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Metrics for Evaluating Policy Commitments in a Fragmented World: The Challenges of Equity and Integrity

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THE HARVARD PROJECT ON INTERNATIONAL CLIMATE AGREEMENTS

The goal of the Harvard Project on International Climate Agreements is to help identify key design elements of a scientifically sound, economically rational, and politically pragmatic post-2012 international policy architecture for global climate change. It draws upon leading thinkers from academia, private industry, government, and non-governmental organizations from around the world to construct a small set of promising policy frameworks and then disseminate and discuss the design elements and frameworks with decision-makers. The Project is co-directed by Robert N. Stavins, Albert Pratt Professor of Business and Government, John F. Kennedy School of Government, Harvard University, and Joseph E. Aldy, Fellow, Resources for the Future. For more information, see the Project's website: http://belfercenter.ksg.harvard.edu/climate

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Metrics for Evaluating Policy Commitments in a Fragmented World:

The Challenges of Equity And Integrity

Carolyn Fischer and Richard Morgenstern[1]

Executive Summary

Despite the uncertainties about the nature and stringency of national emission reduction commitments, some things are clear: the international negotiations not only will include national targets and timetables, but also will have to take account of diverse policies and measures undertaken by individual nations, including those inside the current Kyoto group, as well as among developing countries. The evaluation of these diverse policies poses a number of challenges. For example, how can one assess the fairness of the relative contributions of different nations? And even if fairness is agreed upon, how is it possible to determine the credibility of the commitments?

Ex post, determining whether particular policies have been implemented is a relatively simple matter, although assessing their effectiveness is not always straightforward. Ex-ante, however, the integrity of the international process requires at least some evaluation of the policies and measures proposed by individual nations to estimate their likely impacts. The absence of such evaluation may handicap the negotiators in reaching credible agreements.

The current system for reporting national actions to the international community is highly nonuniform and insufficient to understand differences among countries' policies and their effectiveness. Thus, a first order of business should be the development of a much tighter, narrowly defined set of guidelines designed to reflect genuine differences in activities among nations.

Regarding the fairness of the commitments, certain metrics, like emissions as a share of GDP, population, or historical emissions, are straightforward to calculate, and generally informative, albeit imperfect indicators of burden. Other metrics, like emissions reductions or total costs of

[1] The authors are Senior Fellows at Resources for the Future. Portions of this paper are drawn from an unpublished manuscript by Fischer, Jacoby and Morgenstern (2005) which was presented at a meeting of the Climate Policy Network in Sardinia, Italy, September 7, 2005.

policies undertaken, are unlikely to be reported reliably. The metric of marginal abatement costs—at least among market-based policies—has the advantage of indicating the cost-effectiveness of the international distribution of effort. It is also an important indicator of the competitiveness impacts of climate policies vis-à-vis trading partners. We recommend greater focus on this measure, but caution the difficulty in attributing the marginal costs of non-market-based policies, especially inefficient measures. The key question is what carbon price would achieve the same reductions as the suite of policies selected, either by sector or for the whole economy. This would be analogous to the calculation of the level of effective protection applied in analyses of trade disputes.

Regarding the integrity of the commitments, we see related but distinct issues associated with the ex-post verification of performance – essentially compliance – and the ex-ante challenges faced by international negotiators in comparing often quite dissimilar policies and measures. For ex-post verification, the simplicity of an aggregate, economy-wide emissions target, or even one expressed as emissions intensity, is quite appealing. Existing data and reporting systems are certainly compatible with such approaches. When subnational or specific regulatory or voluntary policies are used, the commitment should be expressed as a transparent, verifiable goal, such as a fuel efficiency standard or level of technology deployment. However, while such goals may be clear, their effects on emissions are less transparent. Therefore, descriptive, institutionally-oriented information must be supplemented with micro data on the actual implementation and performance of these measures. Focusing on specific emission goals as opposed to regulatory standards can help avoid excessive reliance on model-based counterfactuals. R&D programs are by their long-term nature difficult to compare to near-term emissions targets, but these activities should at least be made more comparable across countries. We see no alternative to relying on actual expenditure and deployment data, although care should be taken to link such data to specific program activities, and to include transparent baseline information.

Assessment of the integrity of ex-ante commitments is, perhaps, the most important but also the most problematic area. The greatest challenges are associated with the unavoidable need to model counterfactuals, with all the attendant complexities. New guidelines should focus on the need for greater transparency in models and data, and greater standardization in methodologies in order to improve the consistency of analysis across sectors, policies and countries. Another priority is the strengthening of the mandate of the international group of experts that evaluates the submissions. The current practice of UNFCCC peer review is far too loose an arrangement for the reports to be

credible inputs to climate negotiations. Other international processes may provide lessons for evaluating the quality, consistency and value of the estimates of ex-ante commitments. For example, the World Trade Organization has a Trade Policy Review Mechanism, by agreement in the Uruguay Round, which offers regular, comprehensive reviews of individual Members' trade policies and practices and their impacts on the functioning of the multilateral trading system.

While the multilateral trading system offers some lessons in negotiating and supporting international agreements, the circumstances and party incentives are quite different for a climate framework. A greater role may need to be played by independent institutions, international organizations, academic researchers, and other third-party groups in supporting the evaluation efforts that, in turn, support the negotiations.

Introduction

Development of effective strategies to address global climate change requires collective effort on the part of many countries over an extended time horizon across a range of activities. The Bali Action Plan, for example, calls for action on mitigation, adaptation, technology, and finance, each implying a different suite of policies and contributions. In the early stages of policy development, nations and nation groups may take action more-or-less independently of one another, as is happening now. Specific policies and measures already adopted are quite diverse, including cap and trade programs covering at least a major portion of a nation's greenhouse gas (GHG) emissions, as well as regulatory, voluntary and other activities. Some of these policies are integral components of countries' Kyoto commitments; others are not. Over the longer term, however, progress toward any stabilization goal is going to require increasing levels of international burden sharing and a more formal structure. Agreement will be worked out in a sequence of international negotiations, within which the twin issues of equity and integrity of the responses will be central features.

The challenges of moving ahead in a world of diverse policies are illustrated by a simple story:

> *Two individuals are approached on the street by a sympathetic homeless person seeking assistance. Person A, an established professional with a relatively high income, proposes to rent the homeless individual an apartment for six months. Person B, a younger, struggling academic, offers to donate $100. Regrettably, neither one can make good on their offers immediately. However, they*

both agree to return to the same location at an appointed time the following week to complete the transactions.

