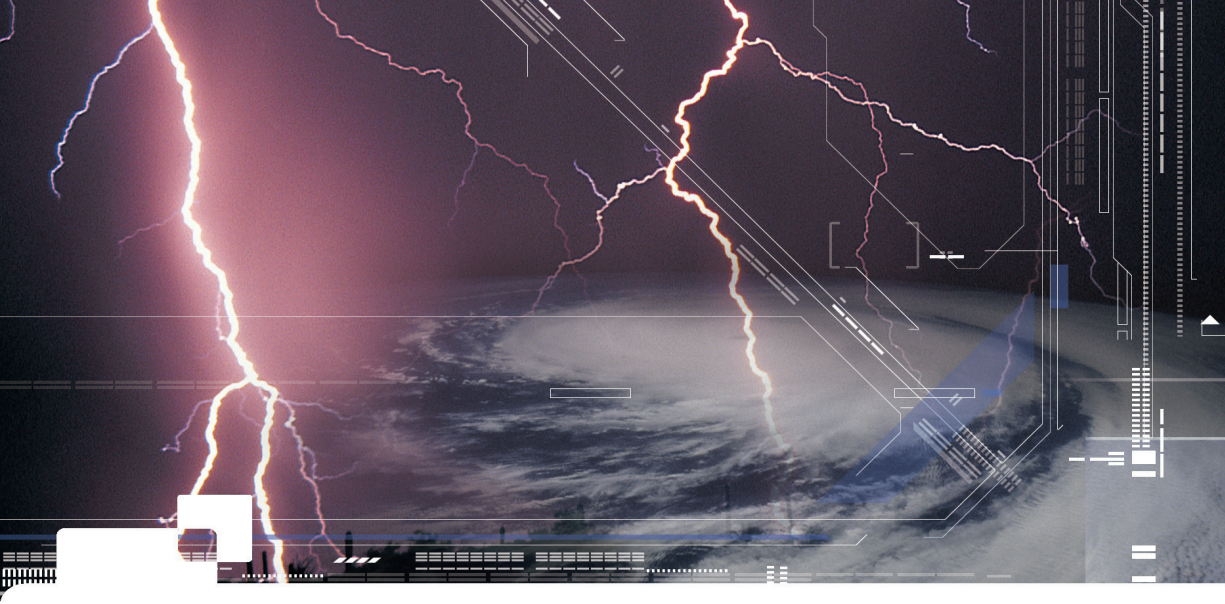

Beyond Copenhagen:

A climate policymaker's handbook

Edited by Juan Delgado and Stephen Gardner

BRUEGEL BOOKS

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Towards a post-Kyoto international climate-policy regime

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Global climate change is the ultimate global-commons problem: because greenhouse gases (GHGs) mix uniformly in the upper atmosphere, damage is completely independent of the location of emissions sources. Thus, a multi-national response is required. The greatest challenge lies in designing an international policy architecture that can guide such efforts.

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) marked the first meaningful attempt by the community of nations to curb GHG emissions. This agreement, though a significant first step, is not sufficient for the longer-term task ahead. Some observers support the policy approach embodied in Kyoto and would like to see it extended – perhaps with modifications – beyond the first commitment period, which ends in 2012. Others maintain that a fundamentally new approach is required.

Whether one thinks the Kyoto Protocol was a good first step or a bad first step, everyone agrees that a second step is required for the post-2012 period. The Harvard Project on International Climate Agreements was launched with this imperative in mind[24]. The project is a global, multi-year, multi-disciplinary effort intended to help identify the key design elements of a scientifically sound, economically rational and politically pragmatic post-2012 international policy

architecture for addressing the threat of climate change.

Principles for an international agreement

A set of core principles emerges from the diverse strands of research of the Harvard Project. These principles constitute the fundamental premises that underlie various proposed policy architectures and design elements; as such they can provide a reasonable point of departure for ongoing international negotiations.

First, because climate change is a global-commons problem, cooperation among countries is essential, whether through the UNFCCC; smaller, key coalitions such as the Group of 20 nations (G20); or bilateral negotiations. Furthermore, since sovereign nations cannot be compelled to act, treaties must create incentives both for participation and compliance.

Second, a credible climate change agreement must be equitable. Industrialised nations should accept responsibility for historic emissions, while emerging economies need to take on increasingly meaningful roles over time. In both cases, the scope of attention and action should include all GHGs, not only fossil carbon dioxide (CO_2).

