
DEVELOPING COUNTRY
INTERESTS IN
CLIMATE CHANGE
ACTION

AND THE IMPLICATIONS FOR A POST-2012
CLIMATE CHANGE REGIME



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**Developing Country Interests in Climate Change Action
and the Implications for a Post-2012 Climate Change Regime**

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1. Introduction

At the 11th Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC) in Montreal, Canada, 2005, parties agreed to initiate the “Dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention”.¹ That dialogue, while undertaken without prejudice to any future negotiations, commitments, process, framework or mandate under the convention, was widely understood as a first official step in thinking about what sort of climate change regime might succeed our current efforts. It centred on four themes:

- (a) Advancing development goals in a sustainable way;
- (b) Addressing action on adaptation;
- (c) Realizing the full potential of technology;
- (d) Realizing the full potential of market-based mechanisms.

While its mandate expired in Vienna in August 2007,² the dialogue fed powerfully into the Bali Action Plan, and the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention that is mandated with its implementation. Indeed, the Bali Action Plan picked up adaptation, technology transfer and market-based mechanisms (finance and investment) as pillars for action, and advancing development goals is embedded as a cross-cutting objective throughout the other elements of the plan, including the pillar of mitigation.

This paper will focus on that cross-cutting objective: advancing development goals in a sustainable way, making the case that there are strategic interests for developing countries in addressing climate change while simultaneously addressing nationally defined development priorities. In doing so, the paper first frames the terms of discussion, arguing for international support for such efforts. This sort of framing has not yet happened at the international level, though there is clearly broad agreement among the parties on the need for such an approach. The paper will then suggest a number of elements that might feature in an international approach to climate change that focuses on advancing development goals in a sustainable way, noting in each case the relationship to and implications for the Bali mandate. The paper finishes by speculating on what those sorts of elements might mean for the shape of a post-2012 climate regime and the carbon market that might accompany it.

¹ UNFCCC (2006a).

² At the fourth workshop under the “Dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention”, Vienna, 27–31 August 2007.

2. Background

Much has been written on the ways in which unchecked climate change might negatively impact developing countries' prospects for sustainable development. Changing rainfall patterns, for example, threaten to severely impact agricultural activity in Africa (in the Sahel, East Africa and Southern Africa), by 2020 reducing the viability of rain-fed agriculture by as much as 50 per cent in some countries.³ Receding glaciers threaten to turn some of the world's mightiest rivers into seasonal flows by 2030 in South Asia and Western South America, again with severe impacts on agriculture.⁴ India's agricultural output could fall by 30–40 per cent by 2035 as the Ganga, the Brahmaputra and the Ganges completely lose their headwater glaciers in the Himalayas.⁵ And a possible sea level rise of some 40 cm by the end of the century would create an estimated 35 million refugees in the Bangladesh delta.⁶

These sorts of negative impacts are well documented, if perhaps not widely enough understood. The upshot is the appalling prospect of the worst effects of climate change being visited on those that did the least to contribute to the global problem. This paper will focus on another aspect of the problem for developing countries, however. It will argue that the climate change negotiations offer the opportunity for developing countries to strategically take action on mitigating climate change and simultaneously achieving nationally defined development goals. In the words of the Group of Eight (G8), "mitigation and adaptation strategies should be pursued as part of development and poverty alleviation efforts".⁷

In the language of the ongoing UNFCCC negotiations, as noted above, this concept has been discussed under the title of advancing development goals in a sustainable manner. It is possible, with some effort, to find this concept within the text of the UNFCCC. The convention strongly affirms the rights of all countries to pursue sustainable development (article 3.4), it makes repeated references to the principle of common but differentiated responsibility (e.g., article 4.1) and it commits developed countries to provide such financial resources as needed by developing countries to fulfill their key mitigation obligations (article 4.3). However there is no clear statement of the basic argument that supporting developing country efforts to achieve sustainable development is a viable or desirable strategy for addressing climate change.

Given the importance of this basic tenet to the ongoing negotiations, and to the shape of the final outcome envisioned at the COP 15, this concept deserves a more in-depth treatment as an introduction to the present paper, which seeks to understand how such outcomes might be realized. The basic argument is rooted in the understanding of the fundamental links between climate change and development. The line of reasoning that encompasses those links goes as follows:

³ IPCC 2007.

⁴ Ibid.

⁵ Ibid.

⁶ Ibid.

⁷ G8 (2008).

1. Climate change is taking place; action to address it is imperative;
2. Poverty and inequity exist in unacceptable measure; development that addresses them is imperative;
3. Economic growth is a means to development – one that will continue to be used in the foreseeable future;
4. There are a number of potential conflicts between economic growth and action on climate change;
5. But there are synergies between climate change action and development: actions aimed at both adaptation and mitigation can contribute to development, and unchecked climate change will undermine development goals and economic growth;
6. Advancing development goals in a sustainable way should thus be a central part of efforts to address climate change in all countries;
7. That said, there are a number of reasons why the international community should focus in particular on helping achieve this in developing and least developed countries.

These points will be fleshed out in greater detail in the remainder of this section, in an effort to give some conceptual grounding to the international discussions aimed at fulfilling the mandate of the Bali Action Plan. As noted above, advancing development goals in a sustainable manner was one of the four pillars of the dialogue on long-term cooperative action that led to the Bali Action Plan, and the action plan itself reaffirms that economic and social development and poverty eradication are global priorities. But to date, there has been little effort to explicitly state why and how the action plan should tackle its mandate for mitigation, adaptation, technology transfer and financing in a way that contributes to sustainable development, or to identify how this could at the same time further climate change objectives more effectively than an approach that ignored development issues.

Agreement on those questions is an essential prerequisite to successfully addressing the four pillars of the Bali Action Plan, given that development concerns permeate every feature of the mandate. The argument that follows aims to contribute to such an agreement.

2.1. Climate change is taking place; action to address it is imperative

In 2007, the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) effectively put to rest many of the debates surrounding the science of climate change, rendering evidence solid enough to impel action. It found that warming of the climate system was “unequivocal,” and that a number of attendant effects were already observable, including:

- (a) An increase in global average surface temperature over the last 100 years of 0.74° C;
- (b) A decrease in the average extent of mountain glaciers and snow cover in both hemispheres;
- (c) An acceleration in the annual rate of sea level rise from 1.8 mm between 1961 and 2003 to 3.1 mm between 1993 and 2003;

(d) More intense and longer droughts over wider areas.⁸

Moreover, relative to its 2001 assessment the report expressed increased confidence about the causes of the observed warming, concluding that “most of the observed increase in globally averaged temperatures since the mid-20th century is *very likely*” due to anthropogenic greenhouse gas (GHG) emissions.⁹

The International Scientific Steering Committee, meeting in 2005 in Exeter, United Kingdom, explored the temperature thresholds that could trigger irreversible catastrophic events such as the melting of the Greenland icecap (leading to an eventual seven-metre sea level rise) and the shutdown of the Atlantic thermohaline circulation that warms the North Atlantic countries.¹⁰ They cautioned that temperature rise above 3° C would likely pose a “serious risk of large scale, irreversible system disruption”.

