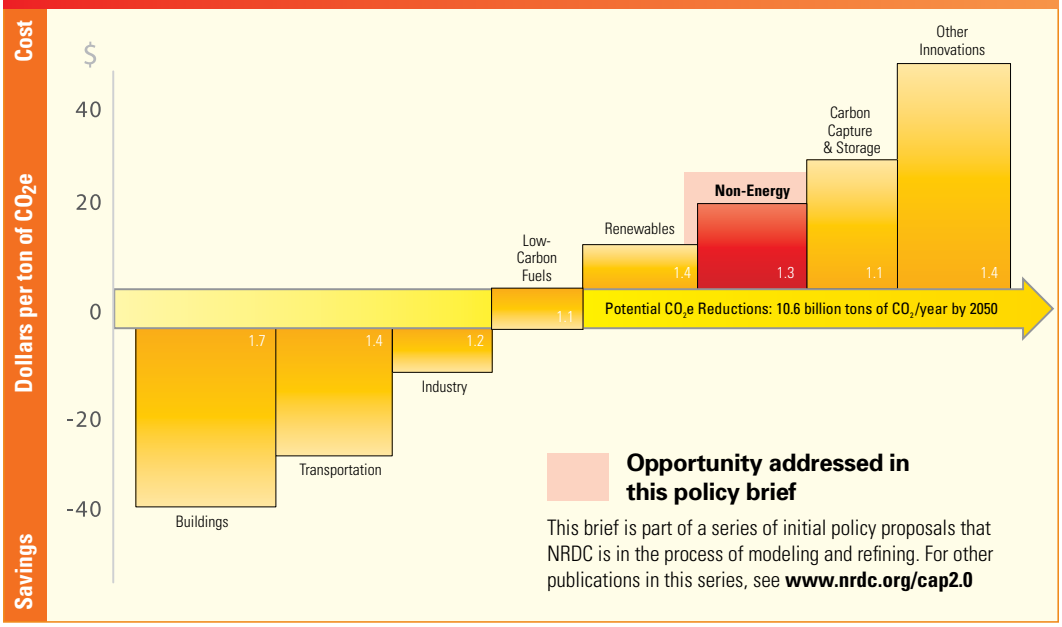
Part of a series on

CAP 2.0

Policy Brief

Reducing Pollution in Domestic and International Uncapped Sectors



Reducing Pollution Outside of the Carbon Cap: The Role of Offsets and Complementary Policies

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Avoiding the worst impacts of global warming will require coordinated global action and strong leadership from the United States and other industrialized countries. The United States must quickly adopt a mandatory cap on greenhouse gas (GHG) emissions that declines over time, with the goal of reducing overall domestic emissions at least 20 percent below 2005 levels by 2020 and at least 80 percent by 2050. These reductions will help to stabilize the concentration of carbon dioxide equivalent (CO_2e) in the atmosphere at or below the target level of 450 parts per million (ppm) identified by scientists.

Meeting this target will require emissions reductions not only from large stationary sources of global warming pollution such as power plants, industrial facilities, and fuel refineries, but also from those sources that are individually too small or dispersed to include under the cap, such as agricultural emissions from the use of nitrogen fertilizers. Similarly, there are means for sequestering carbon dioxide (CO_2)—that is, absorbing it out of the atmosphere and storing it safely—in carbon "sinks" such as soils and forests that are difficult to account for under a cap. The United States must adopt alternative mechanisms such as mandatory policies, incentives, and domestic and international offsets to drive emissions reductions and carbon sequestration in these "uncapped sectors" both domestically and abroad.[1]

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Maximizing the Benefits of an Uncapped Sectors Policy

Under a cap and trade system that allows for the use of offsets, a source of emissions covered by the cap can compensate for—or offset—a portion of their own pollution by paying for a demonstrated reduction of an equivalent quantity of pollution in an area not covered by the cap. Because doing so is often cheaper than reducing emissions within a capped facility, offsets provide one way we can lower the overall costs of achieving our emissions reduction goals.