How can one evaluate the fairness of the relative contributions of persons A and B? If A provides free apartment rental, should B give more than $100? Are income differences between them the only or even the most important determinant of their relative contributions? How about differences in wealth, health, family responsibilities, life expectancy, prior support of similar causes, or other factors? As the recent history of international climate negotiations reveals, it is no simple matter to define fairness among nations, as comparability of effort does not have clear metrics.

The second key issue involving the integrity or credibility of the commitments has two key elements. On the one hand, we must be able to ascertain whether the agreed upon pledges are fulfilled. Ex post, the transactions should be monitored to verify that individuals A and B showed up at the appointed time and made their stated contributions without added conditions. Similarly, credible international reporting systems must verify that particular policies were, in fact, put in place and/or that overall emissions targets are met. As 2012 approaches, for example, it will become abundantly clear whether or not nations will meet their Kyoto targets.

On the other hand, the integrity of the process dictates at least some ex-ante evaluation of the policies and measures proposed by individual nations to assess their likely impacts, that is, at the time the international negotiations are undertaken. Yet, such an evaluation requires making difficult assumptions and using complex modeling techniques. How can one compare the proposal to rent an apartment made by individual A to the $100 offered by B? Although we can readily determine the average rent of an apartment in the area, in the absence of additional information, we don't really know what individual A had in mind: a rooming house in a slum or a luxury unit in a high rent area? Similarly, as we move away from a strict emissions target and timetable framework, toward an approach involving a portfolio of policies—presumably those around which there is a domestic consensus—the specifics of the proposed policies loom larger, and the need for an ex-ante assessment of the emissions implications of the proposals becomes greater.

In a world of diverse policies, the challenge for the international community will be to judge the comparability and integrity of the various national proposals. Over time, proposed policies may become more uniform, thus diminishing the need for such analyses, but at least in the current phase

of international negotiations, a useful input to the negotiations will be some means of talking in a coherent and widely accepted fashion about what individual nations or nation groups are doing or proposing to do to help reduce climate risk.

In this paper we explore various ways that a framework might be developed for devising metrics for evaluating policy commitments, short of, or in addition to, a fixed quantity target. As noted, our focus is on the twin challenges of assessing the equity and integrity of the commitments. Although many of the lessons also apply to evaluating commitments related to adaptation, technology and finance, our principal focus is on mitigation.

The next section provides relevant background on the issue. Section III addresses the issue of equity in some depth and considers alternative approaches for evaluating and comparing efforts at the national level. Section IV focuses on the integrity of commitments, including a discussion of the relatively straightforward issue of ex-post verification, as well as the more complex problem of ex-ante assessment. Also included in this section is a brief review of current experience with national reporting on policies under the UNFCCC framework. The final section (VI) offers recommendations for reform of the current system.

Background

The Berlin Mandate, adopted by the FCCC parties in COP-l, called for the elaboration of policies and measures and the setting of quantified limitation and reduction objectives (QUELROs) over specific time frames. The implication of a possible policies provision was that these measures would be common or uniform across nations. That is, parties to an agreement would be taking roughly the same actions in the policies domain, and the QUELRO that was accepted would be the main indicator of effort.

Under the Kyoto Protocol, the formal crediting of policies was abandoned but the fixed national quantity targets and timetables for emissions reduction were maintained as the principal indicator of national effort or contribution. Indeed, future emission reduction levels—or the nature and stringency of policies that might substitute for fixed national quantity targets—are the main issues in the potential negotiation of a second Kyoto commitment period. Although a nation's Kyoto obligation can be met by increases in sinks and purchases of credits from countries outside

the boundaries of participating Annex B nations, there are no provisions to credit specific policies and measures that nations may undertake. Nor is there evidence of planning among international agencies about how this would be done. Yet the issue of the quantification of diverse or uncommon policies is likely to become a significant issue in future international discussions.

Despite the many uncertainties about the nature and stringency of future commitments in future climate change agreements, one characteristic of coming discussions seems clear: the negotiations may include national targets and timetables, but they also will have to take account of specific policies undertaken by individual nations, including those inside the current Kyoto group, as well as by developing countries and others outside the group. Indeed, countries with different perceptions of the issues may agree in good faith that global warming poses a danger, yet they may prefer vastly different approaches. These preferences may diverge due to the different socio-economic characteristics of nations, or to the uncertain nature of the costs, benefits, and strategies for reducing greenhouse gases, and the negotiators' perceptions of the risks. For example, a country that is more optimistic about future technological potential may prefer to engage in less near-term mitigation in favor of more R&D now and stricter caps later. A country that is more risk averse about impinging upon economic growth and more pessimistic about the speed of technological progress may be willing to accept intensity-based targets. A country that has different expectations about the marginal benefits may be willing to accept a certain carbon tax (or safety valve), but not risk a sharp run-up in energy costs.

Almost all nations, including developing countries, are currently taking some action on emissions mitigation, and each will seek credit for what they are doing. For example, policies being undertaken now by or more Annex B nations include the following:

- Pricing carbon emissions and energy (usually differentiated by sector), such as GHG or fuel taxes, cap-and-trade systems for CO2 or GHGs, or the removal of fuel subsidies;

- Subsidies to low-GHG technologies for energy supplies (e.g., ethanol, wind) or energy-using devices (e.g., hybrid cars);

- Regulatory policies (always differentiated by sector and/or device), such as consumer device performance standards (e.g., CAFE, building standards) or portfolio standards (e.g., in electricity generation);

- Voluntary programs; examples in the U.S. include Climate Leaders for industries, as well as consumer-oriented programs like Energy Star labeling;

- Expenditure on R&D and technology demonstration, such as for low-carbon energy supplies or new energy-saving use technologies; and

- Aid to other countries, which can take the form of financial transfers, technology aid and transfer, capacity building, and aid for adaptation.

Note that with the exception of the price measures, the US has programs at one level or another in all of these areas. Further, the US has consistently claimed that it is carrying its proper share of the needed global commitment. Assuming eventual enactment of a policy that somewhat resembles recent Congressional proposals for carbon pricing programs, which are less ambitious than current/expected European emission reductions but broader in scope, the U.S. is likely to make that claim in even stronger terms. Most other non-Annex B nations also have activities under way in many of these domains. The key question is whether the diverse set of activities can be compared in any meaningful way.