In the same vein, others have found that such a temperature rise would give rise to serious feedback effects, not sufficiently accounted for in most models, such as¹¹ the thawing of permafrost and drying of peat and wetlands, releasing stores of trapped methane in volumes estimated as equivalent to twice the world’s cumulative GHG emissions from fossil fuel burning, and reduced ability of the world’s forests to act as carbon sinks, as water scarcity, fires and disease reduce forest area and productivity.

Yet a temperature rise of 3° C is squarely within the realm of the possible. The AR4 ran projections across six of the standard scenarios in use since the IPCC’s 2000 report on emission scenarios.¹² Table 1 shows that for all but the most upbeat scenario a 3° C temperature increase is within the likely range by the end of this century.¹³

Table 1. IPCC Temperature Change Projections

Scenario	Temperature Change (C at 2090-2099 relative to 1980-1999)	
	Best Estimate	Likely Range
B1	1.8	1.1 - 2.9
A1T	2.4	1.4 - 3.8
B2	2.4	1.4 - 3.8
A1B	2.8	1.7 - 4.4
A2	3.4	2.0 - 5.4
A1F1	4	2.4 - 6.4

Source: IPCC (2007:table SPM-3)

⁸ IPCC (2007).

⁹ Ibid., p. 10.

¹⁰ International Scientific Steering Committee (2005) (“The Exeter Report”).

¹¹ Stern Report, chapter 1, especially box 1.3.

¹² Nakicenovic (2000). For a summary of the scenarios used in AR4, see IPCC (2007:18).

¹³ The likely range of the most optimistic scenario – B1 – misses the 3° mark by one tenth of a degree centigrade.

The growing body of scientific evidence has fostered clear international consensus that action is needed. The UNFCCC commits parties to address climate change, by stabilizing GHG concentrations so as to “prevent dangerous anthropogenic interference with the climate system.” Since the convention was ratified, the international community has repeatedly affirmed its intention to rise to the challenge at the national and international levels.

(a) The G8, meeting in Hokkaido, Japan in 2008, reaffirmed their commitment to take “strong leadership in combating climate change” and endorsed a goal of reducing GHG emissions by 50 per cent by 2050.¹⁴ After the summit the G5 (Brazil, China, India, Mexico and South Africa) issued its own statement urging the international community to address the challenge of climate change;¹⁵

(b) Meeting separately in Hokkaido, the leaders of the major economies (Australia, Brazil, Canada, China, the European Union, France, Germany, India, Indonesia, Italy, Japan, the Republic of Korea, Mexico, the Russian Federation, South Africa, the United Kingdom of Great Britain and Northern Ireland and the United States of America) declared climate change “one of the great global challenges of our time” and pledged to work together to strengthen implementation of the UNFCCC, while recognizing that “deep cuts in global emissions will be necessary to achieve the Convention’s ultimate objective”;¹⁶

(c) The heads of state of Australia, China, India, Japan, the Republic of Korea, New Zealand and the ASEAN nations, gathered in Cebu, Philippines in January 2007 recognized “the urgent need to address global warming and climate change,” and committed to “[m]itigat[ing] greenhouse gas emission through effective policies and measures, thus contributing to global climate change abatement”;¹⁷

(d) The Assembly of the African Union, meeting in Addis Ababa in January 2007 expressed its “grave concern on the vulnerability of Africa’s socio-economic and productive systems to climate change and variability and to the continent’s low mitigation and response capacities” and committed to, among other things, “integrate climate change and climate change adaptation strategies into national and sub-regional development policies, programmes and activities”.¹⁸

Commitment to action in most contexts refers to both mitigation of climate change and adaptation to avoid or diminish the impacts of climate change. Throughout this text, where there is reference to climate change actions and objectives, it should be understood that this covers both spheres.

¹⁴ G8 (2008).

¹⁵ G5 (2008).

¹⁶ Major economies’ leaders (2008).

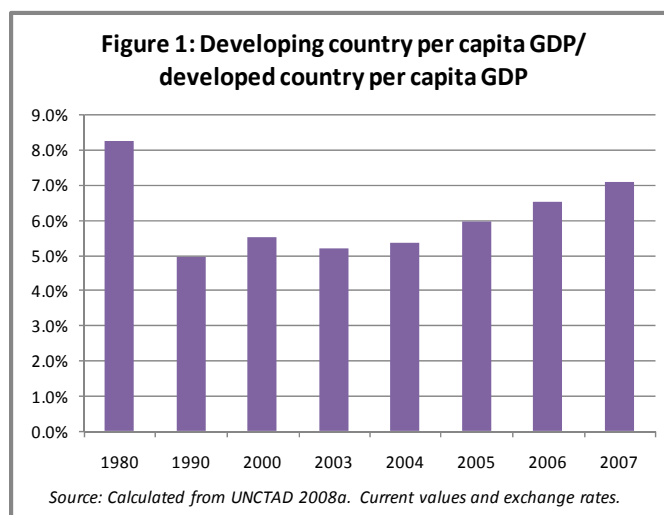
¹⁷ ASEAN et al. (2007).

¹⁸ African Union (2007).

2.2. Poverty and inequity exist in unacceptable measure; development that addresses them is imperative

While strong economic growth in China and India in particular has lifted unprecedented numbers of people out of poverty in the last decades, the World Bank still estimates that almost half of the world's population survives on less than \$2 a day.¹⁹

Poverty and inequity go hand in hand. In dollar terms, the richest 5 per cent of the world's population controls almost one half of world income, earning in 15 hours what the poorest 5 per cent make in a year.²⁰ Access to piped-in water for the richest fifth of world population is at 85 per cent, while for the poorest fifth it stands at 20 per cent.²¹ In sub-Saharan Africa and South Asia 77 per cent and 59 per cent of the population, respectively, do not have home access to electricity – in total over 1.3 billion people.²²



The trends toward equity show some faint signs of improvement. Figure 1 shows developing country nominal gross domestic product (GDP) per capita as a percentage of that in developed countries, and the last decade has seen a gradual upward trend. In part this may be driven by improvements in terms of trade since 2002, at least for exporters of oil, minerals and mining products.²³ It is not yet clear what relative impacts the current financial crisis and economic downturn, with their attendant impacts on commodity prices, will have on developed and developing countries.

As with the efforts to combat climate change, there is clear international consensus on the need to address the crisis in development. In 2001, global leaders agreed on a set of goals that defined a way forward: the Millennium Development Goals (MDGs), to be achieved by 2015. These went far beyond focusing on income poverty to identify development as including goals such as education, health, gender equality, literacy and environmental sustainability. In launching the global effort, the General Assembly declared:

We will spare no effort to free our fellow men, women and children from the abject and dehumanizing conditions of extreme poverty, to which more than a billion of them are currently subjected. ... We resolve therefore to create an environment — at the national

¹⁹ World Bank (2006a).

²⁰ Milanovic (2005).

²¹ UNDP (2006a:7).

²² World Bank (2006b).

