles. The political-economic bargains that underpin the various regimes vary across countries and regions. In general, these bargains reflect the outcomes of intense negotiations and thus represent carefully crafted compromises. It is also important to recognize that carbon markets are not self-sustaining, but instead continuously rely on political decisions around emissions caps. As a result, emissions trading will always remain contentious, subject to intense lobbying and thus remain politically precarious.

Based on these insights, the analysis in chapter 3 suggests the emergence of a global carbon market – ultimately necessary for emissions trading to make a real dent into emissions – either through top-down design or bottom-up linking is unlikely in the foreseeable future.

With regard to a global deal, the ongoing negotiations under the auspices of the UNFCCC are unlikely to generate impressive results. The reality is that five months before the start of the conference, significant differences in the negotiating positions of key negotiating parties remain. These include widely diverging ideas with regard to the size of the overall cap and, naturally, the specifics of a burden-sharing agreement. Beyond that, other key components of the negotiations such as stipulations on adaptation financing, technology transfer and so forth remain contentious. To be sure, some agreement will emerge out of Copenhagen. That agreement will not be a total failure – a political face-saving formula is more likely. That face-saving formula will most likely represent a muddle-through approach to tackling global climate change. However, our analysis above also emphasized that even if a far-reaching global agreement was reached, it would be far from clear that the resulting market structure would produce significant mitigation due to the lack of transparency and the potential for strategic trading. Altogether, a global carbon market based on government-to-government trading would likely be a less than perfect response to the climate challenge at hand.

The analysis also suggests that bottom-up market integration is similarly unlikely to result in significant carbon market integration in the foreseeable future. One of the key limits to any significant integration is the fact that, to date, only few company-level trading schemes actually exist. While various countries are considering the introduction of emissions trading systems in the near future, the

likely political fortunes of the various proposals that are currently on the table are hard to predict. Significantly, however, none of the major emerging economies is even considering the introduction of an emissions trading system in the near future. But even partial steps toward a potential global system, such as the linking of the EU ETS and the prospective US cap-and-trade system seem highly unlikely. This is primarily a consequence of significant variation in the caps existing systems impose, but also a result of different rules of the game allocating the costs as well as benefits of carbon trading across an economy. As noted above, these rules of the game represent often tenuous political bargains. Any international integration requires an "untying" of these bargains which will not only be politically difficult but also engenders the significant risk of a race to the bottom in terms of emissions caps imposed. In that context, policymakers need to balance the potential for achieving enhanced cost effectiveness and reduced leakage, on the one hand, with the risk of adopting a lowest-common denominator approach to setting emissions caps, on the other.

As a consequence, this paper suggests that the most likely medium-term scenario is the parallel existence of company-level emissions markets with some fragile (indirect) links (e.g. through a CDM-type mechanism). Intergovernmental emissions trading based on a revised Kyoto-type regime will also continue but will remain limited in scope. Carbon prices will continue to differ across jurisdictions, reflecting diverging caps and marginal abatement costs. Maintaining domestic political support for carbon mitigation, preventing leakage and managing the quality of offset credits – in other words, a coherent approach towards governing market fragmentation – will be the key policy challenges for the years ahead.

4.2 Governing market fragmentation

In some ways, continued carbon market fragmentation may be the lesser of two evils in the short run. The likely alternative will be for countries to rally around the lowest common denominator – as would be the result of linking trading systems of different stringency with regard to emissions caps imposed. While there are tempting economic gains to be made from linking under these circumstances, the environmental fall-out would be dire. Moreover, linking would also lead to political complacency and considerably reduce the public pressure for some countries to take further action. If the new US administration is finally taking some urgently needed steps, this is partly because it is being pulled along by the EU. The new US administration is slowly moving closer to the political mainstream whether it is in security or environmental affairs. Lowering the hurdles would simply stop this motion in its tracks.

Fragmentation also implies that allowance prices in many Annex I countries will remain higher than under a common linked system. While this is sub-optimal for cost efficiency reasons in the short-run, a certain price level is needed in order to allow for the necessary investments that will enable a switching towards low-carbon technologies in the long run. This is especially important since the development phase of new technologies requires sustained high prices, before allowing for a subsequent drop in prices.[215] For this reason, fragmentation might have some beneficial effects in the long-term. It would allow the commercialization of new technologies – such as CCS – amongst a core group of countries where high carbon prices are politically feasible. Once these technologies have been introduced amongst a core group, prices would drop, allowing for wider application and market linkages.

Finally, without a strong and independent regulator, market linkages through bottom-up approaches are difficult to govern. Thus, there will be a constant threat that changing domestic circumstances might lead to a softening of commitments under the linked trading system. In a fragmented market, on the other hand, market discipline will be easier to maintain. In Europe, the EC has effectively controlled the market for emissions trading, due to its strong regulatory powers and will continue to do so even if the EU ETS will be further expanded across EU borders. In the US, the EPA could potentially be an effective regulator for a common North American emissions trading system (even though its authority in this field has already been undermined in recent negotiations leading up to the passing of the ACESA). Enforcing existing "rules of the game" might therefore then become much easier when accepting some degree of fragmentation.

While carbon market fragmentation – under certain circumstances – might therefore be preferable to market linkage, further steps can and should be taken to draw especially developing countries into existing carbon market structures. Here, several options exist in order to change the perverse incentive structures of current Kyoto flexibility mechanisms, all of which are likely to generate some attention at Copenhagen.

Sectoral approaches. One option for broadening global carbon market integration beyond the existing Kyoto flexibility mechanisms is that of sectoral approaches to emissions reductions.[216] Sectoral approaches have gained much attention in recent years, due to their potential to connect major developing countries with existing carbon market structures. Sectoral approaches imply that some of the major developing countries would commit them-

selves to voluntary "no-lose" targets for emissions reductions in specific relevant sectors. This means that they will face no penalty for missing these targets but will receive special emission reductions credits (ERCs) for reducing sectoral emissions below these targets.[217] These ERCs – much like CERs – can then be sold on global carbon markets to industrialized countries.

Advancing sectoral approaches would have several distinct advantages:

Feasibility. By involving major developing countries directly in emissions trading through a "no-lose" target, sectoral approaches are addressing emissions on a global scale. Not only would sectoral approaches provide concrete incentives for developing countries to progressively lower their domestic emissions, but they could also function as a potential starting point to set up domestic emissions trading systems.

Flexibility. Sectoral approaches are flexible, in the sense that they allow different countries to move at different speeds under an overall framework and therefore avoid the complexities of striking a global deal. By setting "no-lose" targets they provide an incentive for even reluctant players to participate in the hope of long-term advantages.

Avoid Leakage. Sectoral approaches also have the advantage that they will work against emissions leakage from developed countries that are committed to binding emissions reductions targets. By raising emission standards in the major developing countries and spreading best practice amongst "vulnerable" industries, such as aluminum and steel, sectoral approaches will also help overcome domestic opposition to emissions trading in the developed countries.

Low Transaction Costs. While high transaction costs mean that comprehensive emissions trading systems in developing countries will remain a pipedream for some time to come, sectoral approaches are again more feasible. Since under sectoral approaches costs for monitoring and evaluation and other measures will be limited to certain sectors and they will be more affordable and easier to implement.

All of this means that sectoral approaches are a much coveted way for advancing carbon market integration and overcoming the limitations of the CDM. Indeed, the idea of economy-wide premium emission budgets for developing countries has also been variably raised.[218] Such an agreement would essentially function in the same way than sectoral approaches, in the sense that it would set an economy-wide baseline target for emission reductions and allow all further reductions to be traded on international markets. The potential disadvantage of premium emission budgets is that overall transaction costs would be much higher than under sectoral approaches.

The potential of these approaches has meant that they have received considerable support from the EC and others.[219] In reality, however, sectoral approaches face some significant obstacles. First of all, their effectiveness is highly dependent on setting effective "no-lose" targets. If these targets are too soft, their effect on abatement is likely to be small and cheap ERCs might swamp international markets and crowd out more effective abatement measures. Defining these targets will therefore be crucial and politically challenging. Moreover, some developing countries vehemently oppose even these "no-lose" targets, fearing that in the long run they will inevitably lead to binging caps. Similarly, sectoral approaches would lead to a differentiation of developing countries – involving only the major emitters – and therefore encounters the opposition of the least developed countries that fear to lose out from a deal from which they will be excluded.[220] Overcoming these different problems is likely to be challenging.

Programmatic CDM. Programmatic CDM, formally known as a program of activities (PoA) approach can be seen as an attempt to move away from current 'project-based CDM' approaches by integrating several smaller emission reduction activities.[221] This allows emission reduction activities other than large stand alone activities like hydropower stations or landfill projects, which have generated their own problems in the past. Rather, programmatic CDM allows the accumulation of emissions reductions in a dispersed manner. Christiana Figueres explains programmatic approaches as a "[…] coordinated effort on the part of a private or public entity to implement a emission reducing policy or measure via an unlimited number of emission reduction project activities that are dispersed over a geographic region and implemented over a period of time."[222]

The advantage of programmatic CDM is that it allows CDM to be extended to smaller entities, such as SMEs, that they capture activities that are dispersed over time, such as renewable energy and energy efficiency activities, and that they allow the participation of the least developed countries. Programmatic approaches have been permitted by the CDM Executive Board since 2007 and have slowly grown. However, in reality there are large administrative hurdles that remain for these approaches and remains to be seen whether they will be able to be brought to scale.[223] Thus, even though the Executive Board has adopted procedures for the registration of PoAs in June 2007, so far not a single PoA has been registered.[224]

While the previous chapter has shown that based on existing political differences, the emergence of a global carbon market remains a distant if not entirely unrealistic goal, policy-tools already exist that could allow for a gradual broadening and deepening of carbon market integration. In the end, of course, these policy tools are not a substitute for political will either. Thus, furthering sectoral integration with some countries or promoting a wider use of programmatic CDM might still prove to be impossible. However, they provide a useful starting point for broadening the fragmented global carbon market that is likely to take shape in the near future.

4.3 Implications for energy sector investment in Europe

What do the results of this analysis mean for energy utilities in Europe as they are planning investment decisions for the years ahead? As noted above, the power sector has been the key target of emissions trading schemes, intending to provide generators with incentives to invest in low-carbon and/ or no-carbon energy solutions. This is particularly true for the EU ETS which has placed a significant portion of the mitigation burden on the power sector.

For such carbon-friendly investments to occur, however, two things need to be accomplished: First, a sufficiently high carbon price needs to be in place that provides utilities with incentives to invest in the development and deployment of new technologies. For example, the consulting firm McKinsey & Company estimates that for private investment to flow into Carbon Capture & Storage (CCS) technology in the demonstration phase, a carbon price of at least EUR 60 to EUR 90 would be required (the reference case being a new coal-fired power plant). Early full commercial scale projects would require a carbon price of EUR35 to EUR50.[225]

And second, there needs to be long-term policy certainty with regard to the development of the price of carbon. Investments in the energy sector span long time periods, usually at least 15 to 20 years. Given that the development of the carbon price level is determined most of all by political decisions about emissions caps, expectations about these political decisions matter in the investment calculus of private companies. For energy companies to invest in certain low-carbon or carbon-neutral technologies that presuppose a certain carbon price, they need to be reasonably certain that emissions reductions targets will indeed be implemented or even reduced in the future.

Many critics of emissions trading (including some European power utilities) have complained that the EU ETS has not featured emissions caps ambitious enough to stimulate investment into low-carbon energy technologies. More significantly, it has also been pointed out that the "shadow of the future" the ETS provides is not sufficiently long enough for power utilities to redirect their investments into climate friendly technologies. In the absence of clear and predictable European commitments regarding emissions reductions targets in the post-2012 period (the end of the second trading period of the EU ETS), critics have repeatedly emphasized that the EU ETS did not provide the necessary predictable policy framework for facilitating long-term energy sector investments into low-carbon technologies. And indeed, available evidence from the first and second trading rounds suggests that apart from short-term mitigation opportunities, no real long-term transformative energy sector investments have been undertaken.[226]

However, the 2007 emissions reductions commitments made by EU leaders in conjunction with the recent reform of the carbon market have put the ETS on a much more reliable and predictable path that is designed to reduce its prescribed uncertainty. The key to this enhanced predictability lies in the long-term emissions reduction target that was set (and the path that has been laid out by the EU to achieve) that target. Beyond that, the reform will streamline the system and will likely make it more efficient and effective. While serious market governance issues remain, as discussed in chapter 2, overall it seems fair to conclude that the ETS has been able to shed many of its birth defects. These developments should provide a more stable investment environment for power companies. As a result, some observers promote a rather bullish outlook with regard to the development of the carbon price in the EU ETS. One consulting firm recently predicted that the price for European allowances may go up to EUR 70 (a sevenfold increase over 2009 levels) if the EU indeed commits to reducing emissions by 30 and not 20 percent.[227]

Yet, the EU ETS does not exist in a vacuum. Other developments, and in particular the outcomes of global negotiations under the UNFCCC framework, will have an impact on the European trading regime. In addition, the success (or failure) of the development of national trading regimes in other countries, as well as potential attempts to link existing schemes, will have reverberations for the EU ETS. Both are likely to have feedback effects on the European climate policy regime, and thus the levels of certainty – or uncertainty – that energy sector investors are confronted with. What, if anything, can be concluded from the analysis of the prospects and limits of carbon market integration for the predictability of the investment environment power companies in Europe will be confronted with in the years ahead? Before drawing some tentative conclu-

sions and presenting some qualitative scenarios, some basic comments about the link between climate policy uncertainty and investment behavior are in order.