Domestically, however, each offset credited for a one ton reduction in CO_2e emissions in an uncapped sector relaxes the overall cap on emitters by one ton and so does not help achieve reductions beyond those delivered by the cap. To achieve additional reductions Congress could tighten targets for capped sectors, potentially in concert with international negotiations in return for developing countries delivering reductions above and beyond any stated commitments. Congress could also employ complementary policies that drive substantial abatement in uncapped sectors that is not tied to offsets. The primary objectives of a robust uncapped sectors policy should be to:

1) Help ensure the United States meets its 80 percent overall emissions reduction target by engaging all sectors of the economy in abatement efforts.
2) Moderate the cost of carbon allowances through domestic offsets that produce additional and verifiable abatement.
3) Moderate the cost of carbon allowances through high-quality international offsets that encourage developing countries to join effective regimes to address energy and agricultural emissions, as well as tropical deforestation.

Reducing Pollution in the Domestic Uncapped Sectors

According to the Environmental Protection Agency (EPA), at a CO_2e price of $30 per ton in 2020, domestic abatement opportunities in uncapped sectors could provide almost 0.50 $GtCO_2e$ (giga metric tons) of abatement across five different project types. Expanding forest sinks through the afforestation of previously bare or cultivated land and

Table 1: Total Projected Abatement Supply ($GtCO_2e$) at Selected CO_2e Prices

Dollars per ton of CO_2e	2010	2020	2030	2040	2050
$5	0.15	0.11	0.11	0.09	0.13
$10	0.27	0.19	0.22	0.18	0.22
$15	0.36	0.26	0.30	0.24	0.28
$20	0.43	0.35	0.35	0.33	0.36
$25	0.49	0.42	0.39	0.37	0.41
$30	0.54	0.50	0.43	0.41	0.47
$35	0.54	0.57	0.47	0.44	0.53
$40	0.54	0.65	0.51	0.48	0.57
$45	0.54	0.73	0.56	0.51	0.60
$50	0.54	0.80	0.61	0.54	0.64
$55	0.54	0.80	0.66	0.58	0.67
$60	0.54	0.80	0.70	0.61	0.71
$65	0.54	0.80	0.75	0.65	0.74
$70	0.54	0.80	0.80	0.69	0.78
$75	0.54	0.80	0.85	0.73	0.81

Table 2: Projected Abatement Supply ($GtCO_2e$) by Project Type in 2020

	Sinks			Sources	
Dollars per ton of CO_2e	Afforestation	Forest Management	Agricultural Soil Sequestration**	Agricultural Methane (CH_4) and Nitrous Oxide (N_2O)	Landfill Methane (CH_4)
$5	- 0.01*	0.05	0.00	0.00	0.05
$10	0.02	0.08	0.00	0.01	0.07
$15	0.06	0.11	0.00	0.01	0.07
$20	0.11	0.13	0.00	0.02	0.09
$25	0.14	0.16	0.00	0.02	0.09
$30	0.16	0.22	0.00	0.03	0.09
$35	0.18	0.27	0.00	0.03	0.09
$40	0.20	0.32	0.00	0.03	0.09
$45	0.22	0.38	0.00	0.04	0.09
$50	0.24	0.43	0.00	0.04	0.09

Source: EPA, 2009

*Negative values at low prices reflect a switch to another practice or land use relative to the baseline. Higher CO_2 prices are required to make land conversion to forests attractive.

**EPA 2009 baselines include revised business as usual assumptions to reflect the greater prevalence of no-till and/or reduced-till soil practices (including prior to 2010). Additionally, no-till agriculture is assumed to result in saturated soil carbon within 20 years of conversion. As a result, although some abatement potential from these forms of soil carbon sequestration is found in the early years of the program, by 2020 potential from this project type is found to be negligible even as prices rise.

enhancing carbon sequestration in existing forest stands through improved forest management accounts for more than 75 percent of this potential- (approximately 0.38 $GtCO_2e$). Potential reductions in agricultural sources of methane (CH_4) from animal waste and nitrous oxide (N_2O) primarily from fertilizers total 0.03 $GtCO_2e$; the capture and combustion of landfill methane provides another 0.09 $GtCO_2e$.