²³ UNCTAD (2008b).

and global levels alike — which is conducive to development and to the elimination of poverty.²⁴

2.3. Economic growth is a means to development – one that will continue to be used in the foreseeable future

Development, or the increase of human well-being, goes beyond simply alleviating income poverty. There have been a number of measures of well-being proposed that try to encompass a broader approach, the United National Development Programme's Human Development Index being one of these.²⁵ The MDGs may be the clearest international statement to the effect that development goes well beyond economic growth, but much current thinking follows Nobel Laureate Amartya Sen in defining poverty as a lack of freedom to pursue life ambitions, and conversely defines development as a process of fostering such freedom.²⁶

Nevertheless, none of these approaches goes so far as to deny the critical role of economic growth and increased incomes in the development process. In fact the MDGs have addressed income poverty as the first goal. Even Sen allows for the major enabling role of income as a determinant (albeit one of many) of one's capabilities throughout his work.²⁷

Thus economic growth is important even for development more broadly cast. Moreover, economic growth continues to be of primary importance to national governments, whether in developing or developed countries. It is still the metric by which progress is conventionally measured. And as much as policymakers might look for growth with a human face, at the end of the day any growth may be considered better than no growth.

Further, economic growth of one kind or another will continue for the foreseeable future and will undoubtedly persevere as a key element of national development efforts. Before the current economic slowdown the International Monetary Fund (2006) was predicting global growth over the next two years at an impressive 4.7 per cent – a rate which would imply a doubling of global GDP in 15 years. This was driven by projected continued surging growth in 2007 in China (9 per cent), India (7 per cent), ASEAN-4 (5.7 per cent) and the Commonwealth of Independent States (6 per cent). Current forecasts have been significantly lowered as a result of the ongoing financial and economic turbulence. World growth for 2009 is now predicted to reach only 2.2 per cent.²⁸ This still implies a rate of growth of over 5 per cent for developing and emerging economies which is respectable in historical terms, even if not as compared to recent performance.

It remains to be seen whether the current crisis provides a welcome opportunity to unlink growth and environmental damage. Many states are planning significant stimulus spending with a focus

²⁴ United Nations General Assembly (2000:paragraphs 11 and 12).

²⁵ Others include, for example, the Human Wellbeing Index (Prescott-Allen, 2001) and the Genuine Progress Indicator (Venetoulis and Cobb, 2004). For a survey of such indicators, see Boarini et al. (2006).

²⁶ Sen (1999).

²⁷ See Cosby (2004:section 3.2)

²⁸ IMF (2008).

on green growth, and as we seek to go forward sustainably the world is in entirely uncharted territory.

2.4. There are a number of potential conflicts between economic growth and action on climate change

This is a fairly straightforward proposition: as the economy grows, so too will GHG emissions. The equation appears simplest for carbon emissions associated with increased use of energy in industrial, residential/commercial (lighting, heating and appliances) and transportation sectors. All of these tend to increase with income, other things being equal.²⁹ As such, for example, the International Energy Agency's (IEA) World Energy Model, used to derive its authoritative projections of energy demand, is based on projected economic growth (along with demographics, fossil fuel prices and technological development) as a key exogenous assumption. The massive reductions in GHG emissions from economies in transition since 1990 have been driven almost entirely by economic crisis involving negative growth rates.

The reality of the impacts of growth is a little more complex. Copeland and Taylor (1994) developed a seminal model that can be used to break down the environmental effects of economic growth into three effects: scale, composition and technique effects.³⁰

- (a) As the economy grows, if all technology and production patterns are held constant, we get a sheer increase in scale of production – the “scale effect”. This will always have a negative effect on the environment;
- (b) If growth is accompanied by an improvement of techniques of production, such as increased energy efficiency, then the “technique effect” — which is almost always a positive influence on the environment — comes into play. Drivers include economic incentives and government policies;
- (c) The “composition effect” occurs when growth is accompanied by a shifting of the patterns of production. For example, a given economy may evolve to produce relatively less of a good that is highly polluting, and relatively more of a cleaner good. This effect is not so relevant at the global level, though it can occur in limited ways.³¹

Thus, the final impact of any economic growth is, *ex ante*, indeterminate. It will often boil down to a contest between the scale and technique effects – a contest, however, that is almost always won by the power of scale. That is, the rate of development and dissemination of new technology does not normally keep pace with the rate of growth in scale. For example, the Chinese Government's current five-year plan involves a 20 per cent reduction in the energy intensity of its economy – a level of ambition with few international precedents. But over those five years at

²⁹ Shafik and Banyopadhyay (1992). See also Frankel and Rose (2005), who find no environmental Kuznets' curve effect for CO₂ emissions. In other words, such emissions do not fall with increased income, but keep climbing.

³⁰ Their model was originally used to describe the impacts of trade liberalization, but it is also applicable to economic growth.

³¹ The composition effect is usually a response to shifts in comparative advantage among nations – that is, it simply involves shifting to a different division of the same bundle of production among countries.

current rates of growth, China's GDP will be almost 55 per cent larger.³² Barring any composition effects (and of course assuming the targets can be met), this means an overall increase in energy use of 29 per cent over this period.

The same dynamic can be seen repeatedly over time: for example, the improving efficiency of automobiles is routinely swamped by increased miles driven.³³ In part this is due to an effect known in the ecological economics literature as the "rebound" effect – a derivative of the original "Jevons' Paradox", whereby more efficient technology for coal use actually increased the use of coal.³⁴ Improved efficiency effectively lowers the price of the associated goods and services, and as the price of any normal good decreases, we consume more of it.

The Organization for Economic Cooperation and Development (OECD) (1994) notes another type of environmental effect – the regulatory effect.³⁵ Economic growth can enrich citizens who will demand better environmental regulations and can provide governments with the financial resources to propound and enforce them. This is clearly an important consideration in the context of international climate change efforts.

In summary, the overall effects of economic growth will often – but not always – conflict with climate change objectives. This holds true for energy-associated carbon emissions, as argued above. It is also probably true in the context of non-CO₂ GHG emissions, most of which are associated with goods for which demand increases as income grows. Air conditioner ownership in urban China, for example, more than tripled between 2000 and 2007, and with it the production of the GHG HFC-22.³⁶

2.5. But there are synergies between climate change goals and development

While it may be true that economic growth often conflicts with climate change objectives, this is not necessarily the case for development (which is, in the end, the object of growth).³⁷ In fact there are important synergies between development and climate change objectives.

There are, for example, a number of ways in which development efforts can lead to mitigation:

- (a) Efforts to restore forest cover or avoid deforestation/land degradation, for example, can have significant development payoffs, including reduced time spent collecting fuelwood,

³² This assumes an annual rate of growth of 9.1 per cent – the average of the projected 2008 and 2009 figures from IMF (2008). Copeland and Taylor's conception of the technique and scale effects covered only productive activities (efficiency and scale of production), but the concept here has been extended to cover end-use efficiency as well.

³³ For an illustration of this effect in China see IISD (2004:119–122). The IEA (2008a:393) reference case for personal vehicle transport between 2006 and 2030 sees overall increases in traffic overpowering increases in efficiency.