4.3.1 Climate policy uncertainty and energy sector investments

While there continues to be considerable debate about the concrete relationship between uncertainty and investment, standard economic models suggest that the relationship is negative.[228] Most of the work on uncertainty and investment is based on real options theory.[229] Borrowing from theories of pricing financial options, real options theory argues that investment decisions work similarly to financial options.

Facing an investment decision over a specific time horizon, a company either decides to make an irreversible investment, due to favorable conditions, or it can forego that investment, due to unfavorable decisions. This implies that the "option" to invest has a real value that is equal to the loss incurred from giving up its flexibility. The "option value" effect therefore functions like a risk premium that is charged on top of the capital costs of a project. As the option value increases with uncertainty (under certainty it is zero) the cost of making an investment increases as well.

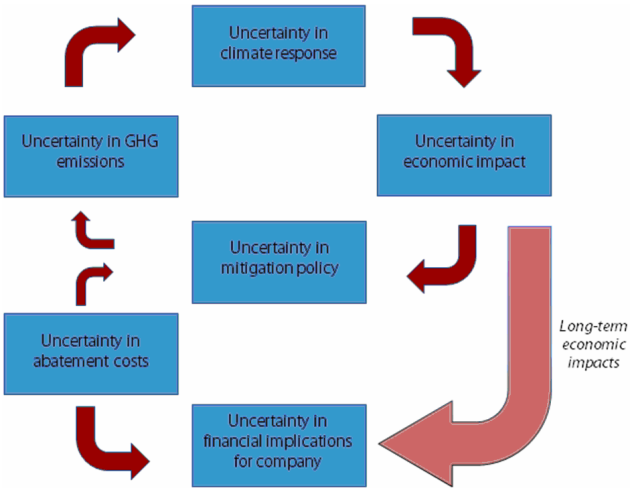
Since options theory suggests that there is a specific cost connected to making a certain investment (and therefore giving up flexibility), the measures that increase market uncertainty can be seen as an obstacle to new investments. This implies that a company will hold on to its investment option until the expected gross margin exceeds a threshold. The size of the investment threshold depends on the nature of the uncertainty.[230]

To understand the impact of climate change policy uncertainty on investments in the power sector it is therefore necessary to judge the contribution this policy is making to overall uncertainty faced by the power sector. Figure 4.3.1a below sketches out the general relationships in that context.

A broad range of factors impact investment decisions in the power sector, and thus far few studies have been conducted that provide a reliable sense of what role climate policy uncertainty plays in the overall investment decision equation.

Importantly, those studies that have been conducted suggest it is unlikely that climate policy uncertainty will pose a serious threat to overall generation capacity in the long run.[231] In other words, even significant climate policy uncertainty (modeled as variation in the price of carbon) does not pose a threat to energy security. Instead, research suggests that fuel price risk is likely to remain the most dominant variable in energy sector investment decisions.

Figure 4.3.1a. Climate policy uncertainty and energy sector investment



Source: Adapted from IEA (2007), Climate policy uncertainty and investment risk (Paris: IEA), p.22.

However, research by the IEA does suggest that climate policy uncertainty does undermine investment incentives for low-carbon technologies. That makes intuitive sense. If there are not reliable, long-term expectations with regard to the specific price of emissions, specific investments into low-carbon technologies (e.g. renewable energies) will not be made. Instead, cheaper technologies will be preferred.

In addition, that research also suggests that climate policy uncertainty is a crucial investment driver for technologies that are only being pursued because of climate change, such as CCS. While the technology for CCS has been around for some time and has been successfully deployed to enhance oil recovery in mature fields, the further development of CCS to serve as a tool to make coal-fired power plants carbon neutral is new and is only being pursued because of concerns over climate change. With significant policy uncertainty, investments in CCS that otherwise are unlikely to deliver any positive effects will not be pursued.

Not surprisingly, research on the link between climate policy uncertainty and investment also suggests that uncertainty has the greatest impact as the shadow of the future for existing policy regimes becomes shorter. Put differently, uncertainty over climate policy has the greatest impact on private investment decisions the shorter the predictable time horizon for investment planning becomes. Consequently, the negative impact of climate policy uncertainty can be reduced by long-term policy-making and by fostering an enhanced visibility of prices as well as policy design. That does not

imply that setting long-term targets – i.e. long-term emissions reductions targets – will be sufficient. Milestones will be crucial to reassure private investors that these long-range targets are credible. Finally, the analysis also suggests that carbon taxes do not necessarily perform better than emissions trading or other climate policy tools since tax levels – much like emissions reductions targets – are subject to political decisions, and can thus change significantly (and quite unexpectedly) over time.

4.3.2 UNFCCC scenarios and Implications for power sector investment in Europe

As noted above, the recent reforms of the EU ETS are likely to enhance climate policy certainty in the EU. However, the EU ETS is not a self-contained system. Most fundamentally, as the analysis in this paper has made clear, while the current commitment of EU leaders to reduction targets appears credible, that does not mean they cannot and will not be changed in case circumstances (and political fortunes) demand. Broader macroeconomic trends will determine the willingness and ability of EU member states to carry the cost of carbon mitigation. The deepening global economic crisis has an ambiguous effect in this context. It reduces, on the one hand, the cost of reaching mitigation targets significantly. At the same time, it reduces the willingness of politicians to commit further funding to climate policies in a context of already strained public finances and rising unemployment. In any event, emissions reductions targets, as well as the other "rules of the game" in the EU ETS, are subject to political review and thus not written in stone.

In addition, developments at the international level – and specifically the outcome of climate change negotiations under the auspices of the UNFCCC – will impact the further development of the EU ETS and thus also the investment environment for power companies in Europe. The EU has already provided for one automatic feedback effect; as noted earlier, in case the UNFCCC negotiations are deemed successful, the EU mitigation target will be increased from 20 percent to 30 percent. It is unclear what happens in case negotiations generate only moderate outcomes, or result in a complete breakdown. However, in both cases it is reasonable to assume that such developments will insert political pressure into the EU system to ease the overall mitigation burden, especially for those industries that compete on the global marketplace and thus are at a competitive disadvantage. Those pressures will likely increase in case the planned introduction of emissions trading regimes in the US are further delayed or even cancelled altogether. At the time of this writing, the political fortunes of the proposals for a US cap-and-trade system in the US Congress are difficult to predict.

Also, beyond burden-sharing and the setting of a global cap, it is also unclear what will happen to the flexible mechanisms under the Kyoto Protocol, and in particular the CDM. In case no burden-sharing agreement is achieved in Copenhagen, the EU will further restrict access of these offset credits into the EU ETS – thus raising the cost of abatement to European industry. Pressure to restrict access of CDM credits will also increase in case much-needed reforms to the institutional infrastructure (especially with regards to quality and additionality controls) fail to materialize.

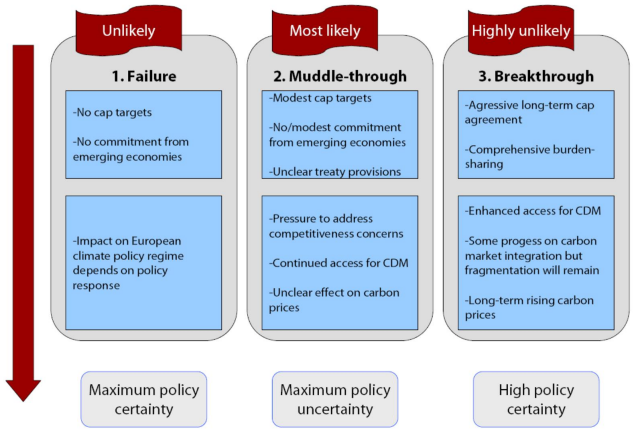
Finally, the impact of potential bottom-up linking strategies on the stability and predictability of the European investment environment are at least ambiguous. On the one hand, bottom-up carbon market integration can have positive economic and environmental impacts. As discussed above, a wider and deeper carbon market reduces the overall cost of mitigation which would in principle be welcomed by industry. In addition, it reduces the chances for leakage which will enhance the environmental effectiveness of the integrated regime. At the same time, the attempt to link carbon markets – such as the European and the prospective US regimes – also has the potential to introduce significant political uncertainty. For example, flawed integration could result in massive price swings that make long-term investments impossible. More likely, the attempt to integrate two carbon market regimes with different cap levels may result in a race to the bottom. In the specific case of EU-US market integration, a joint carbon market would almost certainly require a lower overall cap level than the one that has been agreed upon for the EU ETS, thus depressing carbon prices.

This discussion makes clear that the likely feedback effects between climate negotiations at the global level and the further development of the EU ETS will be real but also complex and difficult to predict. Three broad scenarios, outlined below, provide at least a rough sense of the possible direction of feedback effects between outcomes of the UNFCCC negotiations and the evolution of the EU climate policy regime more broadly, and the EU ETS in particular. Based on that, some assumptions can be made about the implications for the development of the investment environment for power companies.

Scenario 1 assumes a complete failure of the global climate change negotiations. More specifically, it assumes that the Copenhagen Summit will be unsuccessful in generating any agreement on an overall cap on emissions and burden-sharing formula. In other words, the global climate change regime

would break down completely.

Figure 4.3.2a Qualitative scenarios



Source: GPPi

The political reactions in Europe to that scenario could go into two alternative directions. One potential response would be a crumbling of political support for any aggressive climate policy regime in the EU, and as a result the disintegration of the EU climate policy regime (including a breakdown of the EU ETS). Obviously, that would be a doomsday scenario because it would mean an evaporation of all major global efforts to deal with the causes of climate change.

The alternative response would be the complete opposite. Realizing that the major efforts for emissions reductions need to be made by the industrialized world, the EU could tighten (rather than loosen) its climate policy screws. That would mean a tighter cap for the ETS, and thus significantly higher carbon prices in Europe. It would also imply tough restrictions on imports of international offset credits. Under such a scenario, it would also be likely that European policymakers would design other policy tools that can deal with the continued and expanded use of fossil fuels – especially coal – in power generation in major emerging economies. In particular, that would mean a significant upgrading of efforts to invest in the development, deployment and diffusion of CCS. It would also imply enhanced investment in co-firing and bio-mass projects.

A complete failure of the Copenhagen talks is very unlikely. The reputation of all the major players – especially the Europeans and the Americans – hangs in the balance. Ironically, though, a complete breakdown of the UNFCCC negotiations would enhance policy certainty for energy sector investment, regardless of what the political reaction would be. Both a total dismantling of the climate policy regime in the EU, or alternatively a much more aggressive approach to reducing emissions would at the very least create clear expectations about the basic rules of the game. It is important to note in this context that for many power companies a complete disintegration of the European climate policy regime would be a costly scenario. Many have already made quite significant investments into low-carbon technologies that they would like to recoup. Higher carbon prices (and thus higher power prices) would give them higher revenues and margins.

Scenario 3 – entitled “Breakthrough” – is the complete opposite to the scenario just described. It assumes a major success in UNFCCC negotiations, including agreement on an (ambitious) global cap as well as a burden-sharing agreement that is widely regarded as fair by all negotiating parties. It also assumes a reorganization of the CDM system thus making it both more economically efficient as well as environmentally effective. Under this scenario the EU would almost certainly raise its emissions reduction target to 30 percent. Enhanced certainty about the global political environment on climate change policy generally and emissions trading more specifically would provide a major boost to the EU ETS. Enhanced use of CDM credits would put a downward pressure on the price of carbon. Overall, however, that price effect is likely to be dominated by strong and credible policy signals on long-term ambitious emissions reductions targets that will be implemented. Thus, long-term rising carbon prices can be expected. There will be pressure for bottom-up carbon market integration which will inject some political uncertainty about how divergent caps and market governance arrangements will be harmonized.