Beyond offsets there are three key strategies for increasing GHG abatement in the domestic uncapped sectors: 1) expand the cap's coverage to include a wider range of emissions sources; 2) establish mandatory policies such as standards of performance; and 3) create performance-based incentives. Congress should adopt a comprehensive uncapped sectors strategy according to the following guidelines.

EXPANDING THE CAP

Congress should cap direct emissions sources, such as large livestock manure management facilities in confined animal feeding operations (CAFOs), if their annual emissions meet the threshold for emitters covered by the cap. According to the EPA, livestock emissions of methane and nitrous oxide from enteric fermentation (which occurs in a cow's digestive tract) and manure management account for approximately 40 percent of agricultural emissions and 2.6 percent of total U.S. emissions.[2] The EPA estimates that 40 to 50 of the largest U.S. livestock operations emit 25,000 $MtCO_2e$ per year—the annual emissions threshold for capping existing facilities under the United States Climate Action Partnership (USCAP) Blueprint. Dairy operations with 2,000 or more cows, of which there were 730 in 2008, produce roughly 10,000 $MtCO_2e$ per year—the threshold for capping new facilities.[3,4]

Congress should also cap large landfills, both municipal and industrial, that meet the annual emissions threshold.

ENACTING MANDATORY PERFORMANCE STANDARDS

Congress should establish mandates wherever possible—for example, requiring certain measures for land conservation or that performance standards be met by a class of uncapped emissions sources. Congress should not provide incentives or allow offset crediting for practices it can cap or otherwise mandate in this manner, as this would undermine efforts to achieve the needed reductions in total emissions. When it is not possible to immediately cap or regulate a given source but it could become practical to do so in the future, eligibility for offsets and incentives should be designed to gradually phase out.

ESTABLISHING PERFORMANCE-BASED INCENTIVES

Congress should use a portion of allowance auction revenues to fund performance-based incentives that will achieve additional abatement in uncapped sectors. These incentives can be targeted, for example, at foresters to promote sequestration-enhancing forest management, at small landfills to help capture methane emissions and increase capture efficiency, and at farmers to encourage fertilization practices that reduce nitrous oxide emissions. To maximize abatement per dollar spent, incentive payments can be set at the project developer's marginal cost of abatement rather than the marginal cost reflected in the overall offsets market. Unlike abatement claimed in the form of a tradable offset credit, abatement purchased through incentives is not tied to a corresponding increase in emissions from a capped entity, and therefore a lower verification standard is acceptable. To receive payment, participants would have to show they are taking actions above and beyond business as usual, but would not need to demonstrate this additionality on a ton-per-ton basis. As a result, transaction costs could be significantly reduced, making lower incentive payments attractive to and lucrative for their recipients. In addition, regular upward revision of the baseline for qualifying for these incentives would ensure consistent improvements in practices.

Initially, approximately 15 percent of total U.S. GHG emissions are likely to be outside the cap. Of that 15 percent, just less than half are from the agricultural sector, while the rest are from fossil CO_2 or industrial sources too small to be capped.[5] Assuming the United States does not expand the scope of coverage for the cap (or require more than 80 percent reductions from capped emitters), the United States must have complementary policies in place that deliver at least 0.32 $GtCO_2e$ of uncapped sector abatement by 2020—beyond any abatement from domestic offsets—to meet our overall target.

According to the EPA, in 2020, incentives of $15 to 20 per ton of CO_2e abatement could drive sufficient investment in the necessary number of tons at an approximate cost of $4.8 to 6.4 billion, representing roughly 3 to 4 percent of

allowance auction revenues.[6] Over time, these incentives could be phased out if the emissions threshold for capped entities is gradually reduced to capture smaller sources in all sectors and baselines for good practices in agriculture and forestry are revised upward.

Once the EPA has ensured the necessary economy-wide reductions through capping, setting mandates, and establishing performance-based incentives targeted at domestic uncapped sectors, it can then define eligibility standards for both domestic and international offsets as a cost-containment strategy.