³⁴ For a summary of the modern literature on this subject, see Alcott (2005).

³⁵ Like the framework used by Copeland and Taylor, the OECD framework is meant to describe the effects of trade, but can also serve to describe the effects of economic growth.

³⁶ See *The New York Times* (2007). Ownership went from 24.4 per 100 urban households to 87.2. Rural ownership between 1995 and 2005 increased thirty-five-fold.

³⁷ Development is hereinafter used to mean an increase in human well-being.

reduced indoor air pollution from inefficient biomass use and flood control in watersheds.³⁸ In the process, such efforts also address a source of some 20 per cent of total anthropogenic emissions, reducing GHGs emitted and increasing carbon sink capacity;³⁹

(b) Efforts to provide energy to the poor constitute development in their own right.⁴⁰ If that energy is in the form of renewables (e.g., biogas digesters, micro hydro, solar cookers, photovoltaic panels), then those efforts will count toward mitigating emissions, compared to a baseline of conventional new energy provision;⁴¹

(c) Fuel-switching efforts may be aimed at reducing the burden of import costs, improving balance of payments and generating domestic employment.⁴² At the firm level they may simply be about increasing efficiency and/or saving on fuel costs, but they can also yield significant emissions reductions;⁴³

(d) Energy diversification and energy security are objectives that have value in and of themselves, helping to ensure smooth and continuous access to energy at affordable rates and shielding countries from the balance of payments impacts of fluctuating global fossil fuel prices.⁴⁴ But given the GHG-intensive energy profile of many countries, they may also result in a greater share of renewables in the overall mix, with clear benefits for climate change.⁴⁵

There are also a number of ways in which efforts to mitigate GHG emissions can contribute to development:

(a) Efforts to achieve energy efficiency have enormous potential to reduce GHG emissions.⁴⁶ Household energy efficiency programmes can also reduce expenditures on heating and lighting (yielding particularly strong development benefits when targeted at the poor).⁴⁷ And overall energy efficiency, other things being equal, leads to a stronger, more competitive economy, with significant economic benefits for all;

³⁸ Stern (2006:chapter 25).

³⁹ Baumert et al. (2005).

⁴⁰ See World Summit on Sustainable Development (2002:para. 9), World Bank (2006b), IEA (2004:chapter 10), van Geel (2005) and UNDP (2005).

⁴¹ This sort of mitigation relative to a hypothetical baseline of new energy provision has in fact been accepted as additional by the Methodology Panel and Executive Board of the Clean Development Mechanism (CDM). See the important work done by SouthSouthNorth on the theoretical basis and actual calculation of “suppressed demand” baselines (Winkler and Thorne, 2002).

⁴² Bradley and Baumert (2005) note that Brazil’s ethanol program, replacing petroleum as automobile fuel, has reduced Brazil’s external debt by \$100 billion from the baseline case and created hundreds of thousands of jobs among the rural population. It is also, incidentally, offsetting some 26 million tons of CO₂ annually.

⁴³ Note the results of the Brazilian ethanol program cited at *ibid.* UNEP-Risø’s CDM pipeline of projects (www.cd4cdm.org) as of 1 January 2009 showed potential mitigation of 205 million tons of CO₂ equivalent to 2012 from 139 firm-level fuel switching projects.

⁴⁴ See IEA (2008c); Bacon and Mattar (2005).

⁴⁵ This, of course, is not a necessary result. Pabst (2007) notes that the pursuit of energy diversification and energy security can often mean a pursuit of a diversity of sources for conventional energy supply and a lessened dependence on traditional sources.

⁴⁶ The IEA (2008b) has assembled a list of 25 policies and measures aimed at end-use energy efficiency that it estimates as able to reduce global emissions by 8.2 billion tons of CO₂ by 2030, or one fifth of its estimate for global annual emissions by that date under the baseline case.

⁴⁷ Cosby et al. (2006), in assessing the development dividend from CDM projects, found that household energy efficiency projects scored higher than all other project types.

- (b) Efforts to avoid the emissions associated with deforestation, as in the provision of improved cookstoves or solar cookers to fuelwood users, can yield significant development benefits as well, including reduced indoor air pollution.⁴⁸ As noted above, avoided deforestation itself yields a number of development benefits;
- (c) Efforts to capture methane emissions from landfills and livestock operations contribute powerfully to GHG emission reductions.⁴⁹ Such efforts also reduce odours and often the containment technologies used significantly lower the risk of leaching and containment spills – a benefit to local populations.

As well as the links to mitigation efforts, development objectives have strong links to adaptation. This stands to reason: the key objective of adaptation measures is to reduce vulnerability to the immiserating impacts of climate change, so any successful adaptation efforts will, by definition, constitute development.

But it is also possible for appropriately designed development efforts to strengthen adaptive capacity while simultaneously achieving their primary objectives.⁵⁰ OECD (2005:21) notes that in many cases this does not involve new plans, but rather the successful implementation of existing plans in areas such as “water or energy conservation, forest protection and afforestation, flood control, building of coastal embankments, dredging to improve river flow and protection of mangroves”. As well, traditional development efforts aimed at economic diversification have significant potential benefits in terms of increased resilience and reduced vulnerabilities in the face of climate change impacts.⁵¹ This same dynamic has been noted by some researchers in making the connection between economic vulnerability (as measured, for example, by UNCTAD’s Economic Vulnerability Index) and vulnerability to climate change impacts.⁵² In light of all these important linkages, a number of aid agencies are now making efforts to “climate-proof” their programming.⁵³

Just as development has linkages to active climate policies, it also has linkages to the failure of climate policies. Many of these are simply the obverse of the links discussed above. For example, as noted above, successful adaptation policies constitute development; it is conversely true that a lack of adaptation policies will lead to mal-development — a decrease in human well-being.⁵⁴

⁴⁸ Malhotra and Rehman (2004).

⁴⁹ UNEP-Risø’s CDM pipeline of projects (www.cd4cdm.org) as of 1 January 2009 showed potential mitigation of 262.5 million tons of CO₂ equivalent to 2012 from 321 such projects in the area of landfill gas capture.

⁵⁰ Of course, successful adaptation being development as noted above, there is often no bright line to easily distinguish adaptation objectives from development objectives.

⁵¹ This linkage is clearly recognized in the UNFCCC’s Nairobi Work Programme (five-year programme of work of the Subsidiary Body for Scientific and Technological Advice on impacts, vulnerability and adaptation to climate change), which has a distinct stream of work devoted to economic diversification. See UNFCCC (2006d).

⁵² Zhang (2003).

⁵³ See, for example, Danish Ministry of Foreign Affairs (2005). Kjørven (2006) estimates that 27–40 per cent of current donor-funded activities are “climate-exposed.” See also www.iisd.org/security/es/resilience/climate_phase_2.asp on the development of the CRiSTAL tool to screen development interventions for climate change concerns.

⁵⁴ See OECD (2005) for case studies of this linkage in action.

