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RESEARCH ARTICLE

Action targets: a new approach to international greenhouse gas controls

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Abstract

This article introduces and explores a new form of international commitment to limit greenhouse gas (GHG) emissions, called an action target. Action targets differ from other forms of targets, such as the Kyoto Protocol's fixed targets, in that they define a quantity of GHG abatement to be achieved, rather than a future emission level to be reached. This article explains the basic mechanics of how action targets might operate, and analyses the approach across a range of criteria, including uncertainty management and contributions to sustainable development in non-Annex I (developing) countries. The analysis suggests that action targets might improve the prospects of widening and deepening developing country participation in the international climate regime.

Keywords: Kyoto Protocol; Policy architecture; Clean development mechanism; Developing countries; Participation; Mitigation

1. Introduction

For over a decade, governments and observers have struggled with establishing an appropriate form of participation in the international climate regime for developing countries. Industrialized countries, for their part, have largely acceded to a system of fixed emission limits, coupled with market-based trading mechanisms, through the Kyoto Protocol to the UN Climate Convention. For a variety of reasons, developing countries have shown little inclination to join such a system. In particular, GHG targets – Kyoto-style fixed targets and even some alternative target formulations – seem to be viewed by many countries as a threat to development aspirations.

Much greater support has been evidenced for the Kyoto Protocol's clean development mechanism (CDM) which, for its part, has an explicit sustainable development purpose. As a market-based mechanism, however, CDM project proponents tend to seek out the cheapest emission reductions, not the most robust development opportunities. Furthermore, the CDM operates only at a project level, suggesting that it is unlikely to drive the large-scale energy and development transformations needed to achieve the Climate Convention's objective.

The Climate Convention urges all countries to integrate GHG considerations into development planning.[1] Yet there seems to be no effective mechanism through which the climate regime promotes

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such a climate – development integration in developing countries. Considering that developing country engagement is essential to long-term climate protection, and also that economic and social development are the foremost considerations for poorer countries, creating new mechanisms that integrate these vital interests ought to be a major priority. Through several means outlined in this article, action targets attempt to promote such an integration, and thereby transform the notion of a target from threat to opportunity (Goldberg and Baumert, 2004).

Section 2 of this article explains the basic mechanics of an action target. Section 3 illustrates a particularly important aspect of action targets – the reduction of uncertainty over abatement efforts required by a given target. To do this, emissions and economic projections are used to simulate uncertainties inherent in three forms of hypothetical targets: fixed, intensity, and action targets. Section 4 examines the kind of GHG accounting system that would be needed to enable a system of action targets to operate effectively. To date, the only internationally agreed system for GHG accounting is through the CDM. To make more room for sustainable development, action targets would build upon and expand this project-based system. Section 5 addresses emissions trading under an action targets system, and how the attendant environmental risks can be understood and managed. Sections 6 and 7 explore the sustainable development dimension of action targets, including how 'actions' with mutually beneficial climate and development outcomes might be more effectively financed. Section 8 outlines how countries would plan for and assess compliance with action targets.

2. Mechanics of an action target

An action target is an obligation to achieve or acquire an agreed amount of GHG emission reductions. The amount of reductions required by the action target is expressed as a percentage of the country's actual emissions during the compliance period. For example, if a country adopted an action target of 2% for the period 2013–2017, it would need to demonstrate emission reductions equal to 2% of its actual emissions during this period. In this way, an action target defines the amount of abatement to be achieved during a commitment period. This differs from Kyoto-style or dynamic targets, which define a level of *emissions* (or *emissions per unit of GDP*) to be achieved during a particular period.

Mathematically, an action target can be illustrated as:

$$RR = AT \times E \tag{1}$$

where required reductions (*RR*) is the number of reductions a country must achieve, the action target (*AT*) is the percentage by which the country has agreed to reduce its emissions, and *E* is the country's emissions during a given compliance period. Required reductions (*RR*) is equal to the action target (*AT*) multiplied by the country's emissions (*E*). To illustrate, suppose Country *A* agrees to an action target (*AT*) of 5% for the year 2015. If Country *A*'s emissions (*E*) in that year are 100 million tons of carbon (MtC), then the required amount of reductions is 5 MtC. According to Equation 1:

$$\begin{aligned} RR &= AT \times E \\ RR &= 5\% \times 100 \text{ MtC} \\ RR &= 5 \text{ MtC} \end{aligned} \tag{1}$$

This illustration demonstrates that action targets would have the effect of bending the emissions trajectory of a country downward. It follows that, if emissions are *actually* 100 MtC during the compliance year *and* the country has demonstrated 5 MtC of domestic reductions, then emissions *would have been* 105 MtC in the absence of any actions taken to reach the target.[2]

Because the required emission reduction is a function of the actual emissions during the commitment period (100 MtC, see above), large fluctuations in economic and emission levels have only moderate effects on the level of abatement required. In the example above, suppose that Country *A*'s economy grew faster than expected, causing emissions to rise to 120 MtC during the commitment period. In this case, Country *A* would need to demonstrate 6 MtC of reductions (5% of 120), either domestically or through international purchases. Conversely, economic stagnation would have the opposite effect. If emissions turn out to be only 80 MtC during the commitment period, Country *A*'s required reductions drop to 4 MtC (5% of 80). Thus, extremely large emission fluctuations, on the order of 40 MtC, have the effect of altering this particular target by only 2 MtC.