INVESTING IN OUR RECOVERY BY JUMPSTARTING ABATEMENT IN THE DOMESTIC AGRICULTURAL SECTOR

Making immediate investments in the domestic agricultural sector should be part of a "cap-and-recover" policy package. Allowance auction revenues could be pulled forward so that performance-based incentive dollars could be pumped into the economy during 2009 to 2013, preceding the launch of a U.S. carbon market. The initiative would target high-cost, high-quality, and easy-to-measure abatement opportunities, such as methane capture in livestock manure lagoons, thereby encouraging capital investment in equipment such as anaerobic digesters. Incentives would also encourage enhanced soil carbon sequestration and reduced nitrous oxide emissions through more efficient fertilizer application on farms. Such an investment would help develop key infrastructure for uncapped sector involvement in cap-and-trade, including regulatory capacity, and build confidence in the viability of a federal incentive program for the agricultural sector.

Protecting the Integrity of the Cap by Ensuring a Supply of High-Quality Domestic Offsets

Given the fact that offsets allow capped firms to increase their pollution levels, Congress must direct the EPA to develop rigorous quality standards to ensure that offsets provide environmental benefits equal to reducing a ton of pollution from a smokestack or tailpipe. The goal must be to get the most abatement at the lowest cost without compromising quality. Quantifying the benefits achieved through offsets requires complex measurement of emissions sources and sinks and finding answers to a handful of challenging issues.

Additionality

Offsets must meet objective criteria specific to each project type to ensure they deliver environmental benefits above and beyond what would be achieved through business as usual.

Permanence

Unfortunately, sequestration projects can be reversed. If a farmer practicing no-till agriculture reverts to conventional tillage or a forest fire destroys a forest, some or all of the sequestered carbon is released. Offset provisions must therefore clearly assign liability for reversal, requiring either offset developers or users to compensate the environment should the project fail.

Leakage

Offset provisions must ensure that projects do not simply shift carbon emissions or destruction of carbon sinks from one location to another. Certain categories like forestry are particularly vulnerable to this "leakage." In the United States, for example, incentives that only reward afforestation—planting to build or expand forests—may reduce the motivation to continue sequestration-enhancing forest management practices in forests that are currently well managed.[7] To mitigate this risk, domestic afforestation projects should only be credited if good forest management has been incentivized for existing timber stocks. Internationally, a major concern is that conserving forests in one region could shift deforestation to another if monitoring is not based on national baselines and incentives are not tied to net changes in total forest carbon.

Measurement Uncertainty

It is often difficult to accurately measure abatement in sectors as complex as agriculture and forestry. For example, agricultural tillage practices have complex ramifications for overall soil carbon content, as well as emissions of methane and nitrous oxide, and it is difficult to reliably measure these changes.

Co-impacts

Beyond carbon benefits, an offsets policy aimed at boosting carbon abatement in the agricultural and forestry sectors must address the full spectrum of ecological factors. Land management focused exclusively on carbon sequestration could result in short-term choices that degrade long-term ecosystem health and lead to biodiversity loss. Moreover, uncertainty about long-term environmental health suggests doubt about the full range of carbon implications, both direct and indirect.

THE IMPORTANCE OF NUMERICAL LIMITS ON OFFSET AVAILABILITY

For as long as offsets are the least expensive abatement option, capped emitters will invest in offsets rather than reducing pollution at their own facilities or purchasing allowances. It is crucial to avoid relying too heavily on offsets because doing so will likely make it more difficult and costly to meet the long-term goal of reducing overall emissions at least 80 percent by 2050. There are three compelling reasons for placing numerical limits on the use of offsets.

First, limits will help ensure we make transformational investments in capped sectors rather than depending on uncapped sectors to hit our targets. To cut emissions 80 percent by 2050, we must begin investing in long-term abatement in key capped sectors—especially power and transportation—as soon as possible. It may be easier and cheaper in the short-term to purchase offsets than it is to increase the use of renewables, scale up energy efficiency, or launch transit-oriented development, but these transformational investments are likely to be more cost effective in the long run and will provide a lasting stream of benefits.

Second, given that all offsets—and particularly carbon sinks—carry some degree of uncertainty with respect to their efficacy, limits on the use of offsets serve as an environmental "insurance policy." The limits reduce the risk that low-quality offsets will "break the cap" and prevent us from hitting our environmental targets.