While open questions about the potential integration of company-level trading systems remain and thus inject some level of policy uncertainty, overall power companies will be operating in a stable investment environment where long-term bets on clean energy technologies are likely to pay off because of higher carbon prices. However, similar to the first scenario discussed above, the “Breakthrough” option is highly unlikely. For reasons discussed in chapter 3, a comprehensive global deal is a distant if not entirely unrealistic option at this point.

Finally, scenario 2 – entitled “Muddle-through” – describes the most likely situation policymakers and investors will be confronted with in the years ahead. Under this scenario, some agreement on a global cap will be reached in Copenhagen in December 2009. However, that cap will not be ambitious and likely be punctured with so many exceptions that the actual contribution to effective emissions reductions will not be very significant. Also, there will be no success in achieving commitments from major emerging economies (especially China and India) on emissions reductions. That failure may well extend to the US as well, which is currently proposing

rather low reduction targets, at least when compared to European targets. Reform of the CDM will be accomplished but will fall short of creating a reliable and scalable system for international offsets. Overall, much like in the case of the Kyoto Protocol, the finalization of many details of the negotiations (e.g. on adaptation financing etc.) will be pushed into the future and thus will remain unresolved. Given the global economic situation that has significantly cut the costs for Europeans to reach emissions targets, the EU may still stick with its 30 percent target but that remains to be seen. However, the failure to achieve burden-sharing will mean that the EU will restrict access of CDM credits to the ETS. That would raise the cost to European industry to comply with emissions reduction targets. Failure to extract significant emissions reduction commitments from the US as well as major emerging economies will prompt significant pressure on EU policymakers to ease the burden of mitigation, especially for industries that compete internationally. This may not necessarily result in a reduction of the overall cap; yet discussions on other cost containment options (such as price safety valves) as well as compensatory schemes will become more pronounced. The development of the EU carbon price in this context becomes hard to predict. However, it is not unreasonable to assume that it will stay rather low and thus play only a minor role in incentivizing private investment into low-carbon or carbon-neutral technologies.

As indicated above, unfortunately the muddle-through option is the most likely scenario to emerge out of the Copenhagen Summit at this stage. From the perspective of energy sector investment, that scenario is by far the worst outcome with the highest policy uncertainty giving the poorest guidance for investment decisions.

4.4 Concluding Outlook

Overall, the analysis in this paper implies that carbon trading is unlikely to play a major role in global emissions reductions in the short- or medium-term future. Negotiations at the global level currently appear stalled. While the Copenhagen Summit will generate some negotiated outcome, it is unlikely that it will include ambitious agreements on an overall global cap, burden-sharing and government-to-government emissions trading. Also, the country case studies in this paper suggest that progress with establishing national-level, company-to-company trading systems is usually cumbersome and slow. In fact, even in those countries that have taken decisive steps to introduce such systems (the US and Australia) it is by no means a political certainty that these schemes will actually come online, or that they will feature caps that will result in significant emissions reductions. Some of the largest emitters – notably China – at this point do not even ponder the introduction of such schemes. There are also legitimate questions about the capacity of some of the major emitters (in particular India) to introduce an emissions trading regime at all due to the administrative difficulties that are involved.[232] Also, while the European experience suggests that once a system is operating it generates some self-sustaining momentum, it is by no means clear that existing regimes will necessarily be stable, or even feature ever more ambitious emissions reduction targets. The political-economic bargains that underpin emissions regimes are rather precarious. The fact that the further existence and environmental effectiveness of regimes depends on regular political decisions over emissions targets means that there will be continued political-economic battles over the further development of emissions trading regimes the outcomes of which are dependent on a broad variety of different variables.

That does not imply that emissions trading cannot play a useful role in an overall strategy to achieve mitigation of greenhouse gases. However, it does mean that the expectations with regard to the contribution such emissions trading schemes can make should be carefully managed. More importantly, it also means that policymakers will have to aggressively develop other policy tools to complement emissions trading. Most significantly, that will have to include additional mechanisms to foster emissions reductions in major emerging economies, such as, for example, infrastructure deals or other types of initiatives.[233] In addition, other tools will have to be promoted that provide the necessary incentives for private sector participants to invest in the development and deployment of low-carbon and carbon-neutral technologies. Public energy R&D as well as additional technology deployment schemes may play a useful role in this context.[234]

Indeed, many of the key players, notably the EU and the US, have started to deploy larger climate policy packages in recent years that consist of a broad range of mechanisms, not just emissions trading. Also, as shown in chapter 3, while China has been more than reluctant to commit to binding reduction targets in the ongoing negotiations under the UNFCCC umbrella, the country has taken several steps to curb its emissions.

One of the key challenges in that context will be to ensure policy coherence across these different mechanisms. For example, the recent EU Climate Change Package includes a variety of different tools that are addressed to achieve carbon mitigation and a transformation towards a low-carbon economy. In addition to (and independent of) the EU ETS, it also refers to the goal of achieving 20 percent

of power production in Europe through renewable sources of energy by 2020 through the so-called Renewables Directive. Preliminary analysis suggests that in order to meet this objective, the energy sector will have to deliver between 30 and 37 percent of renewable energy by 2020. If that target is achieved, it will generate around a third of the targeted emissions reductions under the EU ETS. The consequence of this will be downward pressure on the carbon price. "Early modeling results indicate that under a scenario of 20% overall emission reduction by 2020, the introduction of the additional renewables reduces the carbon price by about 30%. In addition to reducing the carbon price, the additional support for renewables raises the risk of a carbon price collapse (say to below €10/tCO_2) from close to zero to around a 10% chance. This combination of reduced price expectation and higher price risk undermines the investment signals that the carbon market is intended to create."[235] Thus, in order to gauge the overall political environment for energy sector investments a broader analytical approach is needed that takes into account the full portfolio of climate change policies that are in place. Indeed, a careful evaluation of the full set and coherence of climate change policies that affect the energy sector will become ever more crucial in the future as more and more policy tools, for example for low-carbon technology, are being implemented.

Endnotes

[1] See http://www.barackobama.com/2007/10/08/remarks_of_senator_barack_obam_28.php (accessed 23 June 2009).

[2] IPCC (2007), Climate Change 2007, Chapter 11: Mitigation from a Cross-Sectoral Perspective (accessible at http://www.ipcc.ch/ipccreports/ar4-wg3.htm, accessed 29 May 2009), p.621.

[3] IEA (2007), World Energy Outlook 2007 (IEA: Paris).

[4] Karan Capoor, Philippe Ambrosi (2009), State and Trend of the Carbon Market 2009 (Washington DC: World Bank), p. 31.

[5] Ibid.

[6] In New Zealand, the new government under Prime Minister John Key has shelved the plans for now over concerns of the "economic damage" it may cause to the country. However, a revised trading system may start operations in 2010. In Australia, Prime Minister Kevin Rudd also had to delay the introduction of the Carbon Pollution Reduction Scheme (CPRS) because of a lack of necessary support in parliament. New elections may be necessary to decide the fate of the CPRS.

[7] See also Christian Flachsland, Robert Marschinski and Ottmar Edenhofer (2008), Global Trading versus Linking: Architectures for International Emissions Trading. Potsdam Institute for Climate Impact Research Working Paper, 2 December 2008.

[8] Various studies have been published in recent years that focus specifically on governance challenges related to the emergence of a global carbon market (see e.g. Mark Lazarowicz (2009), Global Carbon Trading: A Framework for Reducing Emissions (London: The Stationary Office); Michael Mehling (2009), Global Carbon Market Institutions: An Assessment of Governance Challenges and Functions in the Carbon Market (London: Climate Strategies)). In these analyses, carbon market integration is presented as an evolutionary and thus irresistible process. There is also a growing number of studies that focus specifically on carbon market integration through bottom-up linking processes. While most of these studies explicitly recognize the political-economic hurdles to integration, the main focus on these studies again is on the technical challenges related to governing international carbon markets (see e.g. Andreas Tuerk (2009), Linking Emissions Trading Schemes (London: Climate Strategies), May 2009; Christian Flachsland, Robert Marschinski, Ottmar Edenhofer (2009), "Global trading versus linking: Architectures for international emissions trading," Energy Policy, Vol. 37; Wolfgang Sterk, Michael Mehling, Andreas Tuerk (2009), Prospects of linking EU and US Emission Trading Schemes: Comparing the Western Climate Initiative, the Waxman-Markey and the Lieberman-Warner Proposal (London: Climate Strategies) April 2009; Christian Flachsland, et al. (2008), Developing the International Carbon Market: Linking Options for the EU ETS (Potsdam: Potsdam Institute for Climate Impact Research), May 2008.

[9] See A. Denny Ellerman and Paul L. Joskow (2008), The European Union's Emissions Trading System in Perspective (Arlington, VA: Pew Center for Global Climate Change), p.39.

[10] See also the seminal article by Theodore J. Lowi (1964), American Business, Public Policy, Case-Studies, and Political Theory, in World Politics 16(4), pp.677-715.

[11] See for an overview of the history of environmental regulation in the US Daniel J. Fiorino (2006), The New Environmental Regulation (Cambridge, MA: MIT Press), pp.40ff. For an overview of the development of environmental regulation at the level of the EU, see David Kelemen (2000), Regulatory Federalism: EU Environmental Regulation in Comparative Perspective, in: Journal of Public Policy (2000)20, pp.133-167. See also Stefan Scheuer (ed.), EU Environmental Policy Handbook (Brussels: European Environmental Bureau), chapter 3.

[12] UNFCCC Website, „Emissions Trading", http://unfccc.int/kyoto_protocol/mechanisms/emissions_trading/items/2731.php (Accessed 18 May 2009)

[13] Ibid.

[14] For an early study of the system see Roger K. Raufer and Stephen L. Feldman (1987), Acid Rain and Emissions Trading: Implementing a Market Approach to Pollution Control (London: Rowman and Littlefield). For an evaluation of the performance of the system see A. Denny Ellerman, Richard Schmalensee, Paul L. Joskow,

Juan Pablo Montero, and Elizabeth M. Bailey (1997), Emissions Trading under US Acid Rain Program: Evaluation of Compliance Costs and Allowance Market Performance (Center for Energy and Environmental Policy Research: Massachusetts Institute of Technology).

[15] Pew Center on Global Climate Change, "Cap and Trade" Pew Center Brief, http://www.pewclimate.org/docUploads/Climate101-CapTrade-Jan09.pdf (accessed 19 May 2009)

[16] OECD (2002), "Towards International Emissions Trading: Design implications for linkages" (Paris: OECD).

[17] See e.g. See A. Denny Ellerman and Paul L. Joskow (2008), The European Union's Emissions Trading System in Perspective (Arlington, VA: Pew Center for Global Climate Change), p.39 who claim that arguments around "prior use" are to some extent legitimate.

[18] The European experience shows, however, that the reality can be more complex. There it has been argued that the free distribution of allowances can indeed raise issues with regard to the overall effectiveness of the cap and that it is important to consider where exactly the windfall profits go. If they extend also to high-emissions installations they could not only discourage investment but also provide incentives to industries to continue using less efficient technology (see e.g. Simon Tilford (2008), How to Make the EU Emissions Trading System a Success (Brussels, Center for European Reform), p.21). Also, the specific entry and exit rules for allowance allocation are crucial. Under EU rules, new entrants will also receive free permits and those exiting the market will lose theirs. Modeling shows that such new entrant and closure rule provide incentives for market participants to build up over-capacity which, from an emissions reduction point of view, are clearly unwanted (see A. Denny Ellerman (2006), New Entrant and Closure Provisions: How do They Distort? Center for Energy and Environmental Policy Research Working Paper 06-013 WP, June).

[19] See Michael W. Wara and David G. Victor (2008), A Realistic Policy on International Carbon Offsets. Program on Energy and Sustainable Development at Stanford University, Working Paper #74, April, p.8.

[20] The American Clean Energy and Security Act (based on the Waxman-Markey proposal), which passed through the US House of Representatives in late June 2009, allows for 2 billion tons of offsets. Half of these offsets must be obtained from domestic sources and half from international sources. In the event that insufficient domestic emission offsets are available, the portion of international offsets may be increased from 50 percent to 75 percent of the total. According to statistics by the US Energy Information Administration, total US emissions in 2007 were roughly 7.2 billion tons. While exact emissions data for 2008 is not yet available, the EIA has announced that emissions were likely about 3% lower than in 2007. Thus, the 2 billion in offsets allowed under ACESA represents roughly 33% of total emissions. For more information on US emissions, see: http://www.eia.doe.gov/oiaf/1605/ggrp (accessed 2 July 2009).

[21] Although climate change was also topical elsewhere, environmental groups were not as effective as their European counterparts in translating public attention into effective policy pressure. See the comprehensive overview of developments of public opinion and political responses in the US by Spencer Weart (2008), The Discovery of Global Warming (Cambridge: Harvard University Press). Also available online at http://www.aip.org/history/climate/index.html#contents (accessed 20 May 2009).

