

CLIMATE POLICY

Linking climate policies to advance global mitigation

Joining jurisdictions can increase efficiency of mitigation

By **Michael A. Mehling**,^{1,2} **Gilbert E. Metcalf**,^{3,4,5} **Robert N. Stavins**^{4,5,6}

The November 2017 negotiations in Bonn, Germany, under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC) validated that the Paris Agreement has met one of two necessary conditions for success. By achieving broad participation, including 195 countries, accounting for 99% of global greenhouse gas (GHG) emissions (1), the agreement dramatically improves on the 14% of global emissions associated with countries acting under the Kyoto Protocol (2), the international agreement it will replace in 2020. But the second necessary condition, adequate collective ambition of the nationally determined contributions (NDCs) that countries have individually pledged, has not been met. One promising approach to incentivize countries to increase ambition over time is to link different climate policies, such that emission reductions in one jurisdiction can be counted toward mitigation commitments of another jurisdiction. Drawing on our research and our experiences in Bonn, we explore options and challenges for facilitating such linkages in light of the considerable heterogeneity that is likely to characterize regional, national, and subnational policy efforts.

Linkage is important, in part, because it can reduce the costs of achieving a given emissions-reduction objective (3). Lower costs, in turn, may contribute politically to embracing more ambitious objectives. In a world where the marginal cost of abatement (that is, the cost to reduce an additional ton of emissions) varies widely, linkage improves overall cost-effectiveness by allowing jurisdictions to finance reductions in other jurisdictions with relatively lower costs while allowing the former jurisdictions to count the emission reductions toward targets set

in their NDCs (see the figure). For example, the baseline efficiency of energy use in low-income countries is very low, relative to high-income countries. Linking can leverage such differences to reduce overall mitigation cost. In effect, linkage drives participating jurisdictions toward a common cost of carbon, equalizing the marginal cost of abatement and producing a more efficient distribution of abatement activities. These benefits could potentially reduce the cost of achieving the emissions reductions specified in the initial NDCs under the Paris Agreement 32% by 2030 and 54% by 2050 (4).

In addition to lowering costs, linkage can improve the functioning of individual markets, reducing market power by including more firms and reducing price volatility by enlarging the market. Beyond such direct economic benefits, political benefits exist. As jurisdictions band together, linking can signal political momentum that contributes to more policies where they do not yet exist and more ambitious policies where they are already in place. Also, administrative economies of scale can be achieved through knowledge sharing in policy design and operation and through shared administrative costs. Finally, and importantly, linkage can allow for the key UNFCCC equity principle of “common-but-differentiated responsibilities and respective capabilities” to be pursued without sacrificing cost-effectiveness.

There are also legitimate concerns with linkage, including distributional impacts within and across jurisdictions, even though aggregate abatement costs are reduced. Because linking is inherently voluntary, however, linking will generally not occur unless both parties to a link anticipate that overall benefits of the link, including revenue from selling emission reductions, will outweigh costs. Likewise, individual exchanges made between compliance entities are voluntary.

Transferring pollution obligations can raise concerns about environmental justice. Although GHGs are a global pollutant, changes in GHG emissions can affect emissions of correlated local pollutants (for example, particulate matter). This is a reasonable concern, but linkage could help

reduce correlated local pollution in developing countries, because jurisdictions that take on increased mitigation efforts as a result of linkage, many of which will be low-income developing countries, will see local pollution decrease along with lower GHG emissions.

A more serious concern of linkage stems from the automatic propagation of some design elements from one system to another, in particular, cost-containment mechanisms in cap-and-trade systems—banking, borrowing, and price collars. This means that there is decreased autonomy, as rules in one system can affect prices in another. All of this refers to what we think of as “hard linkage,” a formal recognition by a mitigation program in one jurisdiction of emission reductions undertaken in another jurisdiction for purposes of complying with the first jurisdiction’s mitigation program. Examples of hard linkage are the links between cap-and-trade systems in the state of California, USA, and Québec, Canada, and, more recently, the European Union (EU) and Switzerland.

But another possibility is “soft linkage,” by which we mean an agreement—explicit or implicit—to harmonize carbon prices either at a specific level or within overlapping bands. With soft linkage, there is no recognition of emission reductions in one system by the other system for purposes of compliance. Still, by aligning carbon prices, such harmonization improves overall economic efficiency.

LINKAGE IN THE PARIS AGREEMENT

Article 6.2 of the Paris Agreement provides a foundation for linkage by recognizing that parties to the agreement may “choose to pursue voluntary cooperation in the implementation of their” NDCs through “the use of internationally transferred mitigation outcomes” (ITMOs) (5). In contrast to the Kyoto Protocol (which also includes provisions for international cooperation), the voluntary and flexible architecture of the Paris Agreement allows for wide variation, not only in the types of climate policies countries choose to implement but also in the form and stringency of the abatement targets they adopt.

