

## CLIMATE CHANGE

# Climate Negotiators Create an Opportunity for Scholars

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The 1992 United Nations Framework Convention on Climate Change (UNFCCC) launched a process to confront risks posed by global climate change. It has led to a dichotomy between countries with serious emission-reduction responsibilities and others with no responsibilities whatsoever. This has prevented progress, but recent talks suggest the prospect for a better way forward and an openness to outside-the-box thinking. Scholars and practitioners have a new opportunity to contribute innovative proposals for a future international climate policy architecture.

## Beyond a Dichotomous Distinction

Article 3 of the 1992 UNFCCC established a key principle: “The Parties should protect the climate system ... on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead ...” (1). As a result, the UNFCCC explicitly recognized that developed countries should “take immediate action” as “a first step towards comprehensive strategies” to address climate change (2). This differentiation in action dates back, in some form, at least to the 1972 Stockholm Declaration on the Human Environment and was incorporated in the 1992 Rio Declaration on Environment and Development.

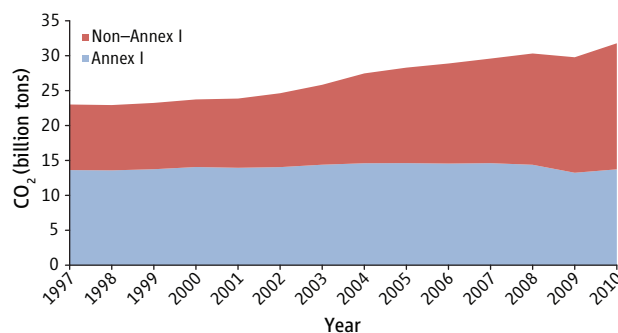
In the first decision of the first Conference of the Parties (COP-1) of the UNFCCC, the global community agreed to the Berlin Mandate, which interpreted “common but differentiated responsibilities” in which “developed country Parties” (also known as Annex I countries) alone are to take on emission-reduction responsibilities. The Berlin Mandate, codified with numerical national targets and timetables for Annex I countries in the 1997 Kyoto Protocol, produced a dramatic gap between rhetoric and reality. By the time of the Berlin Mandate, non-Annex I countries’ annual greenhouse gas emissions



**Negotiating political architecture.** Both developed and developing countries need to be engaged in emission reduction initiatives.

surpassed those of Annex I countries (3). By 2005, when the Kyoto Protocol entered into force, per capita fossil fuel carbon dioxide emissions of nearly 50 non-Annex I countries exceeded those of the Annex I country with the lowest per capita measure (4) (see the chart). Further, the six largest greenhouse gas emitters are not constrained by the Kyoto Protocol, because of lack of commitments (China, Indonesia, Brazil, and India), the nonbinding nature of its emission commitment (Russia), or failure to ratify the agreement (United States).

The dichotomous structure effectively quadruples the global cost of emission abatement necessary to stabilize atmospheric con-



**Annex I and non-Annex I fossil fuel carbon dioxide emissions, 1997–2010.** Since the 1997 Kyoto Conference, Annex I countries’ emissions of fossil fuel–based carbon dioxide have remained level while non-Annex I countries’ emissions have nearly doubled and stood nearly one-third greater than developed countries’ emissions in 2010. This gap is likely wider when accounting for all greenhouse gas emissions. Data from U.S. Energy Information Administration (4). See supplementary materials for details.

Research must address how developed and developing countries can both contribute to emissions reduction.

centrations of greenhouse gases relative to a cost-minimizing scenario that includes emission abatement by all nations (5). The Kyoto Protocol provides no means for developing countries to take on emission targets and engage in international emission trading, because some of the largest developing countries actively opposed a voluntary accession mechanism at the 1997 Kyoto negotiations. Argentina offered to take on an emission target in 1999 but could not even secure agreement to have this discussed on the negotiating agenda. Thus, the Kyoto Protocol severely limited opportunities for developed countries to leverage finance of low-cost emission abatement in developing

countries (e.g., domestic cap-and-trade, fossil fuel subsidy reform, and building codes) through international emission trading under emission targets.

But prospects for change emerged in 2009. Leaders of the seventeen largest developed and developing countries, at the Major Economies Forum on Energy and Climate, agreed that they would need to reduce their greenhouse gas emissions. Leaders of these economies and many more nations negotiated the Copenhagen Accord later in 2009, fol-

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lowed a year later by the Cancun Agreements (December 2010), which together blurred the distinction between Annex I and non-Annex I. Under Copenhagen and Cancun, developed countries pledged economy-wide emission targets, and nearly 50 developing countries pledged emission mitigation policies and actions.