Third, although limits are not a substitute for rigorous regulatory standards, they increase the likelihood of a "race-to-the-top" among project developers. Limits may encourage producers of high-quality offsets to help ensure strong regulatory standards and high-value offsets, keeping junk offsets from flooding the market and driving down prices.

To implement offset limits, Congress should set annual limits on offset use at the individual firm level. Purchased offsets should be bankable but no year-over-year rollover of unused offset limit allocations should be permitted.

Maximizing Global Pollution Reductions and Engaging Developing Countries Through High-Quality International Offsets

LESSONS FROM THE EUROPEAN UNION'S EXPERIENCE WITH THE CLEAN DEVELOPMENT MECHANISM

Offsets provide a mechanism to engage developing countries in voluntary emissions reductions efforts. Under the Kyoto Protocol, the Clean Development Mechanism (CDM) allows industrialized countries with emissions reductions commitments to meet their obligations by paying for reductions in developing countries. By facilitating lowest-cost reductions in pollution, the CDM seeks to provide cost containment to industrialized countries and an economic incentive for developing countries to pursue emissions-reducing activities in advance of binding commitments.

We must ensure, however, that we do not pursue cost-containment benefits at the expense of environmental objectives or institutionalize incentive structures that are counterproductive for meeting our overall emissions reductions targets. The European Union's experience with the CDM is instructive in this regard. The CDM has helped E.U. countries moderate carbon allowance prices in the E.U. Emissions Trading Scheme (ETS) and involved developing countries in these efforts, but its impact on emissions remains in doubt.[8] In its second trading period from 2008–2012, the European Union allowed use of CDM credits in excess of the ratcheting down of its cap. This might not be a concern if parties had complete confidence in the integrity of all CDM projects, but all the quality concerns listed for domestic offsets are at

least as severe for international offsets markets, particularly the issue of additionality. As a result, the European Union's heavy reliance on CDM has called into question the environmental integrity of the ETS. In fact, annual E.U. emissions are likely to be higher in the ETS's second trading period (2008-2012) than in the first trading period (2005-2007).[9]

Even if well regulated, offset projects in developing countries are not additional to existing national caps and thus do not move us closer to global reduction targets.[10] Instead, the United States, European Union, and other industrialized countries must go beyond CDM-based engagement and encourage developing countries to move steadily towards long-term, binding commitments. To do so, the United States must refrain from project-level crediting of emissions reductions in "cappable" fossil CO_2 sectors and make access to its carbon market conditional on the adoption of verifiable abatement targets on the part of developing countries (e.g. through well-designed sector-based actions).

REDUCING INTERNATIONAL AGRICULTURAL EMISSIONS AND ENCOURAGING INTERNATIONAL FORESTATION

From 1990 to 2005, agricultural emissions in developing countries increased 32 percent. By 2005, these emissions were responsible for approximately three quarters of total agricultural emissions, or 7.5 to 9 percent of global GHG emissions—the equivalent of 3.8 to 4.6 $GtCO_2e$ per year. Well-regulated international offsets offer a promising mechanism for addressing these emissions.[11] Eligible project types should include efforts to reduce emissions from difficult-to-cap agricultural sources, such as methane and nitrous oxide from rice paddy fields, and improvements in livestock manure management.

The McKinsey global cost curve analysis also suggests that increasing carbon sinks in both the forestry and agricultural sectors could yield 14 $GtCO_2e$ of abatement in 2030, with 90 percent of this potential in developing countries—the equivalent of roughly one quarter of the total global abatement potential identified for that year.[12] Specifically, the United States should encourage tree planting on nonforested land or the reestablishment of forests on deforested land. These afforestation and reforestation projects can be credited subnationally—on a project-by-project basis rather than against a national baseline of net forest carbon— as they not only increase sinks but also reduce long-term market pressure to clear-cut forests by helping to meet timber demand from better-managed stocks. Importantly, careful approval rules must be in place to ensure additionality, such as a time lag between when land was deforested and when a project developer can receive credit for reforestation.

Table 3: Top 15 Sources of Deforestation Emissions, 2000 to 2005

Deforestation is concentrated in a few areas: there are just 15 countries that account for the majority of deforestation emissions and four that account for almost 60 percent.