To be clear, there are three conceptually—and operationally—distinct aspects of international policy linkage: (i) (the focus of our analysis) provisions in Article 6.2 of the Paris Agreement and related guidance that can facilitate international linkage, by providing, for example, for ITMOs to be used as an accounting mechanism when “compliance” with NDCs is measured; (ii) agreements between two or more jurisdictions to recognize emission reductions generated in the other jurisdictions; and (iii) two or more compli-

¹Massachusetts Institute of Technology, Cambridge, MA, USA. ²University of Strathclyde, Glasgow, UK. ³Tufts University, Medford, MA, USA. ⁴National Bureau of Economic Research, Cambridge, MA, USA. ⁵Resources for the Future, Washington, DC, USA. ⁶Harvard University, Cambridge, MA, USA. Email: robert_stavins@hks.harvard.edu

ance entities, one in each of the linked jurisdictions, engage in an exchange, for example, permitting allowances to move between cap-and-trade systems.

Linkage is relatively straightforward when policies involved are similar. But there are several potential sources of heterogeneity: type of policy instrument (e.g., taxes, cap-and-trade, performance or technology standards); level of government jurisdiction involved (e.g., regional, national, subnational); status under the Paris Agreement (that is, whether or not the jurisdiction is a party to the agreement or within a party); nature of the policy target (e.g., absolute mass-based emissions, emissions intensity, change relative to business-as-usual); and operational details of the country's NDC (e.g., type of mitigation target, choice of target and reference years, sectors and GHGs covered). Most forms of heterogeneity, however, do not present insurmountable obstacles to linkage.

In principle, the most straightforward case of international climate policy linkage would be a pair of national cap-and-trade systems in parties to the agreement, with each using an absolute (mass-based) target in its NDC (for example, cap-and-trade systems in New Zealand and Switzerland). A less obvious case would be a pair of subnational policies—one a carbon tax and one a cap-and-trade system (for example, carbon tax in British Columbia, Canada, and cap-and-trade in Tokyo, Japan). Both policies can be designed to facilitate heterogeneous linkage (6). Another case of heterogeneous linkage might be between the EU emissions trading system and California's cap-and-trade program. All of these would be conceptually feasible and merit consideration, although each raises issues that require attention and call for specific accounting guidance, if linkage is to include the use of ITMOs under the Paris Agreement.

A PATH FORWARD

Parties to the Paris Agreement are working to elaborate guidance on Article 6.2 but have expressed widely differing views on what issues to include (7). In Bonn, parties signaled agreement on the need to offer at least minimal guidance on how to account for transfers of ITMOs. Beyond that, however, positions diverge on whether to address broader questions that bear on linkage under Article 6.2. Particular divisions center around issues of environmental integrity, governance, and sustainable development.

Our analysis, based on case studies of various types of heterogeneous linked systems, reveals common themes (3). What emerges is the importance of guidance on Article 6.2 that sets out a robust accounting framework to prevent double counting of GHG reductions, to ensure that the timing (vintage) of claimed reductions and respective ITMO

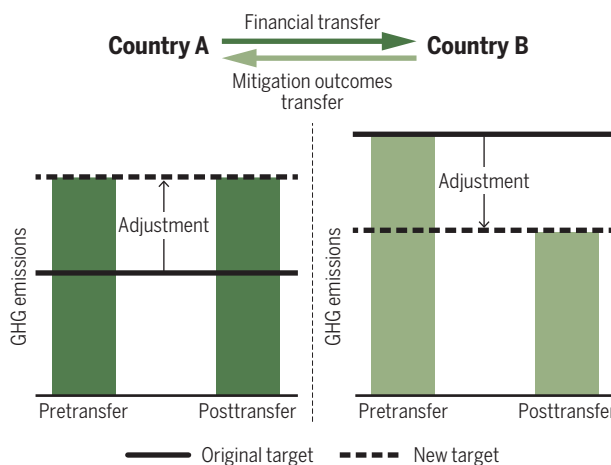
transferring tracks—such as the Talanoa dialogue, to take stock of collective efforts of parties—or the enhanced transparency framework under Article 13 of the Paris Agreement.