Evaluating Equity

Equity is a major concern for international climate negotiations, which are fundamentally about sharing a burden. Toward this end, there is a strong desire to be able to compare efforts and assess whether countries are contributing their fair shares. Yet, comparing efforts involves two kinds of exercises, neither of which lends itself to clear and fair metrics. The first exercise is to compare a portfolio of disparate national policies according to a consistent measure that reflects effort, for example, cost burden or emissions reductions. The second exercise, to assess fairness (for example, in proportion to GDP, population, or some metric of capacity for effort), is to place the measure of effort into an appropriate context reflecting the socio-economic and other circumstances of

individual countries which indicate their ability to undertake emission reductions. The basic problem is that clear metrics are not always fair, and fair metrics are not always clear.

While indicators related to effort do exist, and we discuss some below, none can be translated into total cost burdens or relative emissions reductions without extensive modeling analysis, with a range of associated assumptions that reduce the transparency of the exercise. Most of these kinds of evaluations would be conducted ex-ante as part of the negotiating process, which requires making judgments about future actions and circumstances. Ex post, much of the information is observable, but attempting to evaluate equity or effort at that point still requires making assumptions about unobservable counterfactuals, such as what GDP or emissions would have been in the absence of the policies. Even seemingly straightforward metrics can have important definitional issues in practice that affect their comparability. And even reasonable measures of effort can be poor indicators of fairness.

We consider a number of alternative approaches to measuring climate policy contributions, including measures of emissions performance, reductions and costs. Each can provide some valuable information, but none is terribly satisfying as a reliable measure of effort or equity.

Measurement Options

Emissions Performance

Inevitably, Kyoto-style fixed quantity targets involving a reduction from a specified base will remain part of future international discussions, whether or not commitments are negotiated in these terms. Measures of this type are straightforward to calculate at the national level with available data, at least for industrialized countries, and several comprehensive proposals have been developed (see, for example, Frankel 2007).

However, emissions targets can be a poor indicator of effort, as different countries have different reduction potentials and different needs for emissions growth. For example, under the "Kyoto" metric, the EU might look much more ambitious at a target of 20% below1990 levels than the US would be at a target of 1990 levels by 2020. However, the US has much higher baseline emissions growth, which makes the reduction burden look larger. At the same time, the US has higher income and wealth growth rates, which could make reductions look more affordable.

Developing countries prioritizing economic growth may find emissions intensity of GDP or emissions per capita to be a more acceptable indicator, but even these measures ignore costs and other circumstances related to reductions potential. More complex versions of a targets measure might also be devised, such as accounting for differences in historical emissions paths, or reductions undertaken outside the country through the Clean Development Mechanism (CDM) or other activities. Such alternate approaches were pursued during the Clinton Administration in various attempts to encourage non-Annex B nations to adopt national targets. Still, all these cases rely on some measure of aggregate emissions which, by itself, is a poor indicator of burdens Even though the standard for evaluation may depend on other metrics, nations may have different views on what kinds of adjustments for relative emissions targets result in an appropriate measure of fairness.

Emissions Reductions

Emissions reductions, as opposed to emissions outcomes, are more closely tied to notions of effort. However, they are much more difficult to measure. Estimating the emission reduction effects of policies typically requires projecting a counterfactual baseline and comparing to actual emissions (or, ex-ante, to a projection of emissions assuming the policies are in place). This method is conceptually similar to certifying emissions reductions under the CDM, with the same challenges of estimating credible baselines. But while CDM is a project-based mechanism, these mechanisms are policy-based, making them generally wider in scope and involving more actors. As discussed below in the section on current reporting practices under the UNFCCC, the norm is *not* to report emission reductions for individual policies.

Assessing the reductions associated with a portfolio of policies raises additional challenges. Estimates of the emissions performance of individual policies are difficult to aggregate in a simple fashion, as some policies will overlap with each other—or with covered sector quantity targets. Care must be taken to avoid double-counting and to recognize leakage. Currently, a few countries have attempted to make adjustments for overlapping effects in their national reporting, while others have largely ignored the issue.

In addition to problems estimating reductions, it is unclear how well reductions (in absolute terms or as a percentage of total emissions) reflect the actual socioeconomic costs incurred by a

country. Different countries with the same percentage reduction from baseline could experience very different burdens, depending on their relative capacities for low-cost reductions.

Total Costs

Another possible metric for comparing efforts is to calculate the total cost of mitigation activities, perhaps as a share of GDP. This measure can be quite straightforward for individual policies involving fiscal expenditures, such as subsidies for technology deployment or R&D. It can also allow for spending on non-mitigation activities like adaptation or international assistance. However, non-fiscal policies like regulations (market-based or otherwise) and voluntary programs require difficult modeling to ascertain total cost estimates (not to mention environmental effects).

Nor are total costs necessarily a good measure of the quality of the activities being undertaken. For mitigation policies, fiscal expenditures can be associated with varying degrees of effectiveness in terms of emissions outcomes (ethanol subsidies may be a good case in point). One must also account for baseline spending levels, pre-existing energy taxes, and other factors, to understand the additional costs associated with the country's policy commitments. Further, there are questions about the quality and reliability of this cost measure, because of the many uncertainties involved. Not surprisingly, estimates of the total costs of regulations tend to vary more widely in most modeling analyses than those of marginal cost (Fischer and Morgenstern 2005).

Marginal Costs

An easier measure to compare across countries may be the explicit or implicit *marginal cost* of emission reductions. In the case of an upstream cap-&-trade system or a universal GHG tax, the appropriate measure is straightforward: the emissions price or tax level. However, if the price-based policy is not implemented in an economy-wide manner, then the measure is confounded by the scope question—is a country with a low economy-wide carbon tax putting in more or less effort than a country with a high-price cap-and-trade system applied only to energy-intensive industries? Once measures move beyond price-based instruments, several potential difficulties must be addressed to estimate an implicit price. How does one average across different sector-specific policies? How does one estimate the effective cost imposed by non-price emissions measures?

In some ways, the concept of calculating implicit marginal costs is analogous to the calculation of the level of effective protection that is applied in analyses of trade disputes. In the trade case, effective protection represents the difference between a good's domestic price and the international price it would garner. Effective protection is a function of the tariff and non-tariff barriers facing that good and all of its inputs, and it can be expressed as an equivalent tariff, though often with some difficult calculations. Analogously, the emissions reductions of some non-price measure can be stated in terms of the emissions price that would have the equivalent retarding effect on current emissions. However, the trade calculations are typically made on a good-by-good basis; one could also compare marginal abatement costs on a sector-by-sector basis, which could be highly relevant for assessing competitiveness impacts. But for comparing overall country efforts in climate, some kind of national, multi-sector metric is required, with the associated challenges of aggregating across a variety of policies and sectors.