[22] This overview does not offer the scope to review the developments at the international level, especially following the Rio Earth Summit in 1992, that also fed into EU-internal policy deliberations.

[23] Commission Proposal for a Council Directive Introducing a Tax on Carbon Dioxide Emissions and Energy. COM (92) 226 final, 30 June 1992 (http://aei.pitt.edu/4830/01/000990_1.pdf, accessed 20 May 2009).

[24] See e.g. Tony Ikwue and Jim Skea (2007), Business and the Genesis of the European Carbon Tax Proposal, in: Business Strategy and the Environment (3)2, pp.1-10. Jon Birger Skjaerseth and Jorgen Wettestad, (2008), The European Emissions Trading System: Initiation, Decision-Making and Implementation (London: Ashgate), p.4ff. See also Camilla Bretteville, Froyn and H. Asbjørn Aaheim (2004), Sectoral Opposition to Carbon Taxes in the EU – a Myopic Economic Approach, in: International Environmental Agreements: Politics, Law and Economics 4(3), 279-302.

[25] See "EU carbon tax plan dropped," in: The Independent, 11 December 1994 (http://www.independent.co.uk/news/uk/eu-carbon-tax-plan-dropped-1387018.html, accessed 20 May 2009).

[26] Under a business-as-usual assumption, this translated into total necessary reductions of 14 percent.

[27] Burden-sharing agreement reached during EU Environment Council on 16 June 1998. For more background on the burden-sharing agreement see Per-Olov Marklund and Eva Samakovlis (2007), What is driving the EU burden-sharing agreement: Efficiency or equity?, in: Journal of Environmental Management 85(2), pp.

317-329.

[28] See European Commission (1998), Commission Communication to the Council and the Parliament. Climate Change: Towards an EU Post-Kyoto Strategy (COM(98)353), June; and European Commission (1999), Commission Communication to the Council and the Parliament. Preparing for Implementation of the Kyoto Protocol (COM(99)230), May.

[29] A. Denny Ellerman and Paul L. Joskow (2008), The European Union's Emissions Trading System in Perspective, op. Cit., p.8.

[30] Spelled out in some detail for the first time in European Commission (2000), Green Paper on Greenhouse Gas Emission Trading within the European Union COM(2000) 87final.

[31] The EC proposal foresaw inclusion only of the power sector, production and processing of ferrous metals, parts of the minerals industry (especially cement, glass and ceramic products), the pulp industry and large paper and board production facilities in the ETS. While other industries would be affected by rising carbon prices (especially through higher prices for electricity), this initially limited the range of industry opponents to the proposed scheme.

[32] Directive 2003/87/EC of the European Parliament and the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.

[33] Under the rules of the Directive, "each Member State should develop a national plan stating the total quantity of allowances that it intends to allocate for that period and how it proposes to allocate them." (Article 9). And further: "The total quantity of allowances to be allocated for the relevant period shall be consistent with the Member State's obligation to limit its emissions pursuant to Decision 2002/358/EC […] and the Kyoto Protocol." (Annex III).

[34] As Tilford writes: "The absence of uniformly stringent NAPs created competitive distortions. Countries that imposed relatively demanding caps […] effectively subsidized firms elsewhere in the EU."See Simon Tilford (2008), How to Make the EU Emissions Trading System a Success, op. Cit., p.20.

[35] See A. Denny Ellerman and Paul L. Joskow (2008), The European Union's Emissions Trading System in Perspective, op. Cit., p.31. Ellerman and Joskow also point out, however, that a non-binding cap in trading period 1 was always a distinct possibility because of the modest emission goal that was set that was only slightly below business-as-usual assumptions. Variation introduced by other variables – weather, economic growth etc. – are significant enough to turn a slight reduction scenario into a non-binding reality. In addition, the lack of verified emissions data before 2005 plus a broad array of technical issues around measurements and definitions made a precise estimate of a BAU scenario very difficult.

[36] See Frank Convery, Denny Ellerman and Christian de Perthuis (2008), The European Carbon Market in Action: Lessons from the First Trading Period. Interim Report. CEEPR, Caisse des Depots and UCD Dublin (http://web.mit.edu/globalchange/www/ECMreport.html, accessed 21 May 2009).

[37] Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community. PE-CONS 3737/08

[38] See e.g. Michael Grubb and Karsten Neuhoff (2006), Allocation and Competitiveness in the EU Emissions Trading Scheme: Policy Overview, in: Climate Policy 6(2006), pp.70-30; see also the report issued by the EC (and produced by McKinsey & Company and Ecofys) entitled "EU ETS Review: Report on International Competitiveness" (Brussels: EC, 2006).

[39] For a review of the political feasibility and legal implications of some of these proposals see Harro van Asselt and Frank Biermann (2007), European Emissions Trading and the International Competitiveness of Energy-Intensive Industries: A Legal and Political Evaluation of Possible Supporting Measures, in: Energy Policy (25(2007), pp.497-506.

[40] For example, the European chemical industry mounted an aggressive (yet ultimately only partially successful) campaign against a stiffening of the ETS rules.See e.g. "BASF Says Europe's ETS Will Be a High Cost for the Chemical Sector." Chemical Week, 15 December 2008; "Germany Aims to Protect Industry from Emission Trading Costs." Chemical Week, 29 September 2008; "Shell Boss Says that EU Carbon Plan Could Destroy Oil Industry in Europe," in: The Times, 15 April 2008; "Chemical Industry: Business and Unions Urge Rethink on ETS Revision," in: Europe Energy, 8 October 2008; "Chemicals Boss Warns of Exodus," in: The Sunday Times, 7 December 2008; "Europe's Leading Chemical Producers Took Their Message on Climate Change to the

European Parliament With an Exhibition and a Series of Lobbying Events, " in: ICIS Chemical Business, 15 December 2008.

[41] In competitive markets, companies set electricity prices not just to reflect the actual cost of carbon incurred (i.e. the cost utilities would have to pay for allowances if they were auctioned rather than given away for free) but its opportunity cost (since the allowances that have been received for free could also be sold on the carbon market). Studies have shown that utilities operating in competitive wholesale power markets were indeed able to pass on a significant portion of that "opportunity cost" of carbon to wholesale prices. (See e.g. J.P.M. Sijm, S.J.A. Baker, Y. Chen, H.W. Harmsen and W. Lise (2005), CO2 Price Dynamics: The Implications of EU Emissions Trading for the Price of Electricity (The Hague: Energy Research Center of the Netherlands)). This also affected large industrial customers of electricity. The degree to which utilities can pass on these higher wholesale prices to retail customers, however, further depends on the degree of deregulation of electricity markets. Utilities operating in deregulated markets will at least try to realize a higher price (depending of course on competition and market structure), whereas utilities constrained by regulated prices are unable to do so. In many European countries "[…] retail prices continued to be regulated based on historical costs rather than wholesale market prices. […] What can be generally said is that, for retail customers in many member states though not all, the higher wholesale prices resulting from CO2 emissions costs have not been passed through." (See e.g. A. Denny Ellerman and Paul L. Joskow (2008), The European Union's Emissions Trading System in Perspective, op. Cit., p. 29.) Thus, the ETS played only a marginal role in raising retail prices for electricity since 2005. This was driven primarily by other factors (especially higher prices for fuel such as natural gas and coal). (See e.g. A. Denny Ellerman and Paul L. Joskow (2008), The European Union's Emissions Trading System in Perspective, op. Cit., p. 29.) This is an interesting finding, since the introduction of the ETS was precisely intended to raise power prices in order to incentivize customers to invest in energy efficiency measures.

[42] See e.g. Michael Grubb and Karsten Neuhoff (2006), Allocation and Competitiveness in the EU Emissions Trading Scheme: Policy Overview, in: Climate Policy 6(2006), pp.70-30, at 14-15; J. Smale, M. Hartley, C. Hepburn, J. Ward, and M. Grubb (2006), The Impact of CO2 Emissions Trading on Firm Profits and Market Prices, in: Climate Policy 6(2006), pp.31-48; Simon Tilford (2008), How to Make the EU Emissions Trading System a Success (Brussels, Center for European Reform), p.21; A. Denny Ellerman and Paul L. Joskow (2008), The European Union's Emissions Trading System in Perspective (Arlington, VA: Pew Center on Global Climate Change), pp. 24ff.; Christian Egenhofer (2007), The Making of the EU Emissions Trading Scheme: Status, Prospects and Implications for Business, in: European Management Journal 25(6), pp.453-463, at 457;

[43] A. Denny Ellerman (2006), New Entrant and Closure Provisions: How do They Distort?. Center for Energy and Environmental Policy Research Working Paper 06-013 WP, June.

[44] In fact, as Ellerman and Joskow suggest, the ETS "[…] provides a reminder that the best can be the enemy of the good. […] The initial challenge is simply to establish a system that will demonstrate the societal decision that GHG [global greenhouse gas] emissions shall have a price and to provide the signal of what constitutes appropriate short-term and long-term measures to take in limiting GHG emissions to the desired amounts." See e.g. A. Denny Ellerman and Paul L. Joskow (2008), The European Union's Emissions Trading System in Perspective, op. Cit., p. 46.

[45] These included 1) The abolition of the NAPs and the setting of an EU-wide cap; 2) A longer-term, predictable commitment to reducing carbon emissions (cut of EU allowances by 1.74 percent/ year until 2020); 3) An end to the free distribution of allowances and a gradual increase in the share of allowances to be auctioned (with power utilities leading the way); 4) A new burden-sharing formula within Europe that would take existing energy mixes and GDP per capita into consideration when assigning emissions commitments; 5) The integration of CCS (i.e. CO2 emitted but captured by CCS would not be counted); and 6) Extension of industry coverage of the ETS. The proposals also included an express rejection of price caps or other market interventions that could be designed to install a "safety valve" on the price of carbon. Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions. Building a Global Carbon Market. Report Pursuant to Article 30 of Directive 2003/87/EC. COM(2006)676 final, 13 November 2006.

[46] See Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community. PE-CONS 3737/08, para 6.

[47] Simon Tilford from the Center for European Reform raises that point and outlines a potential path towards strengthening the institutional infrastructure of the EU to deal with the corresponding challenges. See Simon

Tilford (2008), How to Make the EU Emissions Trading System a Success (Brussels, Center for European Reform), pp.38ff.

[48] "Australia's carbon emissions trading scheme falls victim to recession," in: Telegraph, 4 May 2009.

[49] "Plans for a carbon-emissions trading scheme may bring an early election," in: The Economist, 4 June 2009.

[50] If Australia had ratified the Kyoto Protocol, it would have had to limit the growth of emissions between 1990 and 2010 by 8 percent. Indeed, until 2006, emissions were only 4.2 percent above 1990 levels, with a trajectory to suggest that meeting the 8 percent target would be a possibility. However, those numbers need to put into proper context. See Australian Government, Department of Climate Change (2008), National Greenhouse Gas Inventory 2006. Accounting for the Kyoto Target, June (accessible at http://www.climatechange.gov.au/inventory/2006/pubs/inventory2006.pdf, accessed 27 May 2009), p.1.

[51] Australia was the only industrialized country this clause applied to, and as such it was appropriately dubbed the "Australia Clause." See e.g. Clive Hamilton and Lins Vellen (1999), Land-use Change in Australia and the Kyoto Protocol, in: Environmental Science and Policy (2)2, pp.145-152.

[52] In fact, excluding the "Australia Clause", data shows that Australia's CO2 emissions have risen dramatically since 1997. According to some calculations, by 2010 Australia's emissions will have grown by 30 percent above 1990 levels. Clive Hamilton, "The Political Economy of Climate Change," The Milthorpe Lecture, Macquarie University, 8 June 2006.

[53] See http://www.climatechange.gov.au/renewabletarget/index.html (accessed 27 May 2009).

[54] The "Four Corners" program of one of Australia's leading TV channels ABC aired a documentary about so-called "greenhouse mafia". For a transcript of that program see http://www.abc.net.au/4corners/content/2006/s1568867.htm (accessed 27 May 2009).

[55] For an overview of key issues debated during the electoral season see http://en.wikipedia.org/wiki/Australian_federal_election,_2007 (accessed 27 May 2009). See also Julian Glover, "The lucky country", in: The Guardian, 23 November 2007.