But there are also linkages that are novel. A failure of successful mitigation efforts, for example, will have a number of important development impacts, most of them which also threaten to undermine the basis for economic growth. Kjørven (2006) makes the case that climate change unchecked will seriously undermine the achievement of the MDGs. The scenarios of this type are countless, but a few key examples include:

- (a) Patterns of agricultural production will be disrupted, as producers (who constitute some 40 per cent of the population in developing countries as a whole, and over 80 per cent in some⁵⁵) are forced to cope with increased variability and uncertainty of weather patterns. Poor dryland farmers will be heavily affected and the final effects will directly increase malnutrition and poverty in poor countries.⁵⁶ Impacts will also be significant for developed country producers;⁵⁷
- (b) Droughts, floods and extreme weather events will become more frequent and more severe, taking a human and economic toll;⁵⁸
- (c) Risk of immiserating vector-borne diseases such as malaria, and diseases based on lack of potable water, may increase for tens of millions of people;⁵⁹
- (d) Sea level rise will threaten populations and infrastructure in coastal communities worldwide.⁶⁰ The effects of an irreversible dynamic disruption — a disaster scenario such as the melting of the Greenland ice sheet — would imply incalculable damage, eventually raising sea levels by up to seven metres;⁶¹
- (e) Glacial recession will significantly reduce flows of rivers critical to the well-being of huge swaths of the population in developing countries.⁶²

The failure of adaptation efforts will have effects that amount to intensified vulnerability to the sorts of impacts described above.

2.6. Advancing development goals in a sustainable way should thus be a central part of efforts to address climate change in all countries

There are a number of important elements that should feature in any national and international approaches to address climate change, including a focus on adaptation, the engagement of the private sector and the lowering of costs through the inclusion of market mechanisms, and a focus on development and dissemination of new technologies. The foregoing analysis argues strongly that advancing development goals in a sustainable way should also be central.⁶³

⁵⁵ ILO (2004:chapter 3).

⁵⁶ Hadley Centre (2006), Stern (2006:chapter 4) and Magrath (2006).

⁵⁷ See Lemmen et al. (2008) for an assessment of the implications for Canadian producers.

⁵⁸ IPCC (2007).

⁵⁹ van Lieshout et al. (2004).

⁶⁰ IPCC (2007). Also see Dasgupta et al. (2007), who calculate conservatively that 56 million people in developing countries would be impacted by a one-metre sea level rise.

⁶¹ Baer (2007).

⁶² See Rai (2005), Barnett et al. (2005) and Chevalier et al. (2005).

⁶³ In fact, as noted below, there is a great deal of overlap between advancing development goals sustainably and the other elements listed here.

The argument starts with the urgent need for, and the international commitments to, action on both climate change and development. It notes that governments worldwide are pursuing strategies to increase economic growth, which often has inherent conflicts with climate change objectives.

Appropriate development strategies can deal with all of these priorities simultaneously, creating a virtuous development process. They achieve the ends for which economic growth is a key means (and potentially alleviate the pressure for such growth). In the process they address climate change objectives by means of the many positive linkages between such development and mitigation. And where development strategies relate to adaptation, they will by definition advance both development and climate change goals.

The key is the emphasis on win-win policies that can simultaneously achieve development and climate change objectives. Win-win opportunities will not by themselves take us as far as we need to go in addressing either climate change or development needs,⁶⁴ but from the perspective of climate change policy they are an obvious starting point.

2.7. The international community should focus on advancing development goals sustainably in developing and least developed countries

The line of argument laid out in the previous sections holds true for developed countries as well as developing. Economic growth and development are key priorities for policymakers the world over, and climate change impacts will likewise be felt everywhere. In all countries there needs to be a focus on the types of win-win solutions that advance development goals and simultaneously achieve climate change objectives.

That said, as the international community addresses climate change there are a number of reasons why it should focus in particular on advancing development goals in developing and least developed countries.

First, while it is true that economic growth and development are priorities in all countries, the needs in developing and least developed countries are on a different scale altogether than that in the developed world. Section 2.2 illustrates the stark nature of poverty as it exists today in the South. Thus, even declarations with global application such as the Millennium Declaration and the Monterrey Consensus on Financing for Development are strongly focused on actions to assist developing and least developed countries.⁶⁵

Second, current development paths indicate the greatest need for investment to alter energy paths is in developing countries. IEA's baseline projections predict that between 2007 and 2030 non-

⁶⁴ Michaelowa and Michaelowa (2005) caution in particular that much development-related climate change spending might not necessarily mesh with the highest development priorities of the recipient countries.

⁶⁵ See United Nations General Assembly (2000); United Nations (2002).

OECD countries will account for 87 per cent of the world's increase in primary energy demand and practically all (97 per cent) of the global increase in energy-related CO₂ emissions.⁶⁶

Third, developing and least developed countries are particularly vulnerable to climate change impacts.⁶⁷ Many are more exposed to climate change impacts because of their tropical geography. Further, developing countries, and particularly their poorest populations, are generally more sensitive to any climate change impacts, given a high dependence on agriculture, strong reliance on ecosystem services, rapid growth and concentration of population and relatively poor health. And developing countries generally have less capacity to adapt to climate change impacts, having inadequate infrastructure (particularly in water supply and management), meager household income and savings and limited supporting public services.

Fourth, there is a strong argument to be made on equity grounds. The very countries that are most vulnerable are, for the most part, those that have contributed least to the current atmospheric concentrations of GHGs.⁶⁸ It can be argued that there is therefore a responsibility among the largest historic contributors to assist them in achieving development goals in ways that contribute to adaptation and mitigation goals.⁶⁹

Finally, if developing and least developed countries are to contribute meaningfully to efforts toward mitigation of climate change impacts, they will need the strengthened capacity that comes with development. The UNFCCC rightly holds, among its principles, that “economic development is essential for adopting measures to address climate change”.⁷⁰ That is, states that experience development are more likely to be able to play a meaningful role addressing the international challenge that is climate change.

⁶⁶ IEA (2008a).

⁶⁷ This discussion is based on Stern (2006:93-99).

⁶⁸ Baumert et al. (2005) estimate cumulative historic contributions (1850–2002) to climate change at over 75 per cent for developed countries, with the United States and EU-25 alone constituting 56 per cent.

⁶⁹ The principle of responsibility for action based on historical responsibility for emissions was at the heart of the Brazilian Proposal (see UNFCCC, 1997), among others.

⁷⁰ UNFCCC (1992:article 3.4).