Another question regards how well marginal cost acts as a proxy for policy effectiveness. Inefficient policies can have high implicit prices but low effectiveness (e.g., over-subsidy of wind or ethanol). Many policies also raise issues of additionality, uncertainty, and credibility that need to be considered. Should one account for differences in emissions or marginal costs among nations that are the result of policies other than GHG control (e.g., energy, fiscal measures) and differences in national structure (e.g., geography, natural resource base)? Further, how should expenditures on R&D be credited? For example, one might estimate that a similar amount of R&D would be induced by a certain emissions price, but the emissions reductions induced by the R&D policy are not comparable to those that would arise out of that emissions price.

Using Measures for Equity

It is unlikely that any single measure of effort will be acceptable to all countries. Credible commitments to emissions targets can be straightforward to verify, but they have no clear relationship to actual burdens. Meanwhile, measures more related to economic burdens are not straightforward to calculate. Furthermore, translating a measure of burden or effort into something revealing whether that effort is fair or comparable requires an arbitrary decision of which country-specific metrics to use for making those adjustments. And some of those adjustment metrics, which

ideally would reflect capacity for reducing emissions, are difficult or impossible to measure themselves.

Ultimately fairness is subjective: "There are no 'neutral' metrics: different metrics will show different countries in a good (or less good) light" (OECD, p. 6). Furthermore, subjective views may change: whatever seems fair at one time may well be perceived differently in the future. For example, while a fixed 1990 emissions baseline might have seemed fair in1997 when the Kyoto Protocol was first signed, subsequent strong differences in economic performance have changed some parties' views on the equity of the original formula.

That is not to say that attempting to gather measures of efforts is not useful for negotiators. Each country will inform its own opinion of the comparability of different proposals with such indicators. However, the goal of negotiations is to obtain agreement on climate policy commitments, and those may not be determined by a single rule for allocating burdens.

Evaluating Integrity

Ultimately, in any climate agreement, what one cares about is effectiveness. Evaluating the integrity of a collection of country commitments requires two levels of analysis. First, are the commitments themselves credible; that is, do we believe the countries will undertake them and can they be monitored and verified? Second, are the effects of the commitments credible; that is, do we reasonably expect the set of policies being undertaken to lead to the stated emissions goals? The integrity goal necessarily shifts the focus to emissions. The first question of credibility requires the ability to conduct ex-post analysis—choosing metrics in support of enforcing the agreement and engaging in commitments that do have such metrics, be they levels of emissions, regulations, or budgetary measures. The second question requires primarily ex-ante analysis, estimating the expected effects of policies prior to implementation.

Credibility of Commitments

The difficulty of verifying a nation's performance ex post depends to a great extent on how performance is actually defined. If it is defined in terms of an aggregate emissions target or a reduction from a well established baseline, the task is relatively straightforward. Reporting requirements established under the UNFCCC already call for the development and updating of an

emissions inventory for all covered GHGs. As a cross check, the International Energy Agency (IEA) routinely reports CO2 emissions by country, as does the US Energy Information Agency (EIA). Under the terms of both the UNFCCC and the Kyoto Protocol, institutional arrangements have been established to assess ex-post compliance for aggregate emissions targets, including accounting for transactions with nonAnnex B nations. An only slightly more complex story applies to the verification of a target such as emissions intensity, since GDP calculations are readily available.

Not surprisingly, the challenge for determining performance ex post is greater when the focus moves away from aggregate targets to subnational or policy specific measures. This is clear in the case of sectoral emissions targets, and even more so in the case of policies which are not directly tied to an emissions target, such as voluntary programs or regulatory standards.

The principal issue with sectoral targets is that data on fuel use by sector may not be available on a current basis in all countries. In the US, for example, the Manufacturing Energy Consumption Survey (MECS) is only conducted every three years, although it is possible to extrapolate from published sources to estimate sector specific emissions for major sectors. At the same time, nonconventional fuels, such as biomass, pose special data problems, as do some of the nonCO2 gases. Other countries may face similar, or possibly greater, challenges in developing sector-specific emissions data. Currently, the only reporting requirements for sectoral targets are the inventories and national communications as required under the UNFCCC. As discussed below in the section on current practices, the data to support these reports are quite sparse in many countries, and often plagued by omissions, double counting and other problems.

In the case of policies that are not tied to emissions targets, the challenges of verifying ex post performance can be even greater. The challenge arises from the fact that one needs information on the effectiveness of the policies, not simply on whether the institutional arrangements have been established. For example, in the case of voluntary programs, most of the publicly available data is descriptive in nature, covering such aspects as the number of firms/plants enrolled in the programs, what goals have been established, and whether firms have set up internal training or information activities to support the voluntary programs. Very little information is available on what firms actually do to reduce their emissions, and even less is known about how

these actions compare with actions taken by firms that have not joined the programs. Thus, it is extremely difficult to assess the contribution of voluntary programs compared to a realistic baseline.

Recent research on a selected number of voluntary programs in the US, Europe and Japan suggests that, at best, the incremental contribution of voluntary energy or GHG reduction programs is on the order of a 5 percent, plus or minus 5 percent (Morgenstern and Pizer 2007). However, because of the sparse reporting on performance, it is virtually impossible to estimate the effectiveness of most individual programs in operation today. That is not to deny the possibility of building in additional reporting requirements relevant for evaluation purposes but few programs have done so.

Mandatory regulations and policies generally involve verifiable compliance mechanisms, although the effectiveness of mechanisms is not uniform within or across agencies in a single country, and less so across countries. Even when compliance is assured, environmental effectiveness may be an issue. In the case of policies that mandate the purchase of energy efficient capital equipment—such as new source performance standards for power plants, corporate average fuel economy (CAFE) standards for autos and light trucks, or efficiency standards for appliances, it is usually possible to obtain information on the number and performance attributes of the equipment sold and installed. The difficulty comes in keeping track of the actual use of the equipment and in determining what old equipment is being retired in favor of the new equipment. For example, while a new fuel efficient vehicle can reduce energy use per mile, the lower driving cost can lead to more vehicle miles traveled (the so-called rebound effect), and higher purchasing costs can reduce vehicle turnover, thereby offsetting some of the expected gains. Carbon capture and storage equipment might be installed on a power plant, but the associated energy penalty makes it expensive to use. Thus, extensive information about the use of the new capital equipment is required to assess the environmental effectiveness. Unfortunately, such information is often difficult to obtain.