An even greater departure from the Annex I/non-Annex I dichotomy took place at the most recent negotiations in Durban, South Africa, in December, 2011. At the COP-17 talks in Durban, the international community agreed to a negotiating process focused on long-term participation of all parties in the effort to mitigate greenhouse gas emissions (6). The Durban Platform for Enhanced Action (DPEA) calls for a comprehensive legal regime by 2020 that essentially eliminates the Annex I versus non-Annex I distinction.

We ought not to overestimate the importance of a nonbinding agreement to reach a future agreement, especially as some developing countries have considered stepping back from this agreement. Nonetheless, this is a significant departure from the past. It is of vast potential importance, but only “potential,” because just as the Kyoto Protocol’s targets and timetables fulfilled the Berlin Mandate’s promise, future COPs must deliver on the DPEA with a new post-Kyoto agreement by 2015.

### Architectural Evolution

Many international policy architectures exist that could be consistent with the process and principles laid out in the DPEA and the UNFCCC. A top-down formulaic approach to reforming Kyoto could set 5-year emission targets for all countries through 2100 based on four equity principles (7): “progressivity,” adjusting emissions targets based on per capita income; “latecomer catch-up,” helping close the gap between 1990 emissions (the Kyoto baseline) and the starting points for latecomers (e.g., Canada, China, and the United States); “equalization,” aligning targets with global average per capita emissions by the end of this century (8); and an economic feasibility constraint that costs should not exceed a particular share of Gross Domestic Product.

Emissions targets for major developing countries could be set at “business-as-usual” (BAU) emissions levels but become more stringent as countries become wealthier. Keeping poor countries near BAU emissions prevents carbon leakage, an increase in emissions in one country resulting from a decrease in another country. Combining BAU

targets with an international emission-trading program could provide direct economic incentive (export revenues and foreign direct investment) for developing-country participation. By taking on BAU targets, developing countries could create a new export industry by reducing emissions below BAU and exporting emission allowances to developed countries. Developing countries could fully participate without incurring prohibitive costs, addressing cost effectiveness and distributional equity concerns.

Greenhouse gas cap-and-trade systems are in place or under development in the European Union, Australia, Japan, Korea, New Zealand, California (USA), and several Canadian provinces; a global emission reduction credit scheme, the Clean Development Mechanism, has supporters in developing countries. There is interest in linking cap-and-trade systems to allow the use of allowances or credits across systems to meet compliance obligations. Linking increases liquidity and functioning of markets and can greatly reduce abatement costs (9). However, direct linkage of cap-and-trade systems will propagate certain cost-containment design elements from one system to another, so advanced harmonization could be required, akin to bilateral trade agreements that were a precursor to today’s multilateral trade regime.

However, when cap-and-trade systems link with a common emission reduction-credit system (which does not have a cap, but issues credits when emissions are reduced below some agreed baseline), indirect links among cap-and-trade systems are created but without propagation of those design elements of concern. Such indirect linkages can thus achieve many of the benefits that direct links achieve but without the need for advanced harmonization. Bottom-up, indirect international linkage has begun to emerge, and may be part of the de facto international climate-policy architecture.

Finally, the UNFCCC regime for measurement, reporting, and verification is inadequate. For example, China’s most recent greenhouse gas emissions report submitted to the UNFCCC is for the 1994 calendar year (10). In contrast, under the Montreal Protocol, China has reported annual detailed ozone-depleting substances consumption inventory data over 1990–2010. A rigorous system of surveillance—of policies, actions, and outcomes—could support a more robust international climate-policy regime. Conditioning international finance on participation in surveillance could increase the transparency of and trust in the global climate regime for all participants.

### The Path Ahead

The outcome of the Durban negotiations has increased the likelihood that a sound foundation for meaningful long-term action can be developed. With the DPEA, there is a mandate for change. Governments around the world need fresh ideas, and they need those ideas over the next 2 to 3 years. Indeed, they have begun to solicit such ideas as the negotiators begin to frame the implementation of the DPEA.

How can an international agreement facilitate meaningful emission mitigation in developed and developing countries while meeting the UNFCCC’s principle of “common but differentiated responsibilities and respective capabilities?” How can an agreement best leverage public and private finance for investment in climate-friendly technologies and climate adaptation? How can market mechanisms broaden participation and deepen emission mitigation? How can an agreement improve transparency, improve trust, and thereby increase both participation and compliance among nations?

This is a time for innovative proposals for future international climate-policy architecture, not for incremental adjustments to the old pathway. We hope this call will be heard by researchers in universities, think tanks, and advocacy groups around the world.

### References and Notes

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### Supplementary Materials

[www.sciencemag.org/cgi/content/full/337/6098/1043/DC1](http://www.sciencemag.org/cgi/content/full/337/6098/1043/DC1)

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