This contrasts with Kyoto-style fixed targets, which are formulated as a percentage change in emissions relative to a fixed base year. If Country *A*, in the example above, had agreed to a fixed target of 100 MtC, then this target could turn out to be extremely onerous (e.g. if Country *A* ended up on an emissions path of 120 MtC) or require no effort at all (e.g. if economic stagnation put Country *A* on a path toward 80 MtC) resulting in a windfall of excess emission allowances.

As the name implies, some amount of 'action' – in the form of domestic reductions or international purchases – is required to meet any target. This is true for very small targets (e.g. 0.5%) or more ambitious action targets (e.g. 10%). The amount of action can be tailored to a relatively high level of certainty. As the above example illustrates, a country could adopt an action target and be relatively certain, even a decade in advance, of the level of effort (i.e. emission reductions) that will be required to meet that target. This relative certainty regarding level of effort is shown in more detail in Section 3.

3. Uncertainty in levels of effort: comparing fixed, intensity, and action targets

The presumptive approach to target setting, employed in Kyoto, is to set a fixed level of emissions that will be achieved at some point in the future. This can be a technically challenging task, given that business-as-usual (BAU, or 'baseline') scenarios – which are necessary to gauge the stringency and economic acceptability of a particular emission target – are often highly uncertain. Achieving a fixed level of emissions at some future year might be very easy under conditions of low economic growth and industrial stagnation but exceedingly difficult if economic growth were instead robust. Thus, fixed emission targets can entail widely varying levels of effort, depending on underlying socioeconomic conditions (especially GDP growth) present in the country. This problem is especially acute in developing and transition countries, where economies may be more volatile and affected by external conditions.

This uncertainty presents serious technical and political difficulties. If the target is set too stringently, it may constrain economic development (or lead to non-compliance). Given their aversion to risk, governments, especially in developing countries, might avoid emission targets that have the *potential* to adversely affect economic growth, even if that potential is remote. Yet, if the target is set too loosely it will create surplus emission allowances (i.e. 'hot air') which, when traded, will effectively weaken the targets of other countries.

Accordingly, a number of alternative forms of GHG targets have been proposed to try to address the problem of uncertainty. Included among these are dynamic targets, which allow the amount of emissions for a country to adjust according to a variable, presumably GDP. These kinds of targets can take the simple form of 'intensity' targets, which typically frame the commitment in terms of a ratio (e.g. emissions *per unit of GDP*), although other possibilities also exist (Baumert et al., 1999; Philibert, 2005). Dynamic targets tend to reduce the economic uncertainty associated with taking a particular target by adjusting that target to economic reality, that is, by allowing faster-growing economies more emissions and contracting economies fewer emissions.[3] While helping to reduce uncertainty, dynamic targets also introduce additional complexity into both target setting and the interplay between targets and market mechanisms, such as emissions trading. In addition, substantial uncertainties may remain, especially if emissions of non-CO_2 gases and sinks are factored into targets (Kim and Baumert, 2002).

To illustrate the different levels of uncertainty, we compare a modest 2% target in 2015, using three different forms of international target – fixed, intensity, and action – in five large developing countries where emissions are expected to grow significantly.

The fixed target is set at 2% below the US Energy Information Administration (EIA) 'reference case' emission scenario for each country. Similarly, for each country, the intensity target is set at 2% below the 'reference case' intensity (emissions per unit GDP) scenario. Using EIA's 'High GDP' and 'Low GDP' scenarios, we then evaluated the uncertainty in the level of abatement effort that inheres in a target set at 2% below the reference case. In other words, what would be the required amount of abatement in 2015 if emission or intensity levels turned out to follow a High or Low GDP growth pattern, rather than the reference case?

The results, shown in Table 1, demonstrate the well-understood shortcoming of fixed targets when applied to developing countries, where significant growth is expected and uncertainties are high. A fixed target set at 2% below BAU levels (i.e. reference case) could entail, in China for example, either large reductions in emissions (10%, if GDP growth is High) or significant amounts of surplus emission allowances (i.e. 22% 'hot air', if GDP growth is Low). The results are similar for the other countries shown, although the uncertainties tend to be smaller than for China. In every case examined, higher-than-expected GDP growth results in potentially burdensome reductions (–9% to –13%), whereas lower-than-expected GDP growth results in hot air (+3% to +22%).

For intensity targets, there is less uncertainty in the level of abatement effort required to reach a target.[4] In the scenarios examined for a 2% reduction in intensity, almost all require *some* level of reductions, although several are close to zero. The overall level of abatement effort ranges from zero (Brazil and S. Korea, High GDP scenario) to a 7% reduction (Brazil, Low GDP scenario). One factor that is potentially troubling is that *higher* levels of effort tend to be needed when GDP is *lower* than expected (i.e. targets are most stringent in the Low GDP scenarios). This is the case for Brazil (–7% in the Low GDP case), India (–5%), China (–4%) and Korea (–3%). This could be problematic, as economic stagnation will reduce the capacity of countries to take actions on climate, as other social and economic issues rise in priority. It is possible that, in some cases, this dynamic can be remedied mathematically, as the target proposed by Argentina in 1999 attempts to do (Bouille and Girardin, 2002). However, such refinements would be achieved at the expense of added complexity and less transparency in the climate negotiations, and some amount of continuing uncertainty over the abatement effort implied by a given target (Kim and Baumert, 2002).