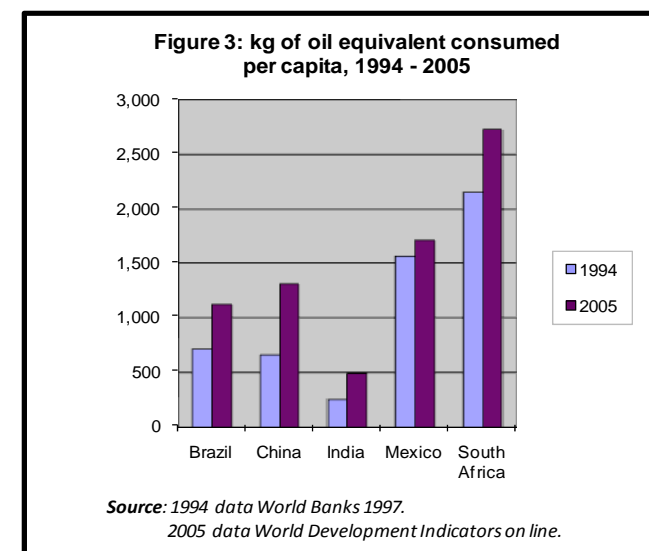
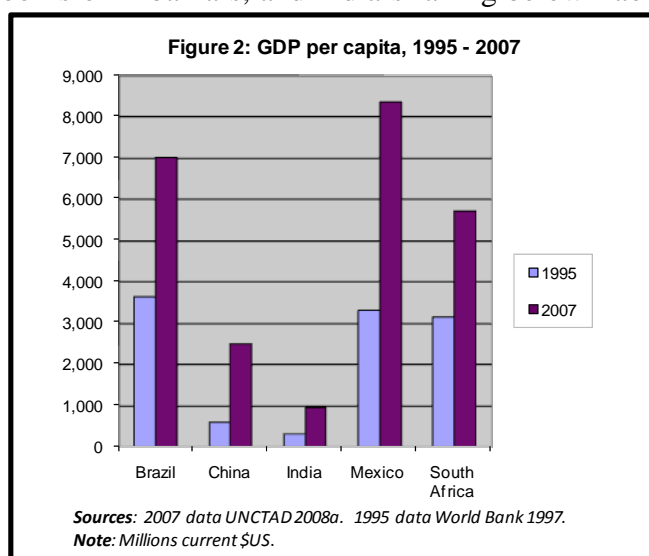
3. Situating the discussion

When the Kyoto Protocol was concluded in 1997, the world was a very different place. Those differences have an important bearing on the present discussion. The economic rise of several fast-growing developing countries, and the associated increase that this entails in GHG emissions, has translated into intense pressure for them to produce some sort of commitment to action at COP 15. As such, considering how such actions might be enunciated strategically, in line with nationally determined development priorities, is an important task.

In 1997 India and China were listed among the World Bank's low-income developing countries, China's GDP per capita being less than Cameroon's or Albania's, and India's falling below Lao People's Democratic Republic and Benin.⁷¹ Brazil's maternal mortality rate was nearly twice that of Viet Nam, at 200 per 100,000 live births, and in South Africa only 46 per cent of the population had access to sanitation.

Figures 2, 3 and 4 show the phenomenal rise of the some of the fast-growing developing countries (Brazil, India, China, South Africa and Mexico). Matching their powerful economic growth is a rise in aggregate GHG emissions. China is reported to have surpassed the United States in total emissions in 2006.⁷² As a whole the five countries listed here in 2003 had CO₂ emissions equivalent to over 80 per cent of the top five Annex I emitters (see table 1).⁷³ Non-OECD countries have already overtaken the OECD as emitters of energy-related CO₂, and if current trends continue, they will double OECD emissions by 2030, with China alone responsible for more than 50 per cent of the global increase.⁷⁴

Of course, compared with many Annex I parties, even the fastest growing developing countries still have significantly lower economic indicators and commensurately



⁷¹ World Bank (1997).

⁷² Netherlands Environmental Assessment Agency (2007).

⁷³ Annex I data based on UNFCCC CO₂ emissions data (without land use, land-use change and forestry or "LULUCF"). Data on Brazil, Russia, India, China, South Africa, the ASEAN states and Mexico (BRICSAM) based on the World Bank's World Development Indicators.

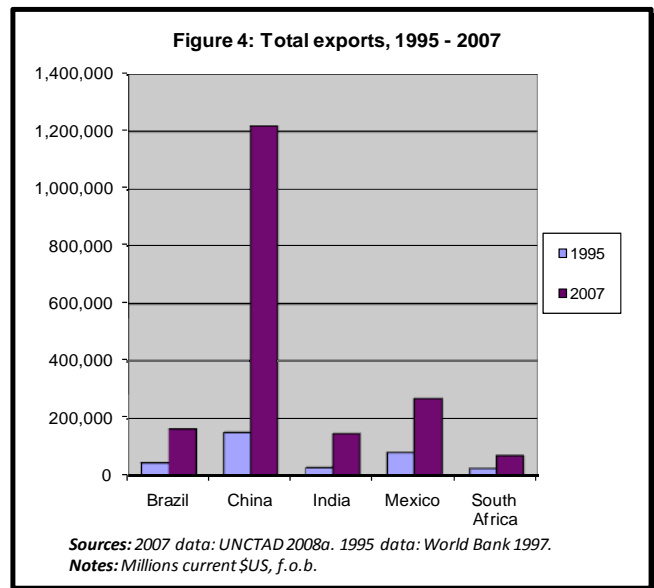
⁷⁴ IEA (2008a:385).

lower GHG emissions per capita (see table 1). And much of the rest of the developing world is still in the same position in relation to the OECD countries as they were when Kyoto was negotiated.

The meteoric rise of the major developing countries has at least two important implications for the elaboration of the Bali Action Plan.

(a) The emissions of developing countries must be taken into account in any post-2012 effort to address climate change. Although they are small on a per capita basis, they are critically important on an aggregate basis. Whether the result is a more severe contraction of developed country emissions, or a more stringent set of obligations for developing countries, somehow the rising emissions of the major developing countries in particular will have to be accounted for if the world is to avoid dangerous climate change;

(b) The major developing countries are increasingly competitive with OECD countries on a range of products and services. Regardless of their levels of development or low per capita emissions, this will heighten concerns about competitiveness and leakage in the elaboration of the Bali Action Plan. There will be pressure for the major developing countries to take actions commensurate with their capacity. In that context, it is a concern that the developing country mitigation commitments in the Bali Action Plan do not allow for taking into account differences in national circumstances (as do the commitments of developed countries);⁷⁵



(c) The key message of this section is that the world is much different than it was in 1997, and will be much different again in 2012, after five more years of the kind of growth predicted in section 2.3. For a post-2012 regime to be effective in addressing climate change, it will have to take account of those differences. As the Bali Action Plan is elaborated there will certainly be some need for developing country involvement – or at least the involvement of the major economic powers among them – in a more meaningful way than was negotiated in Kyoto’s first commitment period.

⁷⁵ See paragraphs 1(b)(i) and 1(b)(ii).

Table 2. North and South: the biggest CO₂ emitters

Country	CO ₂ emissions (kilotons)	CO ₂ emissions (tons per capita)	GDP per capita (current USD)
China	5,005,687	3.9	2,517
India	1,341,761	1.2	973
Mexico	437,630	4.3	8,346
South Africa	436,641	9.4	5,719
Brazil	331,498	1.8	7,023
United States	5,877,677	20.6	44,594
Japan	1,284,376	9.8	34,348
Germany	892,545	9.8	34,979
Canada	593,063	20.0	43,191
United Kingdom	558,938	9.8	45,060

Notes: CO₂ emissions per capita data are for 2004, from World Bank's World Development Indicators online. GDP per capita data is for 2007, from UNCTAD (2008a).