[56] See Australian Government (2008): Carbon Pollution Reduction Scheme: Green Paper, July (accessible at http://www.climatechange.gov.au/greenpaper/index.html, accessed 27 May 2009). See also "Green Paper on Carbon Pollution Reduction Scheme Released." Media Release, Senator the Hon Penny Wong, Minister for Climate Change and Water. The government did not develop the proposal from scratch, but rather was able to draw on work that had been previously completed by a National Emissions Trading Task Force (set up by state and territory governments in 2004 to develop proposals for a sub-national emissions trading scheme) (National Emissions Trading Task Force (2006), A Possible Design for a National Greenhouse Gas Emissions Trading Scheme, August.) as well as the recommendations from Professor Garnaut who published, in March 2008, a paper on emissions trading that was part of the subsequently published Garnaut report (Ross Garnaut (2008), Climate Change Review –Final Report. September, chapter 13 (accessible at http://www.garnautreview.org.au/index.htm, accessed 26 May 2009).

[57] This was not considered ambitious but the government announced that it would review the longer-term goal as well as the cap for an emissions trading system towards the end of 2008.

[58] Greg Gailey, the President of the Business Council of Australia argued that "Australia must put in place a system that supports economic growth and provides an environment for businesses to invest in a lower-emissions future, otherwise our emissions reduction goals will not be met. As we move through the next few months, the objective of the BCA will be to ensure the eventual design of the emissions trading scheme: Addresses competitiveness and carbon leakage issues related to industries that are trade-exposed and emissions-intensive (TEEIs); ensures the potential for growth in the TEEIs industries in coming decades is not eroded in the absence of a global price; and ensures the ongoing reliability of electricity supply by managing the impacts of an emissions trading scheme on electricity costs and investment decisions." Greg Gailey, "Devil in Detail of Getting the ETS Right," in: The Age, 17 July 2008.

[59] Sharon Beder, for instance, argued that "An emissions trading scheme will see the price of electricity and manufactured goods go up but that is no guarantee that the market will invest in alternatives, especially if polluters can pass on the extra cost to consumers, buy up environmentally dubious offsets, or be compensated for extra cost that might damage their international competitiveness. […] Emissions trading is a system that aims to keep costs to Australian industries to a minimum rather than achieve the rapid and significant changes necessary to prevent further global warming." Sharon Beder, "Emissions Trading Scheme a Scam: Renewables Now!" in: Green Left Weekly, Issue 760, 26 July 2008 (accessible at http://www.green-

left.org.au/2008/760/39239, accessed 27 May 2009).

[60] Australian Government (2008), White Paper: Carbon Pollution Reduction Scheme: Australia's Low Pollution Future, 15 December (accessible at http://www.climatechange.gov.au/whitepaper/index.html (accessed 27 May 2009)).

[61] See http://www.climatechange.gov.au/greenpaper/consultation/submissions.html (accessed 27 May 2009). Ford Motor Company Australia, for example, argued that the "[…] proposed auctioning of all permits (aside from proposed allocations to a very narrow range of specific trade-exposed industries) should be replaced by a mixed approach of firm allocation and auctioning. This would represent a sensible "middle-of-the-road" approach between the grandfathering system […] and the proposed full auctioning system […]." (See submission by Ford Motor Company Australia, 10 September 2008, at http://www.climatechange.gov.au/greenpaper/consultation/submissions-d-l.html (accessed 27 May 2009). Arguing that the emissions trading system proposed by the government "[…] is more comprehensive and ambitious in both scope and timing than any other currently in existence or being proposed elsewhere around the world," the global mining group Xsatra calls on the government to not include the growth of emissions-intensive, trade-exposed industries within Australia in the national cap, as long as "best practice technology" is applied and until international agreements are in place. (See submission by Xsatra, 10 September 20008, at http://www.climatechange.gov.au/greenpaper/consultation/submissions-m-z.html (accessed 27 May 2009)). Finally, the Minerals Council of Australia (a trade group) argued that "[t]he emissions trading scheme design proposed in the Green Paper contains substantial flaws. It is not calibrated with efforts being undertaken or contemplated by the world major emitters of greenhouse gas emissions. If adopted in its current form, the impact on global emissions will be negligible, but the impact on the Australian economy and its future prospects will be substantial. The competitiveness of many of Australia's most important export industries will be damaged, many existing operations will steadily decline and future investment will be reconsidered. Inevitably, the living standards of Australians will suffer." (See submission by Minerals Council of Australia, September 2008 at http://www.climatechange.gov.au/greenpaper/consultation/submissions-m-z.html (accessed 27 May 2009).

[62] See Australian Government (2008), White Paper: Carbon Pollution Reduction Scheme: Australia's Low Pollution Future, Policy Decisions Summary, Policy Position 12.1 (accessible at http://www.climatechange.gov.au/whitepaper/report/pubs/pdf/V100fPolicyDecisionsSummary.pdf (accessed 27 May 2009).

[63] In February 2009, the Australian government announced the formation of an expert advisory committee to advise the government on the finalization of administrative arrangements for the EITE assistance program.

[64] Ibid, Policy Positions 13.3 13.4.

[65] Ibid., Policy Position 17.2.

[66] See Ross Garnaut (2008), Climate Change Review –Final Report. September, chapter 13 (accessible at http://www.garnautreview.org.au/index.htm, accessed 26 May 2009), chapter 14.

[67] To read "the Global 2000 Report", see http://www.ourtask.org/pub//readings/pdfs/G2000_Vol_One.pdf (accessed 27 May 2009)

[68] Following the publication of the report, a number of news outlets declared the report to be of vital importance. However, the recommendations in the report were questioned by experts who expressed doubt over the validity of the data and the urgency of action. The New York Times published an article in 1982 which summarizes the reaction of various experts regarding "the Global 2000 Report". To read the article, please visit: http://www.nytimes.com/1982/01/12/science/will-the-next-20-years-bring-prosperity-or-decline.html?&pagewanted=1

[69] The program signified an important reframing of the political debate on environmental regulation in the US, away from targeting large industrial sources and human health concerns towards the more broadly defined approach of pollution control and the effects of pollution on ecological systems at large. Fiorino, Daniel J (2006). The New Environmental Regulation, Cambridge, Mass: The MIT Press

[70] The view of many US policymakers at the time was that the US system of governance, which includes executive agencies not often responsive to Congress and highly-empowered and independent courts, might have insisted on more stringent performance against the agreed targets which were seen as potentially creating a clear economic disadvantage to the US. Second, since the bulk of growth in emissions would be coming from developing nations, policymakers in Washington viewed any effort at mitigating global emissions as futile without the participation of emerging economies. Deutsche Bank (2009), "US Climate Legislation: A Brief His-

tory", http://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD0000000000227484.pdf (accessed 27 May 2009)

[71] For the text of the resolution see http://www.nationalcenter.org/KyotoSenate.html (accessed 29 July 2009).

[72] See Jan Martin Witte (2009), State and Trends and Public Energy and Electricity R&D Support: A Transatlantic Perspective, GPPi Policy paper #4, (Berlin: GPPi).

[73] See http://www.asiapacificpartnership.org/english/default.aspx (accessed 27 May 2009).

[74] A revised form of this bill would eventually re-emerge as the Lieberman-Warner Climate Security Act introduced in 2007, and while the bill was voted out of Committee in December 2007 and received heated debate on the Senate floor in June 2008, it never came to a vote due to the inability of bill supporters to break a Republican filibuster. Pew Center on Global Climate Change, "Summary of the Lieberman-McCain Climate Stewardship Act", http://www.pewclimate.org/policy_center/analyses/s_139_summary.cfm (accessed 27 May 2009).

[75] In its 2009 budget, Omnibus package and stimulus package the Obama administration provided funding, loan guarantees and grants for research, development and deployment of new technologies, specifically targeting solar, biomass, geothermal, wind, low-carbon emission coal and new battery technologies. There was also increased support for a smart electricity grid and tax breaks for the oil and gas industry. For more details see Jan Martin Witte (2009), State and Trends and Public Energy and Electricity R&D Support: A Transatlantic Perspective, op. Cit.

[76] Global Public Policy Institute (2009), Conference Report, "Governing Global Oil in the 21st Century", http://www.globalenergygovernance.net/fileadmin/gppi/TESD5_Conference_Report_final.pdf (accessed 27 May 2009)

[77] For example, his original vision for a cap-and-trade scheme included plans to auction 100 percent of allowances – a vision which never materialized (and for which he mounted no serious campaign to influence) as deals were struck leading up to the passage of the American Clean Energy and Security Act from the House of Representatives.

[78] For an overview of the key uncertainties affecting the debate see an analysis of the Waxman-Markey proposal by the US EPA, http://www.epa.gov/climatechange/economics/pdfs/WM-Analysis.pdf (accessed 28 May 2009)).

[79] See: http://lieberman.senate.gov/documents/detailedacsa.pdf (accessed 27 May 2009)

[80] As the Liebermann-Warner bill passed through the US Senate Environment and Public Works Committee in December 2007, an amendment was proposed by Senator Bernie Sanders (I) which would have increased the stringency of the long-term greenhouse gas reduction target to an 80 percent reduction from 1990 levels of emissions by 2050. The amendment was defeated (7 votes to 12) and Senator Barbara Boxer (D-Ca), the Committee Chairwoman, told Senator Sanders that she appreciated his efforts, but had to protect the "delicate balance" needed to get the bill out of committee—a phrase she used more than once—and voiced her willingness to revisit the targets on the Senate floor.80

[81] Environmental Protection Agency (2008), "EPA Analysis of the Lieberman-Warner Climate Security Act of 2008", http://www.epa.gov/climatechange/downloads/s2191_EPA_Analysis.pdf (accessed 28 May 2009).

[82] According to the EPA, this relaxation of the cap, by itself, would lower allowance prices by 3 percent. This single change would lower the cost of the legislation for households, in part by lowering the impact on household energy bills.

[83] For a full summary of the Committee proceedings, including amendments proposed by state representatives, see: http://energycommerce.house.gov/index.php?option=com_content&view=article&id=1625&catid=141&Itemid=85 (accessed 27 May 2009).

[84] For more background see Center for Public Integrity, http://www.publicintegrity.org/articles/entry/1284/ (accessed 27 July 2009).

[85] "ACCCE Statement regarding the Waxman-Markey Draft," 31 March 2009, accessible at http://www.americaspower.org/News/Press-Room/Press-Releases/ACCCE-Statement-Regarding-the-Waxman-Markey-Discussion-Draft (accessed 28 July 2009).

[86] See "Statement by ACCCE Regarding the Passing of the American Clean Energy and Security Act of 2009," 21 May 2009, accessible at http://www.americaspower.org/News/Press-Room/Press-Releases/Statement-by-

ACCCE-Regarding-the-Passage-of-the-American-Clean-Energy-and-Security-Act-of-2009 (accessed 28 July 2009).

[87] "ACCCE Statement in Regards to the Passage of the American Clean Energy and Security Act," 26 June 2009, accessible at http://www.americaspower.org/News/Press-Room/Press-Releases/ACCCE-Statement-in-Regards-to-the-Passage-of-the-American-Clean-Energy-and-Security-Act (accessed 28 July 2009).

[88] "Lobbying cash paved way for Waxman-Markey's road to House floor," 26 June 2009, Greenwire, accessible at http://www.eenews.net/public/Greenwire/2009/06/26/4 (accessed 28 July 2009).

[89] "[…] the debate in Congress has left the nation with two terrible options: (1) expensive, complicated, regulation-heavy, domestic-only legislation like [the Waxman-Markey Bill], or (2) an "even worse" set of mandatory CO2 controls on everyone and everything through existing Clean Air Act programs." Accessible at: http://www.uschamber.com/NR/rdonlyres/eiku5kqqscd-fncec7o7iat6xp4aq2t3gnd26o66gjs5yynoo7yg5hcotxnyrp3y2isezbqn6z4nyrt5pwtqqzmd6dwf/090514_climaterinciples.pdf (accessed 3 June 2009).

[90] Accessible at: http://www.greenpeace.org/usa/news/greenpeace-waxman-markey-clim (accessed 3 June 2009).

[91] As reported by The Politico, "[…] many of these moderates, tapped by Waxman's predecessor as chairman, Michigan Rep. John Dingell, sit on the subcommittee drafting the bill […] Furthermore, Rust Belt Democrats are seeking protections, possibly in the form of financial compensation, for energy-heavy industries, like steel production or manufacturing, and others from coal states want Waxman to reduce his short-term targets for emission reductions to give the industry more time to develop clean coal technology." "Dems clash over climate bill", in: Politico, 4 May 2009, accessible at: http://dyn.politico.com/printstory.cfm?uuid=0871FF13-18FE-70B2-A865F71EA8534D99 (accessed 22 June 2009) .