Country	Forest Carbon Emissions (megatons of carbon per year)	Share of Global Deforestation Emissions
Brazil	519	25%
Indonesia	486	23%
Nigeria	123	6%
Congo (DR)	87	4%
Burma (Myanmar)	66	3%
Zambia	64	3%
Cameroon	60	3%
Philippines	50	2%
Venezuela	46	2%
Bolivia	41	2%
Ghana	41	2%
Tanzania	38	2%
Ecuador	35	1.5%
Papua New Guinea	3	1.5%
Honduras	32	1.5%

Source: Nicholas Institute, 2008

TACKLING INTERNATIONAL DEFORESTATION AND FOREST DEGRADATION

Forests cover 30 percent of the Earth's surface and, as carbon sinks, have the potential to absorb approximately 10 percent of the global carbon emissions projected for the first half of this century.[13] While forests in developed countries have remained stable or even grown in recent years, rapid deforestation continues in developing countries. Today, 20 to 25 percent of human-caused GHG emissions around the world come from deforestation and forest degradation.[14]

Although technical and political concerns remain, there is general agreement that any effective global climate change strategy must systematically address deforestation. All realistic scenarios to address climate change have deforestation emissions go to zero and effectively require developing countries to make a sizeable dent in reducing deforestation rates before 2020.

Today, powerful economic forces drive countries to deforest, including demand for timber and land, and the need for basic economic development. New institutions and countervailing incentives are needed to slow down

and reverse this trend. Unfortunately, there is a great deal of inconsistency across countries with regard to forest inventories and measurement baselines because of differing methodologies and poor government recordkeeping. Many forest nations also lack resources to measure and monitor forest stocks or suffer major governance deficiencies, such as nonexistent or poorly defined land rights. Today, few, if any, developing countries could participate in a crediting system using national deforestation baselines.

On their own, offset market prices are likely insufficient to fund the kind of forest governance needed to regulate land use, protect the rights of indigenous communities, and ensure that biodiversity and high-conservation value forests are safeguarded. Initial investments in forest-rich nations should therefore focus on capacity building and "pilot" emissions reductions activities that lay the groundwork for national level crediting. Before countries like Brazil and Indonesia can deliver deforestation emissions reductions to market, they need technical assistance and help building critical institutions. Assistance should be targeted at developing national deforestation baselines and establishing systems to monitor changes in net forest carbon at the national level using satellite data and ground verifications, as well as providing mechanisms to ensure that benefits reach actors on the ground.

A comprehensive approach to tackling international deforestation and forest degradation in developing countries must also include support for building credible national frameworks for reducing emissions, a clearly defined crediting system, targets and incentives for near-term deforestation emissions reductions, and a market mechanism to provide ongoing incentives.

MOBILIZING TARGETED FUNDS TO REDUCE EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION

The United States and other member countries of the Organization for Economic Cooperation and Development (OECD) should set aside a portion of allowance auction revenues to address deforestation and forest degradation, with the goal of bringing deforestation rates to zero by 2030. Based on recent estimates of the cost per hectare of avoiding deforestation, roughly $25 to 30 billion per year could compensate all forest nations for maintaining current net forest cover.[15] OECD countries could fund approximately half this total, with a U.S. commitment of $5 billion per year based on its share of OECD emissions. In the United States, deforestation emissions reductions supported by these funds could provide credits for use in a cost-containment reserve. By 2050, any unused credits should be retired, generating abatement additional to the U.S. cap.[16]

A portion of the remaining costs would be borne by developing countries themselves. As a precondition to receiving credits for not deforesting, countries should be required to achieve a fixed level of deforestation emissions reductions below business as usual. Access to the U.S. carbon market must remain conditional on consistently declining deforestation rates, and payments made only once reductions have been verified. Over time, forest nations should continuously take on greater financial responsibility.