For action targets, the level of abatement effort varies rather little between scenarios. This is due to the fact that the reduction requirement is based on actual rather than projected emissions. The

Table 1. Comparison of uncertainty in level of effort: fixed, intensity, and action targets

Country *(2001 emissions)*	GDP Scenario	Projected Emissions in 2015 (MtC)	–2% Fixed Targets			–2% Intensity Targets			–2% Action Targets		
			2015 Emissions (MtC)	Required Reductions (MtC)	(%)	2015 Intensity (t/1000$)	Required Reductions (MtC)	(%)	2015 Emissions (MtC)	Required Reductions (MtC)	(%)
	Low	145	149	4	3%	0.105	–10	–7%	142	–3	–2%
Brazil	Reference	152	149	–3	–2%	0.105	–3	–2%	149	–3	–2%
(95 MtC)	High	164	149	–15	–9%	0.105	0	0%	161	–3	–2%
	Low	1063	1293	229	22%	0.438	–45	–4%	1042	–21	–2%
China	Reference	1319	1293	–26	–2%	0.438	–26	–2%	1293	–26	–2%
(832 MtC)	High	1435	1293	–142	10%	0.438	–16	–1%	1406	–29	–2%
	Low	354	368	14	4%	0.341	–19	–5%	347	–7	–2%
India	Reference	375	368	–8	–2%	0.341	–7	–2%	368	–8	–2%
(250 MtC)	High	423	368	–55	13%	0.341	–19	–4%	414	–8	–2%
	Low	163	174	11	7%	0.155	–5	–3%	160	–3	–2%
S. Korea	Reference	178	174	–4	–2%	0.155	–4	–2%	174	–4	–2%
(121 MtC)	High	193	174	–18	–9%	0.155	–1	0%	189	–4	–2%
	Low	157	171	14	9%	0.176	–2	–1%	154	–3	–2%
Mexico	Reference	174	171	–3	–2%	0.176	–3	–2%	171	–3	–2%
(96 MtC)	High	191	171	–21	11%	0.176	–4	–2%	187	–4	–2%

Notes: Projected emission in 2015 are from EIA (2003) and include CO_2 from fossil fuels only. "MtC" is millions of tons of carbon. Fixed targets are a 2% reduction below the EIA reference case scenario. Intensity targets (emissions per unit GDP) are a 2% reduction below the projected EIA reference case intensity level (not shown). Action targets are, by definition, a 2% reduction below actual emissions in 2015 (see Section 2).

nature of action targets ensures that the level of abatement effort remains at the agreed target, 2% in this case. If GDP (and consequently emissions) growth levels are lower than expected, then slightly fewer tons of reductions will be needed. Conversely, if growth levels are higher than expected, slightly more emission reductions are required. In China, for example, due to the large uncertainties in future emissions, a 2% action target would entail emissions abatement of between 21 and 29 MtC, depending on the economic scenario that actually unfolds.

Because action targets eliminate much of the uncertainty in target setting – at least at the national level – they might make it more likely that countries would participate. Certainly, other factors also determine whether a government chooses to adopt a target. But compared to other target forms, action targets may better enable governments to tailor a target that matches a level of effort at which they are politically ready to commit. Hypothetically, a target level of 0.1% or less would still require *some* level of demonstrated action.

The international political ramifications of broader participation should not be overlooked. Agreeing to an action target, however modest, could reduce the perception in industrialized countries – especially the USA, but also elsewhere – that developing countries are not contributing to global climate protection efforts. Several studies since Kyoto have illustrated that developing countries are indeed taking action to bend the trajectory of their emissions downward (Goldemberg and Reid, 1999; Chandler et al., 2002). However, they are not getting sufficient recognition for climate-friendly actions, and genuine efforts being made in the developing world remain largely invisible to politicians in some wealthier countries, who point toward inaction in the developing world as part of a justification for their own lack of effort.

4. Accounting for emission reductions

While action targets substantially reduce the uncertainties associated with setting the target, they may introduce uncertainty as to what constitutes an 'emission reduction' that could be recognized in pursuance of that target. Devising accounting standards to quantify emission reductions with reasonable accuracy and simplicity is perhaps the most significant challenge to the viability of action targets. Much progress has already been made on defining emissions reductions for CDM purposes, but action targets, as discussed below, may require a different, more expansive, approach. It is here, at the level of an accounting system, that uncertainty can be reasonably managed and reduced. This requires, first and foremost, that GHG accounting principles, definitions and rules be agreed ahead of time so as to guide the subsequent behaviour of governments, the private sector and relevant international organizations.

To date, the most prominent GHG accounting system is the one underpinning the CDM. This may provide a useful starting point from which to build. Defining the precise contours of an appropriate accounting framework for action targets is beyond the scope of this article. However, three desirable features of such a framework merit initial discussion here.