In sum, ex-post verification is most plausible at the aggregate level, especially when performance is defined in terms of a quantity based target such as total emissions or emissions intensity. Problems of a higher order stalk the verification of the effectiveness of a subnational target or specific regulatory or voluntary programs, although some of these may be lessened by requirements for additional data gathering. When the targets are expressed as a change in emissions

against a future, as yet undetermined baseline, the need for a modeled, counterfactual is unavoidable. Yet, gaining consensus on such a counterfactual can be quite difficult.

The bottom line regarding ex-post verification: engage in commitments that are clearly verifiable, and focus on aggregate targets whenever possible. When subnational or policy/program goals are adopted, be sure to collect relevant micro information and avoid metrics that require extensive reliance on modeled counterfactuals.

Credibility of Effectiveness

A national emissions target represents a commitment to meet a specified environmental outcome. Yet, in the absence of information on the specific policies to be adopted, one cannont evaluate whether the target is likely to be achieved. If a country commits to a set of policies without a specific target, there is an even greater need for a detailed evaluation of the proposed policies.

Some countries unwilling to take on fixed aggregate emissions targets at this point might be willing to accept targets in individual sectors in which they have sound strategies or perceive a level playing field. Such efforts may be motivated in whole or part by fears of trade sanctions by nations adopting mandatory policies. Indeed, even in countries with aggregate targets, many are implementing separate targets for certain covered sectors.

Evaluating the contribution of a portfolio of policies raises difficult issues of aggregating across sectors or policies over time. Even within sectors, a host of challenges bedevil any analysis attempting to compare the effects of different policies. Many of the issues are familiar in the realm of crediting programs, including baselines, uncertainty, credibility of current and future efforts; and the secondary effects of measures or offsetting actions (e.g., crowding out, rebound effects, offsetting tax reductions, overlap with other policies). As for the crediting programs, sound guidelines are needed to develop estimates of the primary effects of individual policies, to account properly for secondary effects, and to aggregate when multiple policies are adopted at the same time.

Perhaps the most difficult challenge is to deal adequately with policies that have multi-period effects and to facilitate the comparison of long-term commitments. For example, subsidies for learning (through production), R&D, and demonstration influence the future cost of mitigation, with less effect on current emissions. The benefits may even spill over to other jurisdictions.

However, given the uncertainty involved in research processes, and the interdependence of success with pricing or other regulatory policies, it is difficult to equate current research efforts with a reliable amount of future emissions. The issue is further complicated by the fact that some policies and measures, like a carbon price, can induce private R&D efforts, thereby generating multi-period effects themselves.

In principle, one could compute the impacts of various measures—including R&D and subsidies—that would be expected to achieve the same reduction as a specified emissions increase in a carbon price (see, e.g., Fischer and Newell 2008). However, any measure of equivalency will be heavily influenced by the modeling assumptions, including the expected effectiveness of R&D or learning by doing, the effectiveness of the policy program in promoting R&D, the expected duration of the R&D program, the timing of technological change, discounting, domestic and international spillovers, etc.

Such an exercise can be revealing, if not about the exact tradeoffs among policies, then about the assumptions required for the proposed indirect efforts to lead to desired emissions (or cost) reductions. Understanding those conditions can help policymakers assess how realistic a range of effects is likely to be. Not surprisingly, comparing across R&D programs (and other like programs) may require resorting to fairly gross measures, like spending, installed capacity, and the like. Even those evaluations, however, still need to account for baseline activities and choose verifiable measures.

Thus, while expected emissions should be the primary metric, alternative measures may be more appropriate for different types of policies, especially in nations with weak reporting systems. Greater effort should be put into standardizing the use and implementation of reporting and evaluation methodologies. In the absence of detailed assessment in some countries, it would be reasonable to apply the results from well designed studies in other nations. Hopefully, the use of such practices will encourage nations to undertake more detailed research on their own policies.

Current Reporting Practices

Some precedent exists for the collection and evaluation of the data needed to perform these kinds of analysis, in the form of current reporting to the UNFCCC. We briefly review these

practices for insight into further steps that might support a future international climate policy framework.

Currently, Annex 1 countries are required to submit two reports annually to the UNFCCC: 1) the national GHG inventory; and 2) the national communication. The latter includes a chapter on the inventory but also describes the policies and measures undertaken and provides emissions projections. The UNFCCC has established guidelines for calculating and reporting GHG inventories as well as for the structure and content of the national communications.[2]

Under the UNFCCC guidelines, a country may report planned, adopted, and implemented policies, but must specify the status of the measure. The main intention of a policy does not have to be reducing GHGs for the policy to be listed. The reporting format calls for distinguishing among the sectors to which they apply (e.g., energy, industrial, etc.), and the greenhouse gases affected (CO2, CH4, etc.). Each country must explain what monitoring and evaluation systems are in place according to the objectives and/or activities affected, GHG affected, type of instrument (economic, fiscal, voluntary/negotiated agreements, regulatory, information, education, research, and other), status, and implementing entity. Where possible, countries are required to provide a numerical estimate of the expected emission reductions. They are also asked to provide a brief description of the methodology used to make the calculations.

For emissions projections, Annex 1 countries are only required to report projections 'with policies and measures', but may also report 'without policies and measures' projections. For the aggregate estimate of the total effect of the party's policies and measures, the guidelines require that the 'with policies and measures' projection be compared to a scenario without the policies. Thus, the UNFCCC guidelines call for countries to attempt to calculate the cumulative emissions reductions and compare them to a business as usual scenario. Each country should report net emissions avoided or sequestered for the years 2005, 2010, 2015, and 2020. The guidelines do not prescribe any particular model or approach, but they request a sufficient explanation of the chosen methodology to provide 'basic understanding' to the reader. A description of the method should

[2] The guidelines for the national communications were adopted during COP 2 (Geneva, July 1996) and COP 5 (Bonn, October/November 1999).

include specifying the GHGs involved; the type of model or approach used and the key model characteristics (top-down model, bottom-up model); the original purpose of the model and how it may have been modified to fit the purpose; the strengths and weaknesses of model; and how it accounts for overlap among policies. Parties should include references to more detailed explanations for these criteria and describe any changes in methods from the previous national communication. Basic national information employed in the calculations, such as GDP growth, population growth, etc. should be included in the report.

Every national communication is reviewed by a team of UNFCCC experts through an in-country visit and via appraisal of the report. The reviews are published, usually in advance of required report revisions. While the reviews are designed to make comparison of national reports easier and more transparent, no common metric is applied to the individual country submissions.