Third, a credible agreement must be cost-effective, and therefore needs to bring about technological change and transfer. In addition, it must be consistent with the international trade regime. Fourth and finally, a credible agreement must be practical and realistic. It should build on existing institutions and practices, where possible, and negotiations should attend both to short-term achievements and long-term goals. Finally, since no single approach guarantees a sure path to ultimate success, it is best to pursue multiple approaches simultaneously.

Promising international climate-policy architectures

The decision to adopt a particular architecture is ultimately a political one, which

must be reached by the nations of the world, taking into account a complex array of factors. In this chapter, we highlight just two potential architectures, each with advantages as well as disadvantages. Each is promising in some regards, and also raises key issues for consideration.

Formulas for evolving emission targets for all countries

This first option offers a centralised framework of formulas that yield numerical emissions targets for all countries up to the end of this century (Frankel 2008). National and regional cap-and-trade systems for greenhouse gases would be linked in a way that would allow trading across firms and sources (Jaffe and Stavins 2008). Such a global trading system would be roughly analogous to the system already established in the European Union, where sources rather than nations engage in trading (Ellerman 2008).

The formulas are based on what is possible politically, given that many of the usual science- and economics-based proposals for future emission paths are not dynamically consistent – that is, future governments will not necessarily abide by commitments made by today's leaders. Several researchers have observed that when participants in the policy process discuss climate targets, they typically pay little attention to the difficulty of finding mutually acceptable ways to share the economic burden of emission reductions (Bosetti *et al*, 2008, Jacoby *et al*, 2008).

This formula-based architecture is premised on four important political realities. First, the US may not commit to quantitative emission targets if China and other major developing countries do not commit to quantitative targets at the same time. Second, China and other developing countries are unlikely to make sacrifices different in character from those made by richer countries that have gone before them. Third, in the long run, no country can be rewarded for having 'ramped up' its emissions well above 1990 levels. Fourth, no country will agree to bear excessive cost. Harstad (2008) adds that use of formulas can render negotiations more effective.

Through negotiation, an international agreement would establish a formula which assigns quantitative emissions limits to countries in every year up to 2100. The formula incorporates three elements: a progressivity factor, a latecomer catch-up factor, and a gradual equalisation factor. The progressivity factor requires richer countries to make more severe cuts relative to their business as usual emissions. The latecomer catch-up factor requires nations that did not agree to binding targets under the Kyoto Protocol, or that did not comply with their Kyoto targets, to make gradual reductions to account for their additional emissions since 1990. This will prevent latecomers from being rewarded with more generous targets, and will avoid incentives for countries to ramp up their emissions before signing the agreement. Finally, the gradual equalisation factor moves national *per-capita* emissions in the direction of the global average of *per-capita* emissions in the second half of the century[25].

The caps set for rich nations would require them to undertake immediate abatement measures. Developing countries would not bear any cost in the early years, nor would they be expected to make any sacrifice that is different from the sacrifices made by industrialised countries, accounting for differences in income. Developing countries would be subject to binding emission targets that would follow their business as usual (BAU) emissions in the next several decades[26]. National emission targets for developed and developing countries alike would not cost more than one percent of GDP in present-value terms, nor more than five percent of GDP in any single year.

Every country under this proposal is given reason to feel that it is only doing its fair share. The basic architecture of this proposal – a decade-by-decade sequence of emission targets determined by a few principles and formulas – is flexible enough that it can accommodate major changes in circumstances during the course of the century.

Linkage of national and regional tradable permit systems

A new international policy architecture may be evolving on its own, based on the reality that tradable permit systems, such as cap-and-trade systems, are emerging worldwide as the favoured national and regional approach (Jaffe and Stavins 2008). Prominent examples include the EU's emissions trading system (EU ETS); the Regional Greenhouse Gas Initiative in the northeastern US; and systems in Norway, Switzerland and others; plus the existing global emission-reduction-credit system, the Clean Development Mechanism (CDM). Moreover, cap-and-trade systems are emerging in Australia, Canada, Japan, New Zealand, and the US.

The proliferation of cap-and-trade systems and emission-reduction-credit systems around the world has generated increased attention and increased pressure – both from governments and from the business community – to link these systems. By linkage, we refer to direct or indirect connections between and among tradable permit systems through the unilateral or bilateral recognition of allowances or permits.

Linkage produces cost savings in the same way that a cap-and-trade system reduces costs compared to a system that separately regulates individual emission sources – that is, it substantially broadens the pool of lower-cost compliance options available to regulated entities. In addition, linking tradable permit systems at the country level reduces overall transaction costs, reduces market power, and reduces overall price volatility.