First, to promote sustainable development and maximize GHG abatement, the accounting system would need to have broader coverage than merely projects. More specifically, an accounting system for action targets should be able to accommodate *policies* and even private-sector-led initiatives that have a sectoral or national reach. As discussed in Section 6, these could include policies such as renewable energy portfolio standards, vehicle efficiency standards, and appliance efficiency standards, among others. In addition to promoting policy change, this could reduce the high transaction costs associated with project-by-project assessments. Some observers have suggested expanding the scope of the CDM to cover entire national sectors or geographical areas and encompass policy changes (Samaniego and Figueres, 2002; Schmidt et al., 2004). Indeed, the Protocol Parties have already begun to expand the CDM accounting system by allowing multiple activities – undertaken collectively to implement a policy or standard – to be registered as a single CDM project (see UNFCCC, 2005).[5]

Second, broadening the scope of the accounting system would require altering additionality rules. While challenging for the CDM, additionality assessments could be virtually impossible in the context of multidimensional government policy making. A more promising approach might be to define a set of activities or policies – such as those mentioned above – that are unquestionably climate-friendly and therefore *a priori* eligible for crediting, regardless of the motivation for enactment. In other words, the system would recognize such actions, even if they were adopted primarily for oil security, air pollution or other non-climate reasons. Accounting standards, based on such a set of activities and policies, would then need to be developed to enable emission reduction determinations in a manner that is reasonably simple and transparent, but also in a manner that strives to avoid emission reductions accruing from normal, business-as-usual investments.[6] This might be done through a system of performance benchmarks or rate-based emission baselines (e.g. CO_2 per unit of output), probably on a sector or subsector level.

Third, it is important for negotiators to agree on an accounting system – at least the main contours of one – *prior to* adopting action targets. In doing so, governments may avoid the approach taken under Kyoto, which turned negotiations on CDM project eligibility, additionality methodologies and other issues into *de facto* re-negotiations of national targets.[7] To the extent possible, an accounting system should be developed through broad stakeholder participation (given the

inevitable policy issues that will arise) coupled with the input of technical competence and expertise.[8] Furthermore, as noted above, failure to agree on accounting matters *ex ante* would undermine the uncertainty-reduction benefits of action targets discussed in Section 3. In short, countries would not know what kind of actions would be required to meet a target.

Collectively, these characteristics of an accounting system make it apparent that its overriding purpose is not achieving absolute quantitative accuracy, which no system can deliver. The accounting system should be shaped, instead, with an eye towards promoting the kinds of *actions* that are needed to achieve the Climate Convention's objective, including those actions taken mainly for economic, social or other purposes. Motive, in other words, should be irrelevant, as is the case with projects and policies that help Annex I Parties achieve their Kyoto commitments.

5. Emissions trading and environmental performance

Action targets could operate in a manner that is complementary and consistent with the prevailing Kyoto system of fixed targets, emissions trading and the CDM. Like countries with emissions targets, a country adopting an action target could comply with its obligation by purchasing Kyoto-compliant emission allowances or credits in lieu of (or in concert with) taking domestic action. Likewise, countries could be permitted to sell allowances if they over-comply with their action targets. This would provide a potentially strong incentive for vigorous domestic implementation of action targets, as deeper reductions would generate financial flows.

On the other hand, with a more expansive GHG accounting system – outlined in the preceding section – trading could introduce significant new environmental risk. Environmental risk is affected by the three policy variables shown in Figure 1: the GHG accounting rules, target size, and quantity of allowed trading. If the GHG accounting system is designed to be expansive (i.e. many types of 'reductions' can be recognized), country targets are very small (e.g. 0.1%), and if trading is unrestricted, then environmental risks may rise to unacceptable levels, as countries might be able

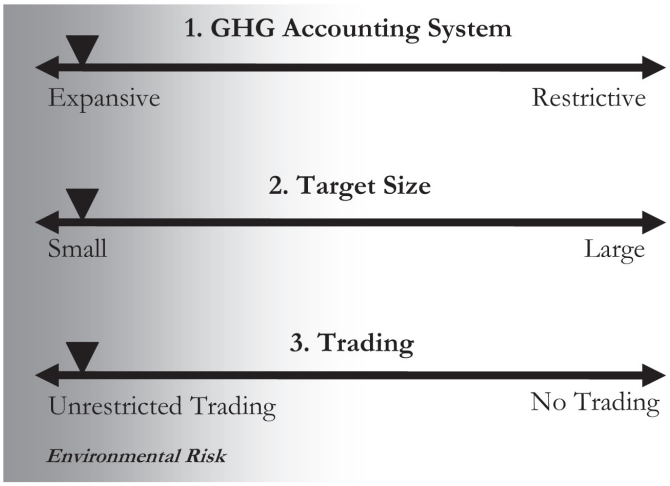

Figure 1. Risk factors: greenhouse gas (GHG) accounting system, target size and trading rules.

to transfer large amounts of credits that entailed little or no new efforts. In short, the system could create excessive environmental risk if the rules of each policy variable are aligned fully on the left, as in Figure 1.

For comparison purposes, the CDM can be viewed as an action target of 0%, as it does not require retention of any credits for commitment purposes, and it places no restrictions on trading of credits once they are generated. To avoid excess environmental risk, the CDM has therefore placed a heavy emphasis on project accounting rules: additionality, monitoring, verification, etc. Variable 1, in other words, is shifted to the right side, while variables 2 and 3 are shifted to the left, as depicted in Figure 2.