[92] However, placing a tax on imports from countries without an emissions reduction scheme could create problems with World Trade Organization (WTO) obligations. The most discussed option in the US is a border adjustment which would require importers to pay a tax with respect to the emissions associated with their product's production so the price is in line with that faced by domestic producers. However, trade law experts have concerns that such trade measures would be considered illegal under WTO law, but future climate agreements could still provide for them without problem as long as Parties to the Agreement voluntarily agree to forgo their WTO rights.92

[93] Congressional Budget Office (2009), "The Distributional Consequences of a Cap-and-Trade Program for CO2 Emissions", http://www.cbo.gov/ftpdocs/100xx/doc10018/03-12-ClimateChange_Testimony.pdf (accessed 3 June 2009).

[94] Congressional Budget Office (2000), "Who Gains and Who Pays Under Carbon-Allowance Trading? The Distributional Effects of Alternative Policy Designs", http://www.cbo.gov/ftpdocs/21xx/doc2104/carbon.pdf (accessed 3 June 2009).

[95] Government Accountability Office (2008), "International Climate Change Programs: Lessons Learned from the European Union's Emissions Trading Scheme and the Kyoto Protocol's Clean Development Mechanism", http://www.gao.gov/new.items/d09151.pdf (accessed 27 May 2009).

[96] Of the revenue resulting from the auctioning procedure, 52 percent would be used for the deployment of energy technologies, 18 percent for programs supporting low-income households who are most adversely affected by the rise in prices resulting from the cap (i.e. energy costs), 18 percent for the adaptation for natural resources, 5 percent for worker training, 5 percent for international projects and 2 percent for energy research and development. Accessible at: http://lieberman.senate.gov/documents/detailedacsa.pdf (accessed 27 May 2009).

[97] Pew Center on Global Climate Change (2009), "Status of Senate Bill 2191, the Lieberman-Warner Climate Security Act", http://www.pewclimate.org/docUploads/l-w-markup-12-05-2007.pdf (accessed 29 May 2009).

[98] Following the Senate vote, Time magazine reported that "It would have taken a truly great floor debate to begin resolving some of those difficult areas — a half dozen thorny deal-breakers (how to contain costs, what to do about China) that need to be figured out before any such bill can pass. But not much of that table setting took place last week, because the debate never made it past the partisan bickering and economic fear mongering. Lieberman-Warner was strangled in its crib, because moderate Democrats weren't ready to go this far, because Boxer and the enviros weren't willing to compromise on their core issues, and because the opponents of global warming legislation remain strong." "Why the climate bill failed," in: Time Magazine, 10

June 2008 (accessible at http://www.time.com/time/nation/article/0,8599,1812836,00.html (accessed 5 June 2009)).

[99] For a more detailed breakdown of the revised version of the Waxman-Markey bill, please see http://graphics.thomsonreuters.com/ce-insight/EMISSIONS-BILL-HR2454.pdf (accessed 29 May 2009)

[100] "Clearly, the Waxman-Markey bill is not equitable as it relates to allowances […] What we believe is very important is that it be equitable across all carbon sources. There needs to be some balance there […] so that you don't shift the cost to one particular source or one particular sector." "Complaints from left and right as House climate markup nears", in: New York Times, 18 May 2009, http://www.nytimes.com/gwire/2009/05/18/18greenwire-complaints-from-left-and-right-as-house-climat-19116.html (accessed 5 June 2009).

[101] See, for example, Victor, David G. and Michael W. Wara (2008), "A Realistic Policy on International Carbon Markets", Stanford University: Stanford, CA. http://www.law.stanford.edu/publications/details/4032/ (accessed 3 June 2009).

[102] For more information on the impact of recent changes to the Waxman-Markey bill, please see: Environmental Protection Agency (2009), "Ways in Which Revisions to the American Clean Energy and Security Act Change the Projected Economic Impacts of the Bill", http://www.epa.gov/climatechange/economics/pdfs/EPAMemoonHR2454.pdf (accessed 28 May 2009).

[103] Environmental Protection Agency (2009), "EPA Analysis of the Lieberman-Warner Climate Security Act of 2008", http://www.epa.gov/climatechange/downloads/s2191_EPA_Analysis.pdf (accessed 3 June 2009).

[104] An article by ClimateWire reported that "Duke Energy Corp. Chairman Jim Rogers said that prices of electricity from coal-fired generators will escalate under proposed House climate legislation if the carbon emission offsets available to the industry in the bill are cut back." Furthermore, it states "[…] concerns about offsets came as two farm groups, the National Corn Growers Association and the American Farm Bureau, sent letters to the Energy and Commerce Committee this week criticizing the bill's treatment of the agriculture sector" who want conversion of cropland to rangeland or grassland to be treated as offsets. "Lobbying: Offset angst bothers Duke Energy chairman and farm groups", accessible at: http://www.eenews.net/public/climatewire/2009/05/20/2 (accessed 5 June 2009).

[105] "House Dems Improve Climate Bill's Chances for Floor Win With Deal on Ag Issues", in: New York Times, 24 June 2009, http://www.nytimes.com/cwire/2009/06/24/24climatewire-house-dems-improve-climate-bills-chances-for-17335.html (accessed 24 June 2009).

[106] See: "Energy and Commerce 'emissaries' a key to House floor success for climate plan", in: New York Times, 22 May 2009, http://www.nytimes.com/cwire/2009/05/22/22climatewire-energy-and-commerce-emissaries-a-key-to-hous-12208.html?pagewanted=2 or "Dems weigh climate floor debate before July 4", in: New York Times, 2 June 2009, http://www.nytimes.com/cwire/2009/06/02/02climatewire-dems-weigh-climate-floor-debate-before-july-17063.html (accessed 5 June 2009).

[107] Accessible at: http://lieberman.senate.gov/documents/detailedacsa.pdf (accessed 27 May 2009).

[108] Accessible at: http://energycommerce.house.gov/Press_111/20090331/acesa_summary.pdf (accessed 28 May 2009).

[109] World Resources Institute (2009), "Brief Summary of the Waxman-Markey Discussion Draft", http://www.wri.org/stories/2009/04/brief-summary-waxman-markey-discussion-draft (accessed 3 June 2009).

[110] Accessible at: http://www.publicintegrity.org/investigations/climate_change/ (accessed 5 June 2009).

[111] For example, the Center for Public Integrity also reports that public transit advocates were almost nowhere to be found when the Senate debated climate change back in 2003. As it became clear that, in contrast to the EU-ETS, the transport sector would likely be covered by a US cap-and-trade system, transit agencies and their allies are among many new players jumping into the climate debate and that last year at least 25 transit groups, cities, and counties engaged in climate lobbying focused on public transit. Among those lobbying during the debate on the Lieberman-Warner bill in 2007, the American Public Transit Association (APTA) wanted ten percent of emissions permit revenues from the bill to be split between direct public transportation spending and a separate fund targeting projects that promote mobility and decrease emissions through a mix of transit and smart growth initiatives. Accessible at: http://www.publicintegrity.org/investigations/climate_change/articles/entry/1181/ (accessed 5 June 2009).

[112] Accessible at: http://www.airlines.org/government/testimony/2009/ATA+Responds+to+Hear-

ings+on+the+American+Clean+Energy+and+Security+Act+of+2009.htm (accessed 5 June 2009).

[113] See e.g. Mark Lazarowicz (2009), Global Carbon Trading: A Framework for Reducing Emissions, op. Cit.

[114] Mark Lazarowicz (2009), Global Carbon Trading: A Framework for Reducing Emissions (Norwich: The Stationery Office). Download available at http://www.decc.gov.uk/en/content/cms/what_we_do/change_energy/tackling_clima/emissions/emissions.aspx (accessed 28 July 2009), p. VIII.

[115] Most assume that the bottom-up approach can serve as a useful building block and stand-in for as long as a more ambitious "global deal" remains unattainable. See for example: Christian Flachsland, Robert Marschinski, Ottmar Edenhofer (2009), Global Trading versus linking: architectures for international emissions trading, Energy Policy, Vol. 37, 1637-1647, p. 1645

[116] The United Nations Framework Convention on Climate Change (UNFCCC) was concluded at the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro (Argentina) and provides the primary framework for multilateral negotiations on mitigation efforts. By June of 1992, 154 nations signed the Convention. Since then, the signatories have met annually at the Conference of Parties (COP) to discuss and assess progress toward the Convention's goals. Today, the UNFCCC has 192 signatories and four observer countries.

[117] For additional background on the UNFCCC process and convention documents, please see: http://unfccc.int/essential_background/feeling_the_heat/items/2914.php (accessed 5 May 2009).

[118] Annex I or developed countries include the European Union (separately), Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, United States of America. This list can be found at: http://www.fao.org/docrep/W4345E/w4345e0l.htm (accessed 27 April 2009).

[119] Developing countries include all countries other than developed countries, namely: all countries in Africa except South Africa, all countries in Asia except Israel and Japan, all countries in Oceania except Australia and New Zealand, and all countries in North and Central America except Canada and USA, and all countries in South America. List available at: http://www.fao.org/docrep/W4345E/w4345e0l.htm (accessed 27 April 2009).

[120] Haimeng Zhang and Sabine Wu (2009), China's Green Revolution: Prioritizing Technologies to Achieve Energy and Environmental Sustainability (McKinsey&Company), pp. 9-11.

[121] Conference of the Parties (COP) meeting archives available at: http://unfccc.int/meetings/archive/items/2749.php (accessed 29 April 2009).

[122] Commitment period between 2008-2012 to achieve emissions levels as of 1990.

[123] This section is largely derived from: Malcolm Hill (2006), The European Union's Emissions Trading Scheme: A Policy Response to the Kyoto Protocol, in Journal of Contemporary European Studies 14(3), pp. 393-410.

[124] Data available at: http://cdmpipeline.org/overview.htm (accessed 7 June 2009).

[125] Annex II countries include: the European Union separately, Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States of America.

[126] Global Carbon Project (2008) Carbon budget and trends 2007. Available at: http://www.globalcarbonproject.org/carbonbudget/07/index.htm (accessed 7 May 2009).

[127] For data on Australia, Canada, Japan, Russia, and the United States, see: Annex I Party GHG inventory submissions 2007 available at: http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/3929.php (accessed 2 July 2009).

[128] The Kyoto Protocol was ratified by the EU 15 comprised of: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the United Kingdom. Though Kyoto commitments only apply to the EU 15, aggregate EU 27 emissions are down 9.3% on 1990 levels. See European Environment Agency (2009), Annual European Community greenhouse gas inventory 1990-2007 and inventory report 2009 (Brussels: European Commission Publication Office), pp. 5-15.

[129] China's carbon emissions have risen by 150% on 1990 levels and India has seen a 103% increase according to the Global Carbon Project, data available at: Carbon Project (2008) Carbon budget and trends 2007. Avail-

able at: http://www.globalcarbonproject.org/carbonbudget/07/index.htm (accessed 2 June 2009).

[130] Energy Information Administration (2008), International Energy Annual 2006, available at: http://www.eia.doe.gov/environment.html (accessed 7 June 2009).

[131] Michael Grubb, Christiaan Vrolijk, and Duncan Brack (1999), The Kyoto Protocol: A Guide and Assessment (London: Royal Institute of International Affairs), pp. 5, 61-111.

[132] European Environment Agency (2009), Annual European Community greenhouse gas inventory 1990-2007 and inventory report 2009 (Brussels: European Commission Publication Office), p. 11.

[133] Arno Behrens, Jorge Ferrer and Christian Egenhofer (2008), Financial Impacts of Climate Change: Implications for the EU Budget, CEPS Working Document No. 300/August 2008.

[134] Indian Delegation Presentation at the Workshop on Financing under AWG-LCA held on June 5, 2008 in Bonn, Germany. The provision of new and additional financial resources.

[135] Financing to help poor and vulnerable countries adapt to the effects of climate change and to encourage technology transfer and investment in adaptive projects is, in general, currently disseminated via four funding schemes: the Least Developed Countries Fund (LDCF), the Special Climate Change Fund, the Global Environment Facility Trust Fund's Strategic Priority for Adaptation and the Adaptation Fund. The Global Environment Facility (GEF) runs the first three funds while the Adaptation Fund is that of the UNFCCC under Kyoto. (Discussion paper prepared for the Round Table on Climate Change at the Thirty-first session of IFAD's Governing Council, 14 February 2008; UNFCCC (2008), Investment and Financial Flows to Address Climate Change: an update.) The GEF estimates that its three funds, comprised of voluntary pledges and donations, amounts to a mere US$ 165 million. Meanwhile the UNFCCC's Adaptation Fund could generate between US$ 160-190 million annually if the financing proposals in place are effective, namely a 2 percent levy from CDM projects. (Oxford Energy & Environment (2007), The Nairobi Climate Change Conference: A breakthrough for adaptation funding. Available at: http://www.oxfordenergy.org/pdfs/comment_0107-1.pdf.) There is also a proposal to apply a levy on international air travel that could amount to between US$ 4-10 billion annually. ("Global Tax on Air Travel Proposed", in: New American, 15 June 2009.) However, while the Adaptation Fund looks promising, it is not yet operational and countries are in need of immediate financing. However, even if the new levy is applied to international air travel and generates its highest potential return, the Fund would still fall short of the World Bank's projections for adaptation costs per year.