While a comprehensive examination of national communications is not feasible, in this section we review the results from selected countries to gain a sense of how well or poorly the guidelines are implemented. Specifically, we review the most recent national submissions for five Annex I parties (the U.S., Australia, U.K., EU, and Japan), classifying their reported policies and measures into eight categories:

- Education&Outreach (E)
- Economic/Fiscal (F)
- Information (I)
- Regulatory (R)
- Research, Development, & Deployment (RD&D)
- Technical (T)
- Voluntary (V)
- Various/Other (O)

The results are summarized in Table 1. Overall, a broad range of individual policies and measures are reported by the five nations. While only the EU has established a formal emissions trading scheme, the other four nations all report integrated climate programs of one type or another. The U.S. focuses on its voluntary reporting under the 1605(b) program, while both the UK and Japan refer to their comprehensive plans.

Within the energy sector, it is clear that all five nations report extensive activities, ranging from regulatory programs for renewables and energy management, to voluntary, information and education programs. In the transportation sector, all countries report programs involving both vehicles and fuels. Not surprisingly, the range of policies and measures is quite broad, including regulatory, voluntary, RD&D, and financial initiatives. Beyond vehicles and fuels, most nations also have some activities in the areas of integrated transport planning, efficiency in aviation, and agreements/partnerships.

In the industrial and agricultural sectors, a number of programs focus on CO_2 while others specifically address the non-CO_2 gases. As in the other sectors, these policies involve many different activities, including information, education and technical support. All countries also report a broad range of policies in the areas of waste management and forestry.

Our examination of these national communications, along with a review of the comments prepared by the UNFCCC reviewers and others reveals a number of findings. Overall, it is difficult to ascertain the quality of the reports, as important information for evaluating the effectiveness of individual policies is often lacking. Many policies and measures are presented in the absence of clear baselines, and the reports generally suffer from a lack of transparency. A number of the national communications emphasize proposed or planned policies rather than the evaluation of existing policies/programs. Whether these omissions are strategic in nature or simply a reflection of missing information is difficult to determine. Nonetheless, the extent of these problems call into question the credibility of the programs.

Some of the observed problems could be easily remedied: for example, more information on the additionality of the policies could be provided, and the methods and assumptions in making projections of the emission reductions associated with individual policies could be presented more clearly. Other problems are more serious and likely difficult to correct, such as the double counting

of reductions, and the inconsistencies of baselines across policies, sometimes even with a single sector or program.

In the area of R&D, at least one country labels its efforts as financial instruments without providing information on the types of research activities being undertaken. In other cases, where some descriptive information is provided, there appear to be inconsistencies in the data. Information on the issue of additionality of the policies is often missing, and some of the national communications do not indicate whether the reported activities are newly implemented or ones that have been previously counted or reclassified.

In the area voluntary programs, which are among the most popular of the policies and measures reported, the focus is almost exclusively on the description of programs, with very little emphasis on the quantification of the emission reductions compared to a realistic baseline. In many cases the reductions are presented compared to base year emissions, without accounting for the likely progress that would have occurred in a business as usual scenario. Also, only a few nations made an effort to address the potential for double counting. When the problem is addressed, it is often only in the form of an aggregate 'guesstimate' rather than a program-specific analysis.

Perhaps the clearest exception to this rule is Australia, which has devoted considerable resources to creating methodologies for evaluating and reporting its climate policy efforts and maintaining comparability across sectors. Each sector has its own methodological guidelines detailing how to accurately monitor, report, and verify emissions in that sector. In May 2005, the Australian Greenhouse Office (AGO) initiated the Australian Greenhouse Emissions Information System (AGEIS), to combine all emissions data and reporting processes into one unit to increase the transparency and accessibility of the inventory. The AGEIS integrates all the sector methodologies and incorporates quality control procedures into the process, specifically using IPCC Guideline Key Tier 1 QA/QC procedures. This information is made public through an interactive website.

Australia's National Greenhouse Gas Inventory Committee reviews all emissions inventories before they are released to ensure accuracy. The AGO examines the performance of all policies and updates the projections yearly. The report is clear in distinguishing among policies that are existing, new, or reclassified. The emissions projections include both business as usual and 'with policies and measures', and they use a consensus forecasting approach for the calculations. Sector projections

are published yearly and reviewed biannually. Individual papers providing more detail on the methodologies used are also published. The national communication provides a web link to those papers and a brief overview of the projections per sector; including a summary of key assumptions, a graph showing with measures and business as usual projections, the impact of current measures, and what models were used.

While non-Annex I nations are not obligated to provide as comprehensive a report as the Annex I countries, China, India and several other nations have gone beyond the minimum requirements. However, these efforts do not generally include preparation of current or future emission projections, either with or without the implementation of policies and measures. What quantitative analysis is presented is often based on outdated information. As with the information displayed in Table 1 from developed nations, it is not possible to determine whether such practices are strategic in nature or whether they represent genuine data gaps.

Conclusion

As the focus in international negotiations moves beyond sole reliance on national emissions targets to include specific policies and measures, there is a clear need to improve the current reporting system in order to provide greater confidence to negotiators about the credibility of countries' activities. Most importantly, it is important that the reported activities be presented in a relatively uniform, consistent fashion. Whereas the current guidelines reflect an attempt to incorporate a broad array of reporting practices used in different countries, the breadth of the different reporting practices can mask genuine differences among countries. Thus, a first order of business should be the development of a much tighter, narrowly defined set of guidelines designed to reflect genuine differences in activities among nations. However, it is important to recognize that no single metric can adequately address the complex issues of equity and integrity central to a successful international agreement on climate change mitigation. Still, some approaches are likely to be more effective than others.

First, regarding the fairness of the commitments, certain metrics, like emissions as a share of GDP, population, or historical emissions, are straightforward to calculate and generally informative, albeit imperfect indicators of burden. Other metrics, like emissions reductions or total costs of policies undertaken, are unlikely to be reported reliably. The metric of marginal abatement costs at

least has the advantage of indicating the cost-effectiveness of the international distribution of effort. It is also an important indicator of the controversial competitiveness impacts of climate policies vis-à-vis trading partners. We recommend greater focus on this measure, but caution the difficulty in attributing the marginal costs of non-market-based policies, especially inefficient measures. The key question is what carbon price would achieve the same reductions as the suite of policies selected, either by sector or for the whole economy. This would be analagous to the calculation of the level of effective protection applied in analyses of trade disputes.