There are also some legitimate concerns about linkage. Most important is the automatic propagation of programme elements that are designed to contain costs, such as banking, borrowing, and safety-valve mechanisms. If a cap-and-trade system with a safety valve is directly linked to another system that does not have a safety valve, the result will be that both systems now share the safety valve. Given that the EU has opposed a safety valve in its emissions trading scheme, while it appears possible that such a mechanism may be included in a future US

emissions trading system, concern about the automatic propagation of cost-containment design elements is important.

However, there are ways to gain the benefits of linkage without the downside of having to harmonise systems in advance. If two cap-and-trade systems both link with the same emission-reduction-credit system, such as the CDM, then the two cap-and-trade systems are indirectly linked with one another. All of the benefits of linkage occur: the cost-effectiveness of both cap-and-trade systems is improved and both gain from more liquid markets that reduce transaction costs, market power, and price volatility. At the same time, the automatic propagation of key design elements from one cap-and-trade system to another is much weaker when the systems are only indirectly linked through an emission-reduction-credit system.

Such indirect linkage through the CDM is already occurring, because virtually all cap-and-trade systems that are in place, as well those contemplated, allow for CDM offsets to be used (at least to some degree) to meet domestic obligations. Thus, indirectly linked, country- or region-based cap-and-trade systems may already be evolving into the *de-facto*, if not the *de-jure*, post-Kyoto international climate-policy architecture.

A post-2012 international climate agreement could include several elements that would facilitate future linkages among cap-and-trade and emission-reduction-credit systems (Jaffe and Stavins 2008). For example, it could establish an agreed trajectory of emissions caps (Frankel 2008) or allowance prices, specify harmonised cost-containment measures, and establish a process for making future adjustments to key design elements. It could also create an international clearing house for transaction records and allowance auctions, provide for the ongoing operation of the CDM, and build capacity in developing countries. If the aim is to facilitate linkage, a future agreement should also avoid imposing 'supplementarity' restrictions that require countries to achieve some specified percentage of emission reductions domestically.

Conclusion

Great challenges confront the community of nations seeking to establish an effective and meaningful international climate regime for the post-2012 period. But some key principles and promising policy architectures have begun to emerge.

Climate change is a global-commons problem, and therefore a cooperative approach involving many nations will be necessary to address it successfully. Since sovereign nations cannot be compelled to act against their wishes, successful treaties must create adequate internal incentives for compliance, along with external incentives for participation. A credible global climate change agreement must be: equitable; cost-effective; able to facilitate significant technological change and technology transfer; consistent with the international trade regime; practical, in the sense that it builds – where possible – on existing institutions and practices; attentive to short-term achievements, as well as medium-term consequences and long-term goals; and realistic. Because no single approach guarantees a sure path to ultimate success, the best strategy may be to pursue a variety of approaches simultaneously.

The Harvard Project on International Climate Agreements does not endorse a single international climate-policy architecture. In this chapter, we have highlighted two potential frameworks among many for a post-Kyoto agreement. Each is promising in some regards and raises important issues for consideration. One calls for emissions caps established using a set of formulas that assign quantitative emissions limits to countries up to 2100. These caps would be implemented through a global system of linked national and regional cap-and-trade programmes that would allow for trading among firms and sources. Second, we discussed an architecture that – at least in the short term – links national and regional tradable-permit systems only indirectly, through the global CDM. We highlight this option less as a recommendation and more by way of recognising the structure that may already be evolving as part of the *de-facto* post-Kyoto international climate policy architecture.

Notes

1 This chapter discusses some of the issues raised at several events held at Bruegel during 2008 and 2009 on the shaping of a global climate agreement. The note does not however represent the views of participants. Special thanks to Stephen Gardner for fruitful discussion and help in preparing this chapter.

2 Put in place after the United Nations COP13 meeting in Bali, Indonesia, December 2007. See: http://unfccc.int/files/meetings/cop_13/application/pdf/cp_bali_act_p.pdf

3 REACH (registration, evaluation and authorisation of chemicals) requires all chemicals manufactured in or imported into the EU to be screened for impacts on health and the environment. REACH is administed by the European Chemicals Agency. See: http://echa.europa.eu/

4 The EU strategic energy technologies action plan (SET-Plan) is a strategic initiative designed to accelerate the development and deployment of cost-effective low carbon technologies. The plan includes measures relating to planning, implementation, resources and international cooperation in the field of energy technology. It was published in 2007 ('A European strategic energy technology plan (SET Plan) – towards a low carbon future', COM (2007) 723).