[136] Various provisions of the UNFCCC obligate Annex II countries to assist developing countries in meeting adaptation costs under specific circumstances (Articles 4.3, 4.4, 4.8, 4.9 and 4.11 of the UNFCCC). Multiple sources express concern that Annex II countries are nowhere near meeting UNFCCC funding goals. Mistra, for example, a environmental research foundation, reports that only US$ 0.4 billion has been raised thus far (well under any estimate by the UNFCCC or IPCC or World Bank estimate of US$ 40 billion per year (for developing country adaptation). "Adaptation Funding: funding, responsibility, and liability," available at http://www.mistra.org/program/clipore/clipore/phase220072010/wp4developingcountryissues/45adaptationfundingfundingresponsibilityandliability.4.596dfd2811604b2cde980007559.html (accessed 1 July 2009).

[137] Questions similar to those raised about adaptation financing pervade the issue of technology transfer in the UNFCCC negotiations: namely who will finance it; at what cost; what is the framework (public, private or both) and in what combination. The Bali Action Plan, a roadmap to achieve a global deal by December 2009, discusses the serious concerns related to technology transfer, in particular, Intellectual Property Rights (IPR). However, processes remain vague and proposals are still forthcoming. This is highly problematic as technology transfer is closely tied to the success of a global deal. Effective technologies reduce the overall costs and increases capacity to reduce emissions. Granting access to technologies for developing countries while supporting competitive research and development in developed countries will require a solid framework for transfer, a transparent financial architecture and trust between country actors. (See also background paper by the International Centre for Trade and Sustainable Development (2008) Climate Change, Technology Transfer and Intellectual Property Rights, Trade and Climate Change Seminar, 18-20 June, Copenhagen, (ICTSD) background paper.)

[138] Available at: http://unfccc.int/essential_background/glossary/items/3666.php#L (accessed 2 July 2009).

[139] Carmenza Robledo and Jürgen Blaser (2008) Key Issues on Land Use, Land Use Change, and Forestry(LULUCF) With An Emphasis on Developing Country Perspectives, (United Nations Development Program), p. 7.

[140] European Communication (2009) Towards a Comprehensive Climate Agreement in Copenhagen; forests as well as soils, oceans and the atmosphere store carbon and are considered carbon sinks. Sources release more

carbon than they absorb while sinks soak up more carbon than they emit.

[141] Kowalzig (Oxfam), 2009.

[142] Alliance of Small Island States.

[143] REDD is a UN initiative reduce emissions from deforestation and forest degradation. “e UN-REDD Program is aimed at tipping the economic balance in favor of sustainable management of forests so that their formidable economic, environmental and social goods and services benefit countries, communities and forest users while also contributing to important reductions in greenhouse gas emissions.” See http://www.undp.org/mdtf/UN-REDD/overview.shtml, accessed 12 June 2009.

[144] European Commission (2008), 20 20 by 2020: Europe's climate change opportunity, p. 3. Available at: http://ec.europa.eu/commission_barroso/president/pdf/COM2008_030_en.pdf (accessed 1 July 2009).

[145] Information from the above paragraphs is drawn from: European Commission (2009), Towards a comprehensive climate change agreement in Copenhagen: Extensive Background Information and Analysis (Brussels), pp. 35-44.

[146] European Commission Press Release (2009), Recession lowers cost of EU Emissions Trading Scheme by a half.

[147] Centre d’analyse stratégique (2009), Analyse Les Ètats-Unis dans le processus de Copenhague: la tentation du leadership, pp. 2-6.

[148] See Richard Muyungi (not dated), “Climate Change Adaptation Fund: A Unique and Key Financing Mechanism for Adaptation needs in developing countries.” Accessible at: http://unfccc.int/press/news_room/newsletter/guest_column/items/4477.php (accessed 1 July 2009).

[149] See overview on Least-developed country fund at http://www.climatefundsupdate.org/listing/least-developed-countries-fund (accessed 1 July 2009).

[150] US Submission on Copenhagen Agreed Outcome, available at: http://www.state.gov/g/oes/rls/other/2009/124101.htm (accessed 6 June 2009).

[151] This excludes for example, technologies such as CCS or the use of some biofuels considered beyond commercial use in 2030.

[152] See http://www.g77.org/doc/ (accessed 1 June 2009).

[153] Meena Raman (2008), G77 and China Affirm that Climate funds should be within UNFCCC, from: Third World Network.

[154] G77 and China Affirm that Climate funds should be within UNFCCC, 9 June 2008, Meena Raman; Submission of the G77 and China Contact Group on Shared Vision, 5 December 2008.

[155] Data available at: http://cdm.unfccc.int/Statistics/Registration/AmountOfReductRegisteredProjPieChart.html (accessed 10 June 2009).

[156] United Nations Environment Program discusses National Adaptation Programs of Action (NAPA) under the Climate Change Convention. Available at: http://www.unep.org/DEC/OnLineManual/Compliance/NegotiatingMEAs/NationalImplementationPlans/Resource/tabid/627/Default.aspx (accessed 7 June 2009).

[157] Oxfam Deutschland (2009), UN Climate Negotiations in Bonn 1-12 June 2009 – Background Briefing.

[158] For a detailed discussion on the advantages of a global deal, see: Christian Flachsland, Robert Marschinski, Ottmar Edenhofer (2009), Global Trading versus linking: architectures for international emissions trading, op. cit., p. 1639-1640.

[159] S. Kerr, ed. (2000), Global Emissions Trading: Key issues for industrialized countries (Cheltenham: Edward Elgar).

[160] C Böhringer, A. Löschel (2003), Market Power and Hot Air in International Emissions Trading: The Impacts of US Withdrawal from the Kyoto Protocol, Applied Economics, Vol. 35, No. 6, 651-63.

[161] As the previous chapter has demonstrated, the current global economic crisis is already largely responsible for a postponement of the Australian ETS and has influenced the internal US debate on carbon trading.

[162] Judson Jaffe, Robert Stavins (2007), Linking Tradable Permit Systems for Greenhouse Gas Emissions: Opportunities, Implications, and Challenges, International Emissions Trading Association, p. 1.

[163] The linkage of the EU ETS with Norway, Iceland and Lichtenstein took place through the incorporation of the EU ETS Directive into the European Economic Area Agreement. Some have pointed out that it is therefore more correct to talk of a 'merging', rather than 'linking' of these different schemes. Ingvild Andreassen Sæverud, Jørgen Wettestad (2006), Norway and Emission Trading: From Global Front-Runner to EU Follower, International Environmental Agreements, Vol. 6, No. 1.

[164] Switzerland is one of the countries that has been in contact with the European Commission and is expected to establish a link between its domestic ETS and the EU ETS after 2010.

[165] For some examples, see: Mark Lazarowicz (2009), Global Carbon Trading: A Framework for Reducing Emissions, op. Cit.; Michael Mehling (2009), Global Carbon Market Institutions: An Assessment of Governance Challenges and Functions in the Carbon Market (London: Climate Strategies); Andreas Tuerk (2009), Linking Emissions Trading Schemes, Climate Strategies, May 2009; Christian Flachsland, Robert Marschinski, Ottmar Edenhofer (2009), "Global trading versus linking: Architectures for international emissions trading," Energy Policy, Vol. 37; Wolfgang Sterk, Michael Mehling, Andreas Tuerk (2009), "Prospects of linking EU and US Emission Trading Schemes: Comparing the Western Climate Initiative, the Waxman-Markey and the Lieberman-Warner Proposal, Climate Strategies, April 2009; Christian Flachsland, et al. (2008), Developing the International Carbon Market: Linking Options for the EU ETS, Potsdam Institute for Climate Impact Research, May 2008.

[166] Jane Ellis, Dennis Tirpal (2006), Linking GHG Emission Trading Schemes and Markets (Paris: OECD), p. 29.

[167] One exemption is a study by the Potsdam Institute for Climate Change, considering the potential role of the International Carbon Action Partnership (ICAP). Christian Flachsland, et al. (2008), Developing the International Carbon Market: Linking Options for the EU ETS, Potsdam Institute for Climate Impact Research, May 2008.

[168] For a standard description of linkage see: Judson Jaffe, Robert Stavins (2007), Linking Tradable Permit Systems for Greenhouse Gas Emissions: Opportunities, Implications, and Challenges, op cit., p. 11-14.

[169] According to one recent assessment, linking the EU ETS to Canada, Japan and the Former Soviet Union total EU compliance costs can be reduced by more than 60%. Expanding this linkage to include the USA and Australia, could reduce compliance costs by a further 30%. Niels Angers (2008), Emissions Trading beyond Europe: Linking schemes in a post-Kyoto World, Energy Economics, Vol. 30, p. 2046.

[170] Andreas Tuerk, et al. (2009), Linking Emissions Trading Schemes, op. cit., p. 5.

[171] Judson Jaffe, Robert Stavins (2007), Linking Tradable Permit Systems for Greenhouse Gas Emissions: Opportunities, Implications, and Challenges, op cit, p. 18-20.

[172] Judson Jaffe, Robert Stavins (2007), Linking Tradable Permit Systems for Greenhouse Gas Emissions: Opportunities, Implications, and Challenges, op. cit., p. 17.

[173] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowances trading within the Community and amending Council Directive 96/61/EC.

[174] Directive 2004/101/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanism.

[175] The US ACESA bill and the Australian Emissions Trading System contain similar provisions for linkage.

[176] European Commission (2009), Towards a comprehensive climate change agreement in Copenhagen, COM(2009) 39final.

[177] International Carbon Action Partnership (2007), Political Declaration, Lisbon, 29 October 2007; On ICAP see also Christian Flachsland, et al. (2008), Developing the International Carbon Market: Linking Options for the EU ETS, Potsdam Institute for Climate Impact Research, May 2008.

[178] European Com Christian Flachsland, et al. (2008), Developing the International Carbon Market: Linking Options for the EU ETS, Potsdam Institute for Climate Impact Research, May 2008; European Commission (2009), Towards a comprehensive climate change agreement in Copenhagen, COM (2009) 39final, p. 11.

[179] Zaki Laïdi (2008), Norms over Force: The Enigma of European Power (London: Palgrave Macmillan).

[180] Andreas Tuerk (2009), Linking Emissions Trading Schemes, Climate Strategies, May 2009; Christian Flachsland, Robert Marschinski, Ottmar Edenhofer (2009), "Global trading versus linking: Architectures for international emissions trading," Energy Policy, Vol. 37; Wolfgang Sterk, Michael Mehling, Andreas Tuerk (2009),

"Prospects of linking EU and US Emission Trading Schemes: Comparing the Western Climate Initiative, the Waxman-Markey and the Lieberman-Warner Proposal, Climate Strategies, April 2009; Christian Flachsland, et al. (2008), Developing the International Carbon Market: Linking Options for the EU ETS, Potsdam Institute for Climate Impact Research, May 2008; M.J. Mace, et al. (2008), Analysis of the legal and organizational issues arising in linking the EU Emissions Trading Scheme to other existing and emerging emissions trading scheme, World Resource Institute; Judson Jaffe & Robert Stavins (2007), Linking Tradable Permit Systems for Greenhouse Gas Emissions: Opportunities, Implications, and Challenges, IETA Report; Niels Anger (2007), "Emissions trading beyond Europe: Linking schemes in a post-Kyoto world," Energy Economics, Vol. 30.

[181] According to a recent report by Climate Strategies, "even if the new Waxman-Markey draft clearly improves the prospects for transatlantic linking, any full bilateral link between the EU and the US is probably still some time away." Wolfgang Sterk, Michael Mehling, Andreas Tuerk (2009), "Prospects of linking EU and US Emission Trading Schemes: Comparing the Western Climate Initiative, the Waxman-Markey and the Lieberman-Warner Proposal, Climate Strategies, April 2009, p. 31.

[182] M.J. Mace, et al. (2008), Analysis of the legal and organizational issues arising in linking the EU Emissions Trading Scheme to other existing and emerging emissions trading scheme, World Resource Institute, p. 51.

[183] Even without linkage these 'outflows' to acquire carbon offsets are considerable, with Germany and the UK likely transferring some €3 billion and €2 billion each to developing countries during EU ETS II (See Sandbag (2009), ETS SOS: Why the Flagship 'EU Emissions Trading Policy' Needs Rescuing, op. Cit.