4. Elements of a strategic approach

Section 2, above, made a detailed case for the international community addressing climate change by advancing development goals sustainably, with a focus on helping developing countries take actions that simultaneously serve global climate change goals and nationally defined development goals. At its heart, this approach involves understanding and exploiting the nexus of environment and development, with particular focus on that subset of linkages involving climate change.

This section will illustrate in greater depth the types of elements that might make up such an approach. The elements examined here are not an exhaustive list of possibilities and are chosen rather to illustrate the types of linkages involved and the different sorts of regime implications of addressing each. Adaptation, for example, is not addressed here, though it is a pillar of the Bali Action Plan and an essential element of any approach to advancing development goals sustainably. The three elements below are chosen because of the trade and investment implications they have for any post-2012 regime, including implications for the shape of international carbon markets. Those implications are discussed in depth in the section that follows this. The elements examined in this section are:

- (a) Avoiding and reversing deforestation;
- (b) Clean energy production and use for developing countries;
- (c) Clean transportation options.

Each of these elements is discussed in greater detail below. For each it is asked why it is significant to climate change and development objectives. It is then asked what sort of regime structure might be implied by the need to address each, with reference to the possibilities or constraints imposed by the Bali Action Plan, and in the understanding that not all of the actions discussed will be necessarily be housed directly under the UNFCCC framework.

4.1. Avoiding and reversing deforestation

Emissions and removals of carbon from land-use change are a significant part of human contributions to the global carbon cycle. IPCC (2000b) calculates total annual carbon emissions from land use change between 1989 and 1995 at 1.6 gigatons (Gt) per year, or 20 per cent of global anthropogenic emissions.⁷⁶

The elements that make up land-use change figures are deforestation for cultivation or pasture, deforestation for forest products or fuelwood, abandonment of cultivation or pasture activities (and subsequent regrowth) and shifting cultivation (slash and burn). Deforestation for cultivation or pasture, mostly centred in developing countries, dwarfs the other elements of this mix, amounting to just over 100 per cent of net emissions.⁷⁷ To put this in perspective, at these levels

⁷⁶ Watson et al. (2000:table 2). This figure has an error limit of 0.8 gigatons at a 90 per cent confidence interval.

⁷⁷ Baumert et al. (2005)

predicted CO₂ emissions from this type of deforestation every year during the first commitment period would amount to roughly double the reduction all Annex I parties combined had achieved in their annual GHG emissions between 1990 and 2004.⁷⁸

As such, avoiding and reversing tropical deforestation is an obvious focal point for international efforts aimed at mitigation. Enkvist et al. (2007) argue that forestry has the highest potential of any sector to contribute to low-cost mitigation between now and 2030. Moreover, a number of studies have suggested that sequestering carbon in forests is likely to be much less costly than other approaches to reducing atmospheric CO₂.⁷⁹ However, the only manner in which developing countries can participate in achieving the Kyoto Protocol's reduction commitments is through the CDM, where deforestation is not covered (having been negotiated out largely due to concerns over methodology and leakage).

As well as being key to mitigation efforts, deforestation is also strongly linked to development. Clearing of land in developing countries is primarily for agriculture: subsistence farming in Africa, cattle ranching and soy plantations in South America, palm oil and coffee plantations and timber products in South-East Asia.⁸⁰ Deforestation negatively impacts those — most directly, the poor — who rely on the affected ecosystems for fuel, food and flood prevention among other things. And widespread low-efficiency fuelwood use generates significant air pollution and health problems. Given the strength of these linkages there is a host of development projects dedicated to avoiding deforestation and land degradation via improved natural resource management, increased fuelwood efficiency and improved agricultural practices.⁸¹

These compelling considerations led to the inclusion of a mandate on avoided deforestation in the Bali Action Plan. Parties are committed to addressing mitigation by, inter alia, considering “policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries”. The question to be answered by December 2009 is exactly what form the final agreement on avoided deforestation will take. The discussion below starts by considering the needs and possibilities in this area.

⁷⁸ Calculations of emissions reductions taken from UNFCCC (2006a), based on total aggregate emissions without LULUCF, where a reduction of 0.7 gigatons of CO₂ equivalent was achieved. (The corresponding figure for reductions with LULUCF is 0.8 gigatons.) Calculations for emissions from deforestation based on Watson et al. (2000:13), where annual net stock change from all LULUCF over 2008–2012 is predicted to be between 1.6 and 1.2 megatons.

⁷⁹ Stavins and Richards (2005). See, though, Enkvist et al. (2007) for a contrary view, holding that a wide range of other policies and measures would be more cost-effective. Also see McKinsey Global Institute (2008) for an analysis that puts avoided deforestation squarely in the middle of the various options ranked by cost per ton of avoided GHG emissions.

⁸⁰ Stern (2006:chapter 25). According to the Food and Agriculture Organization (FAO) (2005), between 2000 and 2005 Brazil (3.1 million ha.) and Indonesia (1.9 million ha.) accounted for 1.5 times the forest loss of the other top eight countries put together.

⁸¹ As of 9 February 2007, the Asian Development Bank's global database of development projects that address environment and poverty contained 25 entries in this area (some comprising a number of projects), making up over 30 per cent of all entries. See www.povertyenvironment.net.

Stern (2006:540) frames the challenge succinctly: “Effective action to protect existing forests and encourage afforestation and reforestation requires changes to the structure of economic incentives that lead to unsustainable logging and to the conversion of forestland to agriculture.”

In other words, deforestation is fundamentally an economic phenomenon. Addressing it will call for policy approaches and positive incentives that alter the basic economics of deforestation. Efforts to this end can be made at the domestic level; Costa Rica and Mexico already pay landowners to be stewards of forested land.⁸² In August 2008 Brazil launched the International Amazon Fund, designed to attract financing for national conservation efforts. At the international level there are at least four ways in which such efforts could be undertaken.

4.1.1 The Papua New Guinea/Costa Rica proposal and the United Nations Collaborative Programme on Reduced Emissions from Deforestation and Degradation in Developing Countries (UN-REDD)

In the lead-up to COP 11, Papua New Guinea and Costa Rica proposed that the international community “consider appropriate expansion of the Marrakesh Accords”, in order to allow the CDM to credit projects that reduce emissions from tropical deforestation.⁸³ The concept is not elaborated in the Papua New Guinea/Costa Rica paper, but presumably the idea would be to allow the CDM to use existing rates of deforestation as a baseline in determining the impacts of a project or programme in reducing GHG emissions. This would involve an amendment of the Marrakesh Accords in the first commitment period or, more relevant to the present analysis, agreement that in any post-2012 regime that there be scope for such crediting.

It would also, however, involve some difficult methodological considerations with respect to verification and monitoring. Watson et al. (2000) makes it clear that there are no easy definitions of what constitutes deforestation, or even what constitutes a forest for that matter. It would also be difficult to address international leakage; if one country’s avoided deforestation leads to another country’s accelerated deforestation, how is that accounted for? While the principle behind this proposal is simple enough, putting into practice would be challenging.