5 Acemoglu *et al* (2009) show how endogenous innovation and directed technical change can make compatible sustained growth and the need to avoid climate change. Acemoglu *et al* (2008) argue that by taxing 'dirty' technologies, one directs innovation investment towards clean technologies, with no necessary effect on the overall rate of innovation. In the long-run, such tax might raise growth since it would eliminate the negative impact on growth of catastrophic events associated to the dirty technology. The tax would obviously not be costless and would reduce current output. The tax does not need to be permanent: temporary taxation could be sufficient to induce the use of green technologies, changing the growth path but not affecting the growth rate.

6 The Stern Review on the Economics of Climate Change (Stern, 2007) was published in October 2006 by the British government.

7 '...rising to 30 percent if there is an international agreement committing other developed countries to comparable emission reductions and economically more advanced developing countries to contributing adequately according to their responsibilities and respective capabilities' (European Commission, 2008).

8 'Member States would also have access to CDM credits covering almost one third of their reduction effort' (ibid).

9 The EU has called for China and other emerging economies to reduce emissions by up to 30 percent compared to business as usual. See European Commission (2009).

10 On the choice of instruments, see Hepburn, in Helm and Hepburn (2009).

11 Stern (2007), but see also Helm (2008a).

12 In technical terms, this is a partial Roberts and Spence hybrid scheme (Roberts and Spence, 1976).

13 For a proposed way forward, see Helm (2008b).

14 It is already apparent that there are considerable political pressures to weaken the EU Large Combustion Plant Directive (2001/80/EC) so that the life of existing coal power stations can be extended. The UK has now announced a significant expansion of coal, most of which will be unabated for a decade. See Miliband (2009).

15 China and India have populations of around 1.3 billion and 1.15 billion people respectively, and these populations are expected to grow significantly by 2050. Adding in a further billion for Africa gives more extra people by 2050 than the entire world population in 1950. See IEA, 2008, table 5.1, p. 125.

16 The European Commission published on 19 May 2009 a call for proposals for CCS and offshore wind projects, to be financed from an EU economic stimulus budget, see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:114:0010:0010:EN:PDF

17 The EU ETS was established as the main mechanism to ensure that the EU as a whole keeps to its Kyoto Protocol commitments.

18 Neither Cyprus nor Malta are Annex I signatories of the Kyoto Protocol.

19 The Fourteenth Conference of the Parties (COP14) to the United Nations Framework Convention on Climate Change (UNFCCC), December 2008.

20 This chapter is part of the research work being carried out by the Sustainable Development Programme of the Fondazione Eni Enrico Mattei. The authors are grateful to the OECD for financial support.

21 The two scenarios are detailed in OECD (2008). In the first, the deployment of CCS and

nuclear energy is limited by political considerations, availability of sites, and environmental concerns. In the second, costly R&D investments and learning-by-doing reduce the cost of new carbon-free technologies, which therefore penetrate the market by mid-century.

22 US President Obama recently committed to R&D tax exemptions and an additional investment of US$ 1.2 billion in basic energy-related research, see http://news.cnet.com/8301-11128_3-10202041-54.html.

23 Given the high stakes at play, such benefits might still be significant, and exceed US$ 1 trillion.

24 This chapter draws upon the Interim Report of the Harvard Project on International Climate Agreements (Aldy and Stavins, 2008), and as such we are indebted to the project's 26 research teams, whose work is documented in our book (Aldy and Stavins, 2009). The project grew from our earlier book, Architectures for Agreement: Addressing Global Climate Change in the Post-Kyoto World (Aldy and Stavins, 2007).The Doris Duke Charitable Foundation has provided major funding for the project, with additional support from Christopher Kaneb, the James and Cathleen Stone Foundation, Paul Josefowitz and Nicholas Josefowitz, the Enel Endowment for Environmental Economics at Harvard University, the Belfer Center for Science and International Affairs at the Harvard Kennedy School, and the Mossavar-Rahmani Center for Business and Government at the Harvard Kennedy School.

25 This is similar to Cao's (2008) 'global development rights' (GDR) burden-sharing formula and is consistent with calls for movement toward *per capita* responsibility by Agarwala (2008). On the other hand, it contrasts with the analyses of Jacoby *et al* (2008) and Posner and Sunstein (2008).

26 Somanathan (2008) argues against including developing countries in the short term, even with targets equivalent to business as usual.