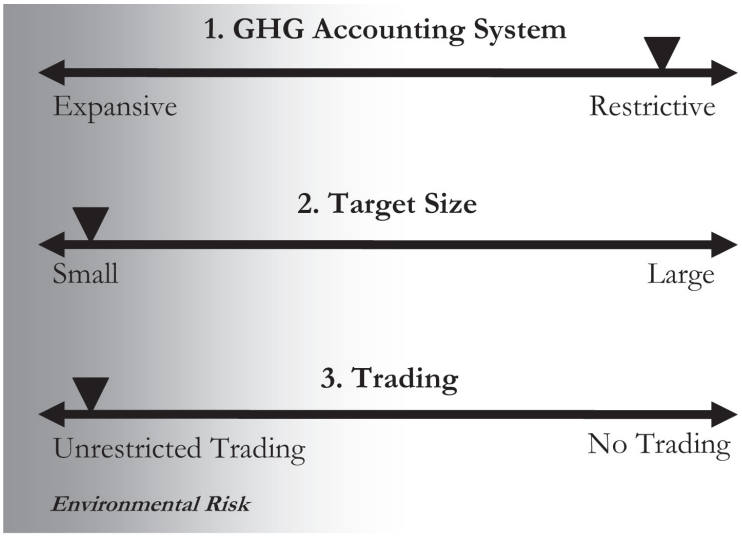

Figure 2. Greenhouse gas (GHG) accounting system, target size and trading rules under CDM.

A simple way to introduce action targets into the Kyoto system would be to use the same accounting rules currently employed by the CDM for defining and measuring reductions as well as monitoring and verifying projects. As depicted in Figure 3, this should have the effect of reducing environmental risk relative to conventional CDM projects, as it would require the host country to retain some or all of the credits generated by the project to meet its action target. On the other hand, it would not expand the notion of a reduction along the lines suggested in Section 4 to promote sustainable development. Therefore, for the purpose of action targets, such an approach is probably too narrow.

If the definition of an emissions reduction is to be expanded, consideration should be given to the other two risk variables: size of the target and availability of trading. First, as to target size, it is likely that in many cases developing countries will already be taking some actions that could qualify to earn future emission reductions. Accordingly, an appraisal of the expected abatement quantities generated by existing actions might constitute a useful starting point for setting an action target. Establishing an action target that is equal to, or higher than, the emission reductions

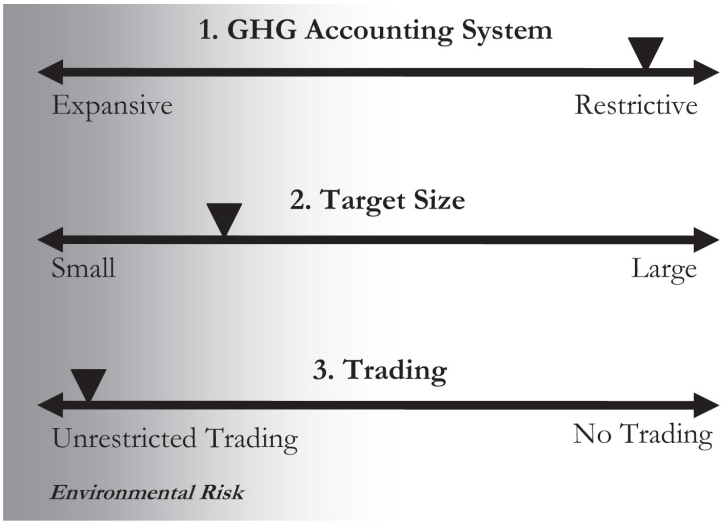

Figure 3. Greenhouse gas (GHG) accounting system, target size and trading rules under CDM-based action targets.

expected under current policies would, for example, give recognition to past actions taken while at the same time avoiding the creation of surplus emission reduction credits. Second, with respect to trading rules, it might be that all surplus reductions (i.e. in excess of the target requirement) are tradable. Another possibility, however, would be to limit the amount of trading to only a portion of the surplus reductions generated. Figure 4 depicts one such set of trade-offs: a more expansive accounting system (relative to the CDM), modest targets, and modest discounting or other restrictions on trade. Finding the optimal target size and trading rules is a subject for further analysis (and eventual negotiation). Key factors influencing the optimal mix include the parameters of the GHG accounting system that are agreed to *ex ante*, as well as the relative stringency of industrialized country commitments, which in large part will determine whether surplus reductions have a market value. If the value is small, trading becomes a less important driver of actions.

If trading is restricted under action targets, an additional consideration would be how action targets interact with the already existing CDM which, as noted, includes no trading restrictions. One approach would be to leave the CDM intact, so that developing countries would have available to them two means of generating reductions: the CDM and action targets. CDM accounting and trading would remain as is, while action targets might have a different set of accounting and trading rules that would promote a broader, but complementary, set of actions not recognized under the CDM.

6. Promoting sustainable development

An important purpose of action targets, noted above, is to improve the prospects of integrating climate protection measures into Parties' development objectives, along the lines urged by the UNFCCC (Art. 3(4)). Action targets provide a mechanism through which countries – alone or in cooperation – can undertake development initiatives in a manner that delivers some tangible climate benefit, even if reduction of GHG emissions is not the primary purpose.