[184] Carsten Helms (2003), "International emissions trading with endogenous allowance choices, journal of Public Economics," Vol. 87; Katrin Rehdanz, Richard Tol (2005), "Unilateral Regulation of Bilateral Trade in Greenhouse Gas Emission Permits," Ecological Economics, Vol. 54.

[185] Banking allows companies to safe unused allowances for coming years, while borrowing allows them to borrow against future savings. Unconstrained borrowing against undefined trading periods can be problematic and creates pressure on lobbying on future caps. Linking between two systems with different borrowing rules can therefore also be an obstacle for engaging into linkage. M.J. Mace, et al. (2008), Analysis of the legal and organizational issues arising in linking the EU Emissions Trading Scheme to other existing and emerging emissions trading scheme, World Resource Institute, p. 56.

[186] The report also predicts that a price level of €60-90 is needed to bring CCS to the development/demonstration stage. See: McKinsey & Company (2009), "Carbon Capture & Storage: Assessing the Economics, McKinsey & Company.

[187] According to the Kyoto Protocol CDM is assigned two different objectives: It is supposed to 'assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments," and it is supposed to "assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objectives of the Convention."

[188] M.J. Mace, et al. (2008), Analysis of the legal and organizational issues arising in linking the EU Emissions Trading Scheme to other existing and emerging emissions trading scheme, op cit., p. 62-66.

[189] Benito Müller (2009), Additionality in the Clean Development Mechanism: Why and What, Oxford Institute for Energy Studies, EV 44, March 2009.

[190] As will be shown below, entitlement rules tend to differ under existing systems. Thus while the US ACESA bill allows 100% of emissions reductions to be achieved through offset credits, the EU ETS set a firm limit on no more than 50% of reductions that is likely to be reduced even further.

[191] For an overview, see M.J. Mace, et al. (2008), Analysis of the legal and organizational issues arising in linking the EU Emissions Trading Scheme to other existing and emerging emissions trading scheme, World Resource Institute, p. 66-71.

[192] According to a recent forecast by New Carbon Finance the impact of the financial crisis has cut the collective cost of reaching the EU's 20% target by 2020 from $309 billion in June last year, to $152 billion this year. Similarly, the cost of achieving a 30% reduction by 2020 have been reduced from $408 billion last year to $205 billion now. New Carbon Finance (2009), "Recession lowers cost of EU Emission Trading Scheme by half," Press Release, 20 March 2009.

[193] European Commission (2008) Joint Impact Assessment on the Package of Implementation measures for the EU's objectives on climate change and renewable energy for 2020, SEC(2008) 85/3, p. 7.

[194] New Carbon Finance (2009), "Recession lowers cost of EU Emission Trading Scheme by half," Press Release,

20 March 2009; Michael Grubb (2009), Carbon Prices in Phase III of the EU ETS, Climate Strategies Briefing Note; Carbon Trust (2008), Cutting Carbon in Europe: the 2020 package, London: Carbon Trust; Environmental Protection Agency (2009), "Ways in Which Revisions to the American Clean Energy and Security Act Change the Projected Economic Impacts of the Bill," 20 April 2009.

[195] LULUCF is an abbreviation used by the UN to designate "land use, land use change and forestry." European countries have so far rejected to accept LULUCF as part of carbon offset, due to the notorious difficult of measuring the real carbon reduction brought about by the use of LULUCF measures.

[196] Wolfgang Sterk, Michael Mehling, Andreas Tuerk (2009), "Prospects of linking EU and US Emission Trading Schemes: Comparing the Western Climate Initiative, the Waxman-Markey and the Lieberman-Warner Proposal, Climate Strategies, April 2009, p. 31.

[197] Wolfgang Sterk, Michael Mehling, Andreas Tuerk (2009), "Prospects of linking EU and US Emission Trading Schemes: Comparing the Western Climate Initiative, the Waxman-Markey and the Lieberman-Warner Proposal, Climate Strategies, April 2009; Andreas Tuerk (2009), Linking Emissions Trading Schemes, Climate Strategies, May 2009.

[198] Daniel S. Hall, et al. (2008), Policies for Developing Country Engagement, Discussion Paper 08-15, October 2008, p. 10-12; Michael W. Wara, David G. Victor (2008), A Realistic Policy on International Carbon Offsets, Program for Energy and Sustainable Development, Working Paper, No. 74.

[199] For a standard overview of the CDM and its development, see: Franck Lecocq, Philippe Ambrosi (2007), "The Clean Development Mechanism: History, Status, and Prospects," Review of Environmental Economics and Policy, Vol.1, No. 1.

[200] There are some indicators that DOEs have performed with only mixed results. See: Lambert Schneider, Lennart Mohn (2009), A Rating of Designates Operational Entities Accredited under the Clean Development Mechanism, Berlin: Oeko Institute, 27 May 2009.

[201] UNFCCC, CDM Statistics, accessible at http://cdm.unfccc.int/Statistics/index.html (accessed 8 June 2009). In comparison, according to the UNEP Risoe CDM/JI Pipeline Analysis and Database, there are currently only about 200 JI projects in the pipeline. UNEP Risoe CDM/JI Pipeline Analysis and Database, accessible at: http://cdmpipeline.org/ji-projects.htm (accessed 8 June 2009).

[202] According to the WB, in 2008 primary CDM transactions have been worth $6.5 billion (down 12.3% from the previous year), while trading in the secondary CDM market had significantly increased to $26.3 billion. Karan Capoor, Philippe Ambrosi (2009), State and Trend of the Carbon Market 2009, Washington, DC.: World Bank, p. 20 & 38.

[203] For some estimates of the growth of CER markets, see: Energy Research Center of the Netherlands (2007), Carbon credit supply potential beyond 2012: a bottom-up assessment of mitigation options, Joint Report with PointCarbon & ECOFYS, November 2007, p. 77.

[204] Adapted from Karan Capoor, Philippe Ambrosi (2009), State and Trend of the Carbon Market 2009, op cit., p. 31.

[205] Michael W. Wara, David G. Victor (2008), A Realistic Policy on International Carbon Offsets, Program for Energy and Sustainable Development, op cit., p. 18.

[206] Daniel S. Hall, et al (2008), Policies for Developing Country Engagement, The Harvard Project on International Climate Change, October 2008, p.12.

[207] Some analysts have been quick to point out that considerable bottlenecks exist within the EB when it comes to the issuing of actual credits. Thus by early 2008, the EB had only managed to issue some 130 million CERs over a period of two years. According to Wara and Victor, this means that "assuming the proportions of project types stay about the same, the actual rate of issuance by the CDM EB is only about 1% to 2% of the actual rate needed to issue all the CERs in the CDM pipeline in a timely manner." Michael W. Wara, David G. Victor (2008), A Realistic Policy on International Carbon Offsets, Program for Energy and Sustainable Development, op cit., p. 16.

[208] European Commission (2009), Towards a comprehensive climate change agreement in Copenhagen, op. cit.

[209] Judson Jaffe & Robert Stavins (2007), Linking Tradable Permit Systems for Greenhouse Gas Emissions: Opportunities, Implications, and Challenges, op cit., p. 28

[210] Ibid, p. 28.

[211] Christian Flachsland, Robert Marschinski, Ottmar Edenhofer (2009), Global Trading versus linking: architectures for international emissions trading, Energy Policy, Vol. 37, 1637-1647, p. 1642.

[212] International Rivers Alliance (2009), Initial Analysis of Offsets Provisions in the Draft of the American Clean Energy and Security Act (ACESA), 15 April 2009, p. 3.

[213] European Commission (2009), Emission Trading: EU ETS emissions fall 3% in 2008, 15 May 2008; According to the EU reform proposal, adopted… offsets should not exceed 3% of allowances. In October 2008, the European Parliament adopted a resolution calling for this margin to be increased to 4%. However the European Parliament resolution is non-binding and a final offset target is likely to only be negotiated as part of the Copenhagen summit. European Commission (2008), Proposal for a Directive of the European Parliament and the European Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading system of the Community, COM(2008) 16final.

[214] Energy Research Center of the Netherlands (2007), Carbon credit supply potential beyond 2012: a bottom-up assessment of mitigation options, Joint Report with PointCarbon & ECOFYS, November 2007.

[215] William Blyth (2008), Linking Carbon Markets and Technology Support Mechanisms: Making Sense of the EU Climate Package, EEDP Programme Paper, 08/01.

[216] M. Bossi, J. Ellis (2005), Exlporing Options for Sectoral Crediting Mechanisms, COM/ENV/EPOC/IEA/SLT, Paris: OECD; UNFCCC (2008), Analysis of possible means to reach emission reduction targets and of relevant methodological issues, FCCC/TP/2008/2; Jake Schmidt, et al (2008), Sector-based approach to the post-2012 climate change policy architecture, Climate Policy, Vol. 8, 494-515; Akihirio Sawa (2008), A Sectoral Approach as an Option for a post-Kyoto Framework?, December 2008, The Harvard Project on International Climate Agreements, Discussion Paper 08-23.

[217] Jake Schmidt, et al (2008), Sector-based approach to the post-2012 climate change policy architecture, op cit., p. 496.

[218] Environmental Defense (2007), CDM and the Post-2012 Framework, Discussion Paper, 27-31 August 2007, Vienna AWG/Dialogue.

[219] European Commission (2009), Towards a comprehensive climate change agreement in Copenhagen, op. cit., p. 11.

[220] Daniel S. Hall, et al (2008), Policies for Developing Country Engagement, p. 14.

[221] World Bank (2005), Programmatic CDM project activities: eligibility, methodological requirements and implementation, Washington DC: World Bank; Miriam Hinostroza, et al (2007), Potentials and barriers for end-use energy-efficiency under programmatic CDM, CD4CDM Working Paper Series, Working Paper, No. 3, September 2007, UNEP/RISO Center.

[222] Christiana Figueres (2008), Programmatic CDM: Regulatory Hurdles that can be overcome, September 2008, available at: http://figueresonline.com/publications/PoA%20paper%20for%20IETA.pdf, accessed on 23 June 2009.

[223] Jane Ellis (2006), Issues related to implementing “programmatic CDM”, OECD/IEA Project for the Annex I Expert Group on the UNFCCC, 8 March 2006.

[224] World Bank (2009), State and Trends of the Carbon Market 2009, op. Cit., p.50.

[225] See McKinsey & Company (2008), Carbon Capture & Storage: Assessing the Economics (McKinsey & Company) (accessible at www.mckinsey.com/clientservice/ccsi/pdf/CCS_Assessing_the_Economics.pdf, accessed 1 June 2009).

[226] See discussion in chapter 2.3.1. See also Sandbag (2009), ETS SOS: Why the Flagship ‘EU Emissions Trading System” Needs Rescuing (London: Sandbag).

[227] ICF (2009), European Power and Carbon Markets Outlook (European Outlook) (New York: ICF).

[228] This section draws on IEA (2007), Climate Policy Uncertainty and Investment Risk (Paris: IEA).

[229] A.K. Dixit and R.S. Pindyck (1994), Investment under Uncertainty (New Jersey: Princeton University Press); L. Trigeorgis (1996), Real Options: Managerial flexibility and strategy in resource allocation (Boston: MIT Press).

[230] While the standard view on investment uncertainty is most widely accepted, it should also be noted that it

has at times been contested. Thus, there are studies that have shown that under perfect competition and constant returns to scale as well as symmetric adjustment costs, an increase in uncertainty may also raise the value of a marginal unit of capital and hence the incentive to invest (see A.B. Abel (1983), Optimal Investment under Uncertainty, American Economic Review, Vol. 73, 228-233; R. Hartman (1972), The effects of price and cost uncertainty on investment, Journal of Economic Theory, Vol. 5, 258-266). Others have pointed out that the decision to invest not only sacrifices a waiting option, but also holds a reward from the implicit acquisition of future development options (see H.T.J. Smit, L. Trigeorgis (2004), Real Options and Investment under Uncertainty, Boston: MIT Press). An increase in uncertainty affects both of these options and therefore has to be balanced.

[231] See IEA (2007), Climate policy uncertainty .and investment risk, op. Cit., for the following discussion.

[232] To be sure, while the establishment of a national trading regime would seem a logical step to fulfill obligations under any potential Kyoto II regime, it would not be the only potential way for countries to fulfill their commitments.

[233] See for the further development of such proposals Michael W. Wara and David G. Victor, A Realistic Policy on International Offsets, op. Cit.

[234] See also Jan Martin Witte (2009), State and Trends of Public Energy R&D. GPPi Policy Paper Series No. 4 (June).

[235] William Blyth (2008), Linking carbon markets and technology support mechanisms: Making sense of the EU Climate Change Package. Chatham House EEDP Programme Paper 08/01, p.8.

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