Second, regarding the integrity of the commitments, we see related but distinct issues associated with the ex-post verification of performance – essentially compliance – and the ex-ante challenges faced by international negotiators in comparing often quite dissimilar policies and measures. For ex-post verification, the simplicity of an aggregate, economy-wide emissions target, or even one expressed as emissions intensity, is quite appealing. Existing data and reporting systems are certainly compatible with such approaches. When subnational or specific regulatory or voluntary programs are used, the commitment should be expressed in a transparent, verifiable goal, such as a fuel efficiency standard or level of technology deployment. However, while such goals may be clear, their effects on emissions are less transparent. Therefore, descriptive, institutionally-oriented information must be supplemented with micro data on the actual implementation and performance of these measures. Focusing on specific emission goals as opposed to regulatory standards can help avoid excessive reliance on model-based counterfactuals. R&D programs are by their long-term nature difficult to compare to near-term emissions targets, but these activities should at least be made more comparable across countries. We see no alternative to relying on actual expenditure and deployment data, although care should be taken to link such data to specific program activities, and to include transparent baseline information.

Third, assessment of the integrity of ex-ante commitments is, perhaps, the most important but also the most problematic area. The greatest challenges are associated with the unavoidable need to model counterfactuals, with all the attendant complexities. New guidelines should focus on the need for greater transparency in models and data, and greater standardization in methodologies in order to improve the consistency of analysis across sectors, policies and countries. Another priority is the strengthening of the mandate ofo the international group of experts that evaluates the submissions. The current practice of UNFCCC peer review is far too loose an arrangement for the reports to be credible inputs to climate negotiations. Other international processes may provide

lessons for evaluating the quality, consistency and value of the estimates of ex-ante commitments. For example, the World Trade Organization has a Trade Policy Review Mechanism, by agreement in the Uruguay Round, which offers regular, comprehensive reviews of individual Members' trade policies and practices and their impacts on the functioning of the multilateral trading system. Although the review is not intended as an enforcement mechanism, it is expected to foster greater adherence to obligations by improving transparency and by providing information about each country's practices and circumstances. The review mechanism itself is also subject to appraisal and improvement over time.

While the multilateral trading system offers some lessons in negotiating and supporting international agreements, the circumstances are quite different for a climate framework. In trade, countries negotiate the removal of barriers to foreign goods in exchange for the benefits of greater access to foreign markets. In climate change there is no such exchange; the negotiations are to share a global burden, from which the benefits are far removed in time and not excluded from non-members. Perceptions of fairness and effort thus play a greater role, although global outcomes are ultimately what matter. National governments may not provide the objective evaluation that is essential to the serious comparison of national mitigation proposals. A greater role may need to be played by independent institutions, international organizations, academic researchers, and other third- in supporting the evaluation efforts that, in turn, support the negotiations.

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Table 1: Examples of Policies and Measures

Major Policies and Measures	United States	Australia	United Kingdom	European Union	Japan
Framework policies and cross-sectoral measures					
Integrated Climate Program	Voluntary Reporting of GHGs (1605(b)) (V); Climate Leaders-assist companies develop long-term climate change strategies (V)	Market-based allocation of grants to abatement opps (E); Greenhouse Challenge Plus-Partnerships between govt. and industry to abate GHG emissions (R, F, V); National Framework for Energy Efficiency (R, I, E)	UK Climate Change Programme		Kyoto Protocol Target Achievement Plan
Emissions trading			Domestic schemes since 2002 (E); EU ETS since 2005 (E);	ETS for EU	
Energy Sector					
Renewable Energy Supply	Develop clean, competitive power technology using renewable sources (wind, solar, geothermal, biomass) (RD&D);	Mandatory Renewable Energy Target for power supplies (R); RD&D and early-stage commercialization of renewable energy projects, including solar cities (RD&D, E; multiple programs);	Renewables Obligation (R): target of 10% for electricity supplied from renewable energy sources by 2010; subsidy for biomass heat (F);	Increase contribution of renewables to primary energy supply by 2010 (R); Increase biomass use for production of electricity, heat and transport fuels; Promotion of biofuels (R); support activities for promotion of renewables & energy efficiency (I)	Promotion of nuclear energy (V); Promotion of new energy sources (biomass, photovoltaic power generation) (V); Promotion of co-generation and fuel cells (RD&D)

Energy efficiency improvement in industrial sector	EnergySTAR (V)-promote cost-effective energy reduction; Provide recs for improving productivity, reduce waste, & save energy (I, RD&D);	Stimulate large energy using businesses to take more rigorous approach to energy management (R); assist industry in efficient use of energy-innovation & capacity building (V);		Emissions Trading Scheme (F)-covers combusion plants > 20MW; improve energy performance of new (and partially existing) buildings (R);	Energy conservation through cooperation among multiple businesses (V)
Energy efficiency improvement in commercial sector	Commercial Bldg Integration (R, RD&D)-energy-saving opps using whole-bldg system-design approach for new and renovated bldgs; EnergySTAR (V)-promote energy performance	Minimum energy eff/performance requirements (R);	Energy Efficiency Loan Scheme for Small&Medium-sized Enterprizes (F), Building Regulations-requires increased energy standard for new and refurbished bldgs, 2002 & 2005 (R),	Improve energy performance of new (and partially existing) buildings (R);	Energy management based on Energy Conservation Law (commercial and other) (R); Improvement of energy performance of commercial buildings (V), Promotion of energy management systems for buildings (V)
Energy Efficiency improvements in the residential sector	EnergySTAR (V)-promote energy performance; Residential Building Integration (V, RD&D, E)-D,D,&D housing that integrates energy eff technologies and practices	Minimum energy eff/performance requirements (R);	Energy Efficiency Commitment-require energy suppliers to make homes more efficient (R); measures to encourage consumer choices and estb product standards (V)	Improve energy performance of new (and partially existing) buildings (R);	Improvement of nergy performance of residential buildings (V); Promotion of home energy management systems (V)

Energy Efficiency in Appliances	Conduct analyses, developes reviews, and updates eff stndrds for most major household appliances and major commercial bldg techn and equipment (R);	Energy performance codes and standards for domestic appliancese & commercial&industrial equipment (R);	Market Transformation Program (V)-encourage industry to drive up product performance standard	Improve mnm boiler efficiency (R); Labelling and mnm efficiency requirements for household appliances (R); promote use of CFLs within non-residential consumers (V);	
Assistance to Impoverished to improve energy efficiency	Enables low-income families to reduce energy bills by making homes more energy efficient (E, RD&D)		Warm front and fuel poverty programs (F: grants to poor)		
combined heat and power (CHP) generation	CHP Partnership (V)-remove market barriers to encourage cleaner energy supply		Good Quality CHP target to 2010 of 10 Gwe (2000) (E)	Promote the generation of heat from renewables	