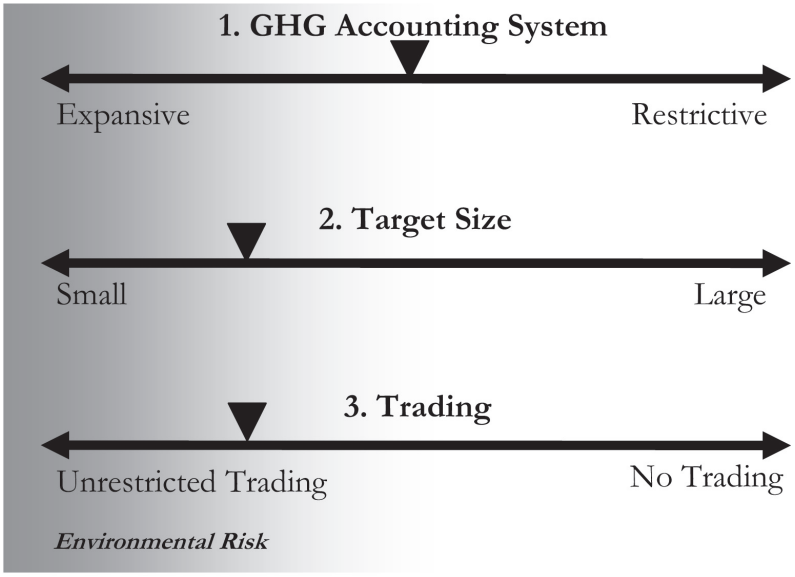

Figure 4. Greenhouse gas (GHG) accounting system, target size and trading rules under action targets.

Renewable energy initiatives, energy efficiency standards, forest conservation programmes and biofuels programmes are examples of actions that could be pledged. These kinds of policies and measures reinforce the important priorities of developing countries, and have tangible GHG benefits that could be recognized and captured, as suggested by Winkler et al. (2002). Such activities could be further advanced through action targets, and many are already under way in developing countries. New Delhi, for example, recently switched its public vehicle fleet (e.g. auto-rickshaws and buses) to less-polluting compressed natural gas. This was done for vital public-health-related reasons – as air pollution has choked India's crowded capital city – but the switch will also reduce GHG emissions. Likewise, China has adopted vehicle emission standards, which has benefits with respect to oil security, air pollution and technology transfer, but also with respect to the climate (An and Sauer, 2004).

In addition to recognizing actions that promote sustainable development with climate co-benefits, a system of action targets would recognize policies or projects undertaken solely for climate purposes. These, for example, might include carbon capture and storage initiatives or the elimination of potent N_2O and HFC gases in various industrial processes, among others. These kinds of climate-specific activities would probably require funding by international donors, and indeed some are already being funded through the CDM at the project level.

The CDM itself, however, has little capacity to assist developing countries in 'achieving sustainable development' – one of its stated purposes. A genuine altering of development paths is likely to require *policy* interventions of the kind not yet recognized by CDM project rules. A comprehensive assessment of the CDM in Latin America, for example, found that the sustainable development component of the CDM basically amounts to ensuring that 'the GHG mitigation project is congruent with the nation's existing environmental policies', rather than actually precipitating policy changes in a manner that promotes cleaner development (Figueres, 2004). Furthermore, even at the project

level, development-related benefits are likely to be secondary to climate benefits. The fact that a majority of CDM credits are expected to come from projects generating low-cost reductions of non-CO_2 gases, such as elimination of N_2O or HFC, suggests that a mechanism based mainly on market principles encourages project proponents to seek out the cheapest emission reductions, not the most robust development benefits.

A true 'sustainable development' instrument under the Convention or Protocol would need to promote larger scale, transformative initiatives – for example, providing access to electric power in Africa or southern Asia – in a manner that delivers tangible climate benefits. With an appropriate accounting framework, discussed in Section 4, climate-friendly elements of such large-scale initiatives could be developed, formally recognized, and quantified under an action target. Given the decisions at the first meeting of the Protocol Parties in December 2005,[9] the CDM Executive Board may begin to shape a more expansive accounting framework that could accommodate some climate-friendly sustainable development policies within the existing CDM.

7. Financing eligible activities

The UNFCCC establishes a framework for financing GHG mitigation in developing countries. In short, developing countries are required to formulate and implement national GHG mitigation 'programmes',[10] and industrialized countries are obligated to provide the finance and technology to meet the 'agreed full incremental costs' of implementing these programmes (UNFCCC, Art. 4(3)). Financial resources can be provided through the Global Environment Facility[11] (GEF) or through bilateral, regional, or multilateral channels (UNFCCC, Art. 11).

The present model for funding mitigation in developing countries has had only limited success, perhaps because it is so vague and indefinite. There are no definitions, guidelines or requirements as to what constitutes a national mitigation 'programme'. There is no systematic accounting of funding provided (aside from the GEF), nor of the resulting emission reductions.[12] Both the mitigation programmes (in developing countries) and the associated financing and technology transfer (from developed countries) are viewed as more hortatory than mandatory.

A system of action targets could improve the situation in at least three ways. First, action targets provide a tangible commitment toward which financial resources can meaningfully be directed. The successful financial mechanism of the Montreal Protocol on Substances that Deplete the Ozone Layer (together with bilateral assistance) finances the phase-out *commitments* agreed to by developing countries. If the GEF were similarly geared towards assisting the implementing of action targets, then developing countries would be able to negotiate additional funding, and all stakeholders could monitor progress.