Additional financing could also come from an international market for avoided deforestation credits. Countries that have established a national system for tackling deforestation and reduced their gross deforestation emissions below a credible, nationally appropriate, and verifiable baseline should be eligible to generate credits for any additional reductions—often referred to as Reduced Emissions from Deforestation and Degradation or REDD credits—to be sold in the U.S. (or other) market. National deforestation baselines should be based on nationally appropriate factors to avoid crediting non-additional actions—for example, based on at least five years of recent data in countries with a history of deforestation—and be set on a trajectory to reach zero by no later than 2030. Congress should require that reductions be demonstrated using both remote sensing technology and ground-truthing—gathering data in the field to complement data obtained remotely—and that uncertainty be appropriately accounted for.

Given concerns about cross-border leakage, in which reduced deforestation in one country causes timber demand to be met through deforestation elsewhere, policies must also encourage sustainable forestry and address demand for wood products and commodities such as meat, soybeans, and palm oil, which require large-scale forest clearing. In the United States, a recent amendment to the Lacey Act requires that wood product imports be certified as legally harvested, representing a positive step forward. A similar policy is currently on the agenda for the European Union.

Recommendations

1. Congress should direct the EPA to develop policies that will deliver 80 percent emissions reductions by 2050 in uncapped sectors. These policies should include expanding the cap's coverage to encompass direct sources of emissions in uncapped sectors that meet the threshold for covered entities, mandatory policies like performance standards, and performance-based incentives for additional abatement. Once the EPA has put in place these policies to ensure the necessary economy-wide reductions, it can define eligibility standards for offsets as a cost-containment strategy.

2. The EPA should convene an independent committee to establish a list of offsets-eligible project types and adopt conservative, standardized certification protocols for each. Certain projects types—typically those with high upfront costs that generate high-value offsets such as afforestation and reforestation—are generally well suited to such standards and thus likely to qualify from the outset. These measurement and verification protocols, however, must include mechanisms to address even modest degrees of uncertainty. Project types for which rigorous baseline methodologies are not yet well developed or which still carry substantial measurement uncertainty, such as some practices based on soil sequestration or forest management, are less likely to meet these standards and so should not qualify initially. Instead, the United States should use complementary policies such as performance-based incentives to target these abatement opportunities. Such incentives can move us toward our goal of reduced emissions and increased sequestration in sectors such as agriculture and generate abatement that is additional to the cap. Periodic review of the offsets-eligible project list should provide the opportunity for new or initially ineligible project types to prove their merit over time and gain certification eligibility. If a project type qualifies both for offset certification and performance-based incentives, project developers can choose between the two parallel financing and regulatory structures.

3. Congress should designate an offsets auditor and require a performance audit for all offset project types. A random sample of live projects should be audited every two to three years to determine if they are delivering their intended carbon benefits. The EPA should manage the offsets-eligible list based on audit results and specify a mechanism to compensate the environment should a project (or entire project type) fail to deliver some or all of its carbon benefits. This two-pronged "recourse" after a bad audit must be explicit:

a) remove the project type from offsets-eligible list, but include an option for project developers to petition for future reinstatement if there are material changes in practices, new science developed, and/or improvements made in measurement techniques
b) provide an explicit mechanism for compensating the environment on a ton-per-ton basis for any forgone abatement, either via an offsets reserve or by reducing the cap in future years.

To meet permanence requirements, Congress should also require offset developers or users to compensate the environment on a ton-per-ton basis in case of project reversal. Congress should require the maintenance of offsets or allowance reserves or the purchase of offsets insurance.

4. Internationally, the United States should refrain from crediting abatement for projects in "cappable" sectors. Increasingly the concern is not whether emissions reductions would have happened absent offset mechanisms, but instead whether domestic emissions should increasingly fall under the commitments of developing countries. To the extent that retaining eligibility to sell offsets encourages developing countries to rely on external funding from industrialized countries, it can delay efforts to reduce emissions on their own and discourage movement towards binding emissions limits.

5. Congress should require developing countries to commit to reducing emissions by a defined level below business as usual by 2020 as a precondition for selling offsets into the U.S. carbon market. This carbon market access rule will be a significant tool for the United States in ensuring that a strong international agreement on climate

change is reached. The required level of reductions below business as usual for key developing countries will be an important element of the U.S. negotiating position. These targets can either be overall targets or sector-specific, with credits awarded for reductions beyond sector-specific baselines in industries such as power or cement. By 2025, we should expect developing country emissions to peak and then begin to decline. After 2025, only countries with binding emissions reduction commitments in place should be eligible to sell excess credits into the U.S. market.