Transport(ation)

Car Fuel Efficiency Policies	Corporate Average Fuel Economy (R)-raised fuel economy for light trucks from 20.7mpg to 22.2mpg by 2007	National Average CO2 Emissions Target (V); Fuel Consumption Labelling Scheme (R); Green Vehicle Guide (I)	EU's fuel efficiency (V)-pressing EU for targets beyond 140g/km after 2008	Reduce average CO2 emissions of newly sold cars to 140 g/km until 2008-09 against a 1995 baseline (V)	Increase fuel efficiency according to top-runner standards (V); Promotion of clean energy cars (V);

Vehicle Fuel policies	Renewable Fuel Standard (R)-increase amt of renewable fuel to 7.5 billion gallons by 2012; RD&D on advanced techn that make biofuels affordable	Alternative Fuels Conversion Program (F-subsidies); Compressed Natural Gas Infrastructure (F-subsidy); Reducing incentive to swithc from using altv fuel to diesel (F-grants); Grants for exapnded biofuels production (F); Production grants for ethanol and biodiesel (F);	Incentives to use bioethanol and biodiesel (F); Renewable Transport Fuel Obligatin(R)-transport fuel suppliers' sales must be 2.5% renewable by 2008-09	Increase use of liquid and gaseous biofuels (R);	Intro sulfur-free fuel (and cars to run on fuel) (V);
Agreements/Partnerships	FreedomCAR & Fuel Partnership and Vehicle Technologies Program (RD&D)-fuel cells, hybrid propulsion systems, etc.; SmartWay Transport Partnership (V,T, I,E)-fuel-saving techn in transport and freight operations	Low Emissions Technology Demonstration Fund (RD&D, F), market-based allocation grants to cost effective abatement opps (F);		Promote modal shift in freight transport away from road (F); promote modal shift to lower congestion (F)	Improvement in envr performance of marine transport, and efficiency of trucking (V)
Integrated transport planning		Strategic transport planning: Initiatives to improve sustainability of passenger and freight transport (O)	Local authorities more power to decide public transportation and road systems/bike lanes (F); pricing policy to manage congestion (R, F)	Infrastructure charging (F)-Road charging to recover costs of infrastructure	Design of CO2 saving transport systems (promote intelligent trsansport systems, public transport, eco-driving, transport alternatives) (V); Transport demand management (V)

Efficiency in Aviation	Aircraft Fuel Efficiency: improve technology (T, RD&D)		Control GHG emissions and develop sustainable strategies (V); Pushing to have aviation part of EU ETS scheme (R)		Energy efficiency in aviation (V)
Industry/Industrial Processes	Reduce methane emissions from coal mining operations (I, E) and natural gas systems (V);	Capture waste coal mine gas (R);	National & EU UK Emissions Trading Scheme (F); Climate Change Levy-non domestic energy use (F); grants for specific industrial branches (F); Climate Change Agreements (V)	Emissions Trading Scheme (F); IPPC Directive (R)-integration of pollution permits for plant operation based on BAT; Energy efficiency in non-core areas of industry (V)	Promotion of blended cement in public projects (V);
Reducing ozone-depleting chemicals, fluorinated gases	Transition away from ozone-depleting chemicals (R, I); Encourages reduction of HFCs, PFCs, SF6, HFC-23 (V);	Reduce ozone depleting substances and synthetic GHG emissions (R); Develop guidelines to reduce emissions of SF6 (R, V);		Directive on Fluorinated Gases (R, V)-improve monitoring, verification, & containment, and restrict use;	Abatement of N20 and HFC emissions (T); Recovery and destruction of fluorinated gases (V); promotion of new materials and technologies to substitute fluorinated gases (RD&D)

Agriculture	Conservation Programs (T, E)- encourages farmers to convert erodible cropland to native land and conservation on current lands; Provide incentives to encourage bioenergy production and renewable energy systems (E)	Build capacity to reduce emissions from agriculture (I, RD&D); Support primary producers for improved envr and natural resource mngmnt outcomes (F, V);	CAP & Rural Development Programs (F): reduce livestock/production, enahnce envr i.e. soil organic matter; Catchment Sensitive Farming Program (V, R)-water pollution prevention; Research on methane production from different sources (R);	Common Agricultural Policy (CAP) (R)- sustainable agriculture by removing direct payments for production, carbon credits for energy crops; Rural Development Policy (F)- food quality schemes, support organic farming & agri-envr measures	

Waste Management

Landfill policy to reduce landfill gases	Stringent Landfill Rule (R)-reduces methane/landfill gas emissions;	Reduce and capture methane emissions (V, R, F);	EU Landfill Directive-reduce methane/ landfill gas emissions (R);	Landfill Directive (R)-amount of waste to landfills, recovery of landfill gas;	
Recycling, Reuse, Recovery policies	WasteWise (V, T, I, RD&D)- encourages recycling, source reduction, etc.		Waste Strategy 2000-reduce quantity of waste produced; Landfill Tax (F), includes a constant rise in the tax rate	Recovery rates for waste packaging (R); Recovery of Waste Electrical and Electronic Equipment (WEEE) (R); Acceptance of used vehicles and recovery by their producers (R);	Waste Disposal Law - Recycling Plan: promotion of reduction, resuse, and recycling of waste (V);

Incineration policies				Reduce negative impacts of incineration and co-incineration of waste (R);	Upgrading combustion in incineration facilities (V)
Forestry	Forest Land Enhancement Program: provide assistance to private landowners, with explicit carbon sequestration goals (T,E)	Build capacity to enhance forest sinks (I, RD&D); Environmental plantings (F, I); Remove impediments to plantation establishment (F, I); reduce land use change emissions from clearing of native vegetation (R);	UK Forestry Standard (R, I); Woodland grants scheme for England (F\); Woodland planting in Scotland-reforestation (F: grant);	Sustainable Forestry (R)-afforestation, investment in forests aimed at improving economic, ecological, or social value, maintaining & improving ecological stability of forests; Prevention of damage to forests by fires and tropical deforestation (R);	Promotion of appropriate forest management practices (V); Establishment of new foresets; Urban Greening-creation of urban parks by central and local administrators