Second, because action targets incorporate the concept of sustainable development into their basic operation, they could help tap and eventually influence the much larger 'non-climate' funding sources. This might increase the overall funding that mutually supports climate protection and sustainable development. Funding could come from any source: bilateral aid agencies, the GEF, multilateral development banks, export credit agencies, the private sector, the host government (federal and perhaps state/local), state and local communities, or others. Some funders – host governments, development banks, and aid agencies – would be primarily concerned with alleviating poverty or otherwise boosting economic development. Other funders, such as the GEF, would invest because of the explicit climate benefit. Still others, such as private banks or corporations, would have commercial purposes, or finance the GHG component of a policy or project in order to acquire resulting emission reductions. The intent

is to align and strengthen the linkages between the relevant financial institutions in a manner that maximizes resource and technology flows to development initiatives that deliver climate benefits.[13] In some cases, public–private partnerships might come together to forge large, transformative strategies that offer both development and climate benefits. In other cases – such as energy efficiency – measures may be sufficiently attractive on non-climate grounds that they would not require international assistance.

Third, action targets could integrate financial flows associated with 'carbon financing' with the other financial flows mentioned above. (These flows are explicitly disconnected under the CDM.[14]) As discussed in Section 5, a system of action targets could allow for the transfer of surplus emission reductions to industrialized countries that are covered by emission caps. Accordingly, should there be a reasonable price of carbon in the future, carbon finance could provide a further tangible boost to pledged actions. While carbon finance could play an important role, however, action targets differ from the CDM or proposals to expand the CDM in that they are not predicated on the existence of a market for emission reductions.

8. Assessing compliance

Compliance assessments under action targets would entail two basic steps. First, a determination of required reductions would need to be made at the end of the commitment period (or, during a 'true-up' period following the commitment period). To do this, according to Equation 1 (see Section 2), a country's action target would simply be multiplied by its actual emissions during the commitment period. This is not to suggest that countries should wait until the end of the commitment period to determine what actions are needed to meet their action targets. Just as fixed targets require countries to look ahead to determine the actions they will need to take during, or even preceding, the commitment period, action targets require countries to assess the number of reductions they are likely to need to meet their target (as demonstrated in Sections 2 and 3, this assessment cannot be far off the mark) and to have a plan in place to achieve the amount of required reductions.

To undertake this first step, a national GHG emissions inventory would be needed. However, the degree of accuracy and international oversight such inventories would require is less under action targets than under fixed or dynamic targets. This is because measurement inaccuracies have a relatively small effect on the required reductions (*RR*) under an action target. Repeating the Country *A* example used above: if the action target (*AT*) is 5%, and the emissions (*E*) inventory during the commitment period is understated by 10% (90, instead of 100 MtC), then the required reduction will be 4.5 MtC (5% of 90). Similarly, a 10% overstatement in emissions during the commitment period would increase the reduction requirement to 5.5 MtC (5% of 110). Thus, the same dynamics that reduce uncertainty in target setting also help to offset the potentially deleterious effects of inaccurate national inventories.

By contrast, under a system of fixed or dynamic targets, a bias of a few percentage points might substantially alter the level of effort needed to achieve compliance. Accordingly, inventories must be prepared to a higher degree of quality and are subject to rigorous international standards and oversight procedures. Were developing countries to adopt such targets, achieving high quality inventories would entail major financial and institutional capacities, which might otherwise be directed toward substantive action. Indeed, almost all developing countries have reported difficulty in compiling their emissions inventories under the Climate Convention.[15]

The second step in a compliance assessment is determining the amount of reductions a country has generated domestically and transacted internationally (purchases and sales).[16] Thus, for action

targets, the compliance assessment would need to be directed primarily at assessing the efficacy of pledged *actions*, rather than a Kyoto-style assessment of actual *emissions*. This assessment would need to proceed in accordance with the accounting standards that were adopted (see Section 4 for discussion). This kind of process – examining actions, or the lack thereof – might help accelerate learning in climate protection efforts and help build capacity to take further actions. Emissions inventories may tell policy makers whether emissions have gone up or down, but they do not explain the reasons for those changes. In contrast, the information required to assess compliance with action targets should enhance the ability of regulators and stakeholders to distinguish between actions that were effective from those that failed to produce desired reductions.

If a process to deal with instances of non-compliance is needed to protect the integrity of the trading system,[17] it should be facilitative. First, non-compliance may not be deliberate; rather it may be the result of lack of capacity, or even the failure of industrialized countries to deliver on the promised financial assistance needed to achieve these reductions. Thus, a facilitative process might improve the prospects of future compliance and better North–South cooperation. Second, a facilitative process is in step with the Convention principles, which grants transition economies, such as Russia and the Ukraine, a 'certain degree of flexibility' in achieving commitments. Accordingly, it seems appropriate that developing countries be likewise offered flexibility in meeting action targets.

Conclusion

This article does not answer all of the questions surrounding action targets and their implementation. Indeed, there are significant challenges associated with an action target approach, and further study is needed. How can we be assured that countries would adopt reasonably stringent targets, especially in light of the USA's non-participation in Kyoto? Can a suitable accounting system be developed? How would action targets be implemented at the domestic level? How would action targets (governmental obligation) best avoid conflicts with pre-existing CDM projects (private sector-led)? Should industrialized countries be able to pursue action targets?