6. Due to massive leakage risks, deforestation emissions reductions should be credited on a national level. Subnational crediting should be for afforestation and reforestation projects only. Countries should receive avoided deforestation credits based on positive annual changes to their total forest carbon stock over and above national baselines; these credits can then be sold into U.S. (and other) carbon markets. Baselines must be tied to a period prior to adopting compensated reductions to avoid creating an incentive to drive up the deforestation rates to receive more credits for subsequent reductions. To encourage continually decreasing deforestation rates, baselines should be revised downward every 10 years. Because they create new forest stocks, afforestation and reforestation projects can be credited subnationally so long as measures are in place to ensure additionality.

Endnotes

1. The term "offset" describes a reduction in emissions or increase in sequestration by an entity outside the cap, which the government certifies in the form of an "offset credit" and allows capped entities to use for compliance in lieu of pollution permits or "allowances."
2. Source: EPA, 2008, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2006*. Of this total, emissions from the anaerobic decomposition of manure from managed lagoons, ponds, tanks, and pits account for roughly 30 percent. While options for reducing emissions from enteric fermentation are not yet well proven, emissions from manure management can be captured and/or flared using various forms of anaerobic digestion technology.
3. Source: USDA, 2009, *Farms, Land in Farms, and Livestock Operations: 2008* Summary.
4. This assumes a dairy cow produces 5 $MtCO_2e$ in methane emissions per year from the anaerobic digestion of her manure. Emissions are based on a lactating cow weighing 1,376 lbs. Source: USDA; http://www.rurdev.usda.gov/rbs/index.html
5. According to the *EIA Emissions of GHG Report* (December 3, 2008), 2007 agricultural emissions were responsible for seven percent of total U.S. emissions. Agricultural sources accounted for 215 $MMtCO_2e$ or ~30 percent of U.S. CH_4 emissions, primarily from livestock management, and 292 $MMtCO_2e$ or ~76 percent of U.S. N_2O emissions, primarily the result of nitrogen fertilization of soils.
6. This assumes $150 billion in annual revenues from the auction of emission allowances.
7. Source: EPA, November 2005, *Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture*.
8. *International Climate Change Programs; Lessons Learned from the European Union's Emissions Trading Scheme and the Kyoto Protocol's Clean Development Mechanism*, U.S. GAO Report to Congressional Requesters, November, 2008.
9. Oko-Institut, Is the CDM fulfilling its environmental and sustainable development objectives? An evaluation of the CDM and options for improvement (World Wildlife Fund, November 2007).
10. To stay on the 450-ppm path, global cumulative emissions must decline at least 50 percent below 2005 levels by 2050. To meet this target without the need for steep and unrealistic reduction rates in latter years, developed country emissions should peak by 2010 and then decline at least 80 percent below 2005 levels by 2050. Developing country emissions should peak between 2020 and 2025 and begin to decline towards a 30 percent reduction below 2005 levels by 2050.
11. Smith, P., D. Martino, Z. Cai, D. Gwary, H. Janzen, P. Kumar, B. McCarl, S. Ogle, F. O'Mara, C. Rice, B. Scholes, O. Sirotenko, *Agriculture. In Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer eds., Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2007).
12. Source: McKinsey & Co., January 2009, *Pathways to a Low-Carbon Economy*.
13. Source: FAO, 2005. Forest Resources Assessment.
14. Source: IPCC, 2000. Though deforestation itself does not release large amounts of CH4 or N2O, these GHGs are often emitted when cleared land is used for cattle or other ruminant livestock, paddy rice, and other crops, especially those fertilized with nitrogen.
15. Source: McKinsey & Co., December 2008, *Saving the World's Forests Today; Creating Incentives to Avoid Deforestation*. This report was prepared in consultation with the President of Guyana and his staff.
16. A cost-containment reserve would only be triggered in the event of extreme volatility in the price of allowances, at which point offset credits would be injected into the market to stabilize prices. Funds from the sale of reserve credits should be used to refill the reserve to avoid reducing the overall contribution of the United States to global abatement goals.