Clear and consistent guidance for accounting of emissions transfers under Article 6.2 can contribute to greater certainty and predictability for parties engaged in voluntary cooperation, facilitating expanded use of linkage. Too much guidance, however, particularly if it includes restrictive quality or ambition requirements, might impede linkage and dampen incentives for cooperation. Such a combination of common accounting rules and an absence of restrictive criteria and conditions may accelerate linkage and allow for broader and more ambitious policy cooperation, which can increase the potential for parties to scale up the ambition of their NDCs. That may ultimately foster stronger engagement between parties (and non-parties), as well as with regional and subnational jurisdictions.

The parties to the Paris Agreement will continue negotiations in May, toward a goal of agreeing to a finalized rule book for Article 6 at the annual UNFCCC summit in Katowice, Poland, in December 2018. Decisions that the negotiators reach this year could greatly advance, or impede, international climate policy linkage and thereby play a key role in determining the fate of the Paris Agreement. ■

Transferring mitigation outcomes

Rather than reduce its greenhouse gas (GHG) emissions to meet its original target, country A cooperates with country B, which can reduce emissions at lower cost. Incentivized to reduce emissions, country B sells part of its mitigation outcome to country A. Both targets are adjusted to reflect the transfer, and country A meets its adjusted target at lower cost than if it had reduced its own emissions.



transfers is correctly accounted for, and to ensure that participating countries make appropriate adjustments for emissions or reductions covered by their NDCs when using ITMOs. Suggested approaches for ITMO accounting under Article 6.2 (3) include, in particular, how to make adjustments to national emission budgets to account for ITMOs and how to account for heterogeneous base years, different vintages of targets and outcomes, and transfers between parties and non-parties to the agreement. These issues were identified, if not yet resolved, during the negotiations on Article 6.2 in Bonn. As negotiators proceed to address them, they can draw on a wealth of experience and existing research (8–11). Future study should expand on the specific conditions of accounting and ITMO transfers under the evolving architecture of the Paris Agreement.

An important insight from our analysis, however, is that parties should exercise caution when developing guidance that goes beyond accounting issues. Onerous conditions related to the ambition or integrity of domestic action, for instance, could deter linkage. This does not mean that such concerns should be neglected; rather, they are best addressed under separate corresponding nego-

REFERENCES AND NOTES

- UNFCCC, "Paris Agreement—Status of Ratification"; http://unfccc.int/paris_agreement/items/9444.php [accessed 3 January 2018].
- UNFCCC, "Kyoto Protocol"; http://unfccc.int/kyoto_protocol/items/2830.php [accessed 20 November 2017].
- M. A. Mehling, G. E. Metcalf, R. N. Stavins, "Linking Heterogeneous Climate Policies (Consistent with the Paris Agreement)," Discussion paper ES 17-6, Harvard Project on Climate Agreements, October 2017.
- World Bank, Ecofys, and Vivid Economics, *State and Trends of Carbon Pricing 2016* (World Bank, Washington, DC, 2016).
- UNFCCC, "Paris Agreement, Article 6" (UN, Paris, France, 2015), pp. 7–8.
- G. E. Metcalf, D. Weisbach, *Rev. Environ. Econ. Policy* **6**, 110 (2012).
- W. Obergassel, F. Asche, "Shaping the Paris Mechanisms Part III: An Update on Submissions on Article 6 of the Paris Agreement" (Wuppertal Institute for Climate, Environment, and Energy, JIKO Policy Paper 05/2017, 2017).
- J. Jaffe *et al.*, *Ecol. Law Q.* **36**, 789 (2009).
- M. Ranson, R. N. Stavins, *Clim. Policy* **16**, 284 (2016).
- D. M. Bodansky *et al.*, *Clim. Policy* **16**, 956 (2016).
- M. A. Mehling, "Legal Frameworks for Linking National Emissions Trading Systems," in *The Oxford Handbook of International Climate Change Law*, C. P. Carlarne, K. R. Gray, R. G. Tarasofsky, Eds. (Oxford Univ. Press, 2016), pp. 261–288.

ACKNOWLEDGMENTS

The authors acknowledge comments from S. Biniaz, D. Bodansky, C. Haug, C. Hood, and A. Marcu and financial support from the Enel Foundation.

10.1126/science.aar5988

Linking climate policies to advance global mitigation

Michael A. Mehling, Gilbert E. Metcalf and Robert N. Stavins

Science **359** (6379), 997-998.
DOI: 10.1126/science.aar5988

ARTICLE TOOLS	http://science.sciencemag.org/content/359/6379/997
REFERENCES	This article cites 4 articles, 0 of which you can access for free http://science.sciencemag.org/content/359/6379/997#BIBL
PERMISSIONS	http://www.sciencemag.org/help/reprints-and-permissions

Use of this article is subject to the [Terms of Service](#)

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. 2017 © The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works. The title *Science* is a registered trademark of AAAS.