There is no silver bullet for protecting the climate system. The approach advanced in this article is a modest one that, if viable, would be only one part of a broad and ambitious effort to protect the world from dangerous climate change. Such an effort would no doubt include deeper reductions from industrialized countries, perhaps through fixed targets or even a hybrid approach involving a combination of fixed and action targets. It must also include measures to help vulnerable countries adapt to impacts of unavoidable climate change, provisions for technology development and transfer, and perhaps greater clarity as to the regime's long-term objective.

In one respect, however, the approach advanced here could significantly alter the way we think about and implement our response to climate change. Adopting action targets would shift the focus of climate protection somewhat away from short-term fluctuations in emissions and toward the actions that give rise to those fluctuations, but without abandoning quantitative commitments. Of course, any system to address climate change must keep a continuous eye on greenhouse gas emissions and be prepared to make corrections as new information about emissions, atmospheric concentrations and the response of the climate system comes to light.

Ultimately, governments will need to decide whether targets and trading, as conventionally understood, are workable for developing countries. Existing evidence increasingly suggests that this presumptive path is fraught with difficulties. While our preliminary analysis suggests that

action targets could ameliorate some of these difficulties, much work remains to be done before the workability of action targets can be reliably assessed. It is our hope that this article will stimulate sufficient interest in this new approach to motivate additional research and analysis, so that such an assessment soon can be made with confidence.

Notes

1 See UNFCCC, Art. 4, paras 1(b), 1(f), and Art. 3, para 4 (urging Parties to be 'guided' by the principle that '[p]olicies and measures to protect the climate system … should be … *integrated with national development programmes*').

2 This dynamic holds true only if the target is achieved through domestic actions, since making international purchases to achieve compliance will not reduce domestic emissions. Because of this asymmetry, the mechanics of an action target actually favour, albeit slightly, compliance through domestic action rather than through international purchases. This effect is relatively small and could be eliminated mathematically if desired by policymakers. These calculations are available from the authors.

3 Yet another approach is *dual* targets, involving two national targets with differing legal characters: one non-binding (selling target) and another which could be binding (compliance target) (Philibert and Pershing, 2001). This approach can also reduce uncertainty and the risk of hot air. Non-binding and dual targets, which can also be deployed with dynamic targets (Kim and Baumert, 2002), are not explored further here.

4 The conclusions of this relatively simplistic analysis are confirmed by more complex modelling efforts (see Jotzo and Pezzey, 2005).

5 This decision (UNFCCC, 2005) establishes that 'a local/regional/national policy or standard cannot be considered as a clean development mechanism project activity, but that project activities under a programme of activities can be registered as a single clean development mechanism project activity' provided that CDM methodological requirements are met. It remains to be seen how this language will be interpreted.

6 See the GHG Protocol Initiative (http://www.ghgprotocol.org), convened by the World Resources Institute and World Business Council for Sustainable Development, for an example of such accounting standards at the corporate and project level.

7 The adoption of expansive project eligibility and additionality rules that would have granted credits for projects that countries were likely to have undertaken anyway had the potential to significantly reduce the stringency of national targets. Likewise, extremely onerous requirements that would have denied credits for even the most uncontroversial projects held the potential to make targets more stringent than some Parties had expected.

8 The GHG Protocol may be a useful multi-stakeholder model for developing such standard (see note 6 above).

9 See UNFCCC (2005), and also note 5 above.

10 See UNFCCC, Art. 4, para 1(b) ([f]ormulate, implement, publish and regularly update national … programmes containing measures to mitigate climate change . . . .'). Although Art. 4, para 1(b) constitutes a mitigation obligation applicable to all Parties, it is invoked primarily in the context of developing countries, since Annex I Parties are subject to additional obligations under the UNFCCC and Kyoto Protocol.

11 During the year 2003–2004, the GEF (as the financial mechanism of the Convention) contributed about $217 million to climate change activities, about $150 million of which was targeted at GHG mitigation efforts related to wind power, energy efficiency and other areas (UNFCCC, 2004a).

12 See UNFCCC (2004b). The most recent estimates of bilateral assistance are from 1998–2000, when the OECD estimated 'climate-change-related aid[0]' (broadly defined) at about $2.7 billion per year (OECD, 2002). Multilateral funding through the World Bank, UNDP and others for the support of Convention implementation is significant, but not presently known.

13 For an excellent discussion of this concept, see Heller and Shukla (2003, p. 132) (referring to 'programmatic climate cooperation').

14 CDM project participants must provide an 'affirmation' in the registered project design document that any public 'funding does not result in a diversion of official development assistance and is *separate from and is not counted towards the financial obligations of those Parties*' (UNFCCC, 2001, Appendix B) (emphasis added).

15 See UNFCCC (2002, para 161). Problems reported include lack of quality data, lack of technical and institutional capacity, and problems related to methodologies.

16 This could be accomplished through the same registry system as developed under the Kyoto Protocol.

17 Even if the target were made non-binding, the system would need to ensure that a country is not a net seller at the end of the commitment period if it cannot comply with its target (Philibert, 2005).

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