UN-REDD, created in June 2008, will operate along these lines, functioning as a fund for voluntary contributions by Annex II parties and others, and disbursing funds in support of country-level actions and capacity-building. The emissions reductions generated from the projects are for the moment not available to be used as compliance credits by Annex I governments, given the fact that the CDM does not cover avoided deforestation. But the clear aim of the programme is to work as a pilot project, to test methodological innovations and find ways in which to link UN-REDD to the UNFCCC process, in fulfilment of the Bali mandate. It is hoped that in a post-2012 regime the credits generated would be valid within the regime. To date the programme has attracted a commitment of \$35 million from Norway – champion of international efforts to address these issues.

⁸² Stern (2006:544).

⁸³ Papua New Guinea and Costa Rica (2005).

4.1.2. Brazil's proposal for reducing emissions from deforestation

In a submission to the Dialogue on Long-Term Cooperative Action (specifically in the context of advancing development goals in a sustainable way) Brazil elaborated on earlier proposals to propose a new agreement, under the auspices of the UNFCCC, to compensate developing countries for avoided emissions from deforestation.⁸⁴

Unlike the Papua New Guinea/Costa Rica proposal, this proposal does not envision the reduced emissions from avoided deforestation being used by Annex I countries to count towards their obligations; these reductions would be additional to any such obligations. It would presumably involve establishment of a funding mechanism with contributions from developed country parties. Financial incentives would be awarded to countries that lowered their rates of deforestation below an established baseline rate. No penalty would apply to those countries that exceeded their baseline rate, but for the purposes of calculating financial incentives due from the fund, such failure would count against any future reductions.

The financial incentives would be in the form of new and additional payments, in the form of technology transfer, and/or in the form of capacity-building. The latter might be particularly important. Avoiding deforestation involves significant domestic-level challenges that typically require, at a minimum, strengthening legal and regulatory systems (particularly involving property rights and enforcement) and natural resource management capacity.

4.1.3. Sustainable Development Policies and Measures (SD-PAMs)

In its fundamentals, as applied to deforestation, this idea is similar to the Brazilian proposal. It has been proposed that one way to engage developing countries in a post-2012 regime without actually embarking on the politically difficult course of setting quantitative targets is to allow them to pledge to undertake sustainable development policies and measures that will reduce GHG emissions.⁸⁵ In the context of the Bali Action Plan, these would presumably constitute measurable, reportable and verifiable mitigation actions. Such pledges would be voluntary, and would be designed primarily to serve domestic policy needs not related to climate change objectives. They would, if successfully carried out, be rewarded with funding, either by agreement through existing channels (e.g., official development assistance (ODA), the Global Environment Facility (GEF), multilateral development banks) or through some expressly designed international mechanism. If a post-2012 regime chose to involve developing countries in this fashion, it could allow for pledges to curb deforestation, thus directing financial support toward efforts to do so.

4.1.4 Developing country commitments post-2012

⁸⁴ The Papua New Guinea/Costa Rica proposal also mentions the idea of a separate agreement as one option for addressing tropical deforestation, but does not elaborate any further.

⁸⁵ See Bradley and Baumert (2005).

A final possible regime design is to assign quantitative targets to developing countries, or some sub-group of developing countries, and to allow avoided deforestation to count toward fulfillment of those obligations. If the regime allowed for emissions trading along the lines of the present regime, this would allow countries such as Brazil and Indonesia to generate large quantities of Assigned Amount Units (AAU) -like credits, generating significant revenues that could be devoted to forest protection. Judging from the final stages of debate at COP 13, there is strong opposition among developing countries to the idea of such targets in a post-2012 regime – opposition that would hardly be overcome by designing a system that would benefit only a subset of countries (those with major deforestation problems). If the regime allowed afforestation and reforestation to count toward commitments with a high cap, or no cap, it might broaden the group of benefiting countries somewhat, certainly including China, for example.⁸⁶

Stern (2006:540) cites estimates of the opportunity cost to forested countries of stopping forest land conversion and of completely eliminating forestry, expressing the results in terms of the cost per ton of avoided CO₂ emissions. The former are estimated at less than \$5 per ton, while complete elimination of deforestation would drive the costs up to \$30 per ton. While it is not argued here that either of these scenarios is desirable or likely, it is instructive to note that these figures are not outside the reasonably expected range of prices for carbon in a post-2012 world.⁸⁷

4.2. Clean energy production and use for developing countries

Energy in developing countries is a critically important focus for a strategy that advances development goals as a way to address climate change. Energy is the biggest part of the battle for effective mitigation. Moreover, energy is fundamentally linked to development:

Without access to modern energy services, the poor are deprived of opportunities for economic development and improved living standards. Modern energy services provide lighting, cooking, heating, refrigeration, transportation, motive power and electronic communications that are indispensable to increasing productivity, creating enterprises, employment and incomes, and accessing safe water and sanitation, as well as health and education.⁸⁸

From the development perspective, the challenge is the immense need for new energy supplies in the coming decades. For many in developing countries the issue is basic needs. 2.4 billion people still use traditional biomass for cooking and heating, and 1.6 million women and children die each year from exposure to the resulting indoor air pollution.⁸⁹ 1.6 billion people worldwide have

⁸⁶ China reported an annual net gain in forest area from 2000–2005 of over 4 million ha. This was almost four times the gain of the next nine leading nations combined (FAO (2005:table.2.6)).

⁸⁷ Enkvist et al. (2007) estimate a price per ton of CO₂e of €40 in 2030, assuming the need to limit atmospheric concentrations of CO₂e to 450 parts-per-million. For reference, since the European Union's Emission Trading Scheme (ETS) came into force in 2005, prices for carbon allowances under that scheme have ranged from €1.50 to just under €30 per ton.

⁸⁸ World Bank (2006b:1).

⁸⁹ Ibid.

no access to network electricity (mostly in sub-Saharan Africa and South Asia), and 80 per cent of those are the rural poor of developing countries.⁹⁰

Energy needed to feed projected economic growth is also significant. IEA (2008a) cites a need for \$26.3 trillion dollars in new energy investment between 2007 and 2030, with more than 60 per cent of that in non-OECD countries.⁹¹ By 2030 the result would be a 45 per cent increase in global energy use, with developing countries accounting for 87 per cent of that total.⁹² China alone in 2005 added more than 70 GW of new capacity to its grid – equivalent to adding two 650 MW generating stations per week or adding, over the year, the equivalent of the United Kingdom's entire installed generating capacity.⁹³

For all intents and purposes there are two separate challenges here: the challenge of providing basic energy needs to the rural poor, most of whom are not connected to any grid, and the challenge of supplying new capacity to urban centres to increase the productive capacity of industry and accommodate rising household demand. The two challenges are, in fact, simply two ends of a continuous spectrum: providing clean energy for development. But the context, the scale and the implementing strategies differ markedly between the two.

In the rural context the challenge is to provide cleaner energy than current sources used for cooking, heating and lighting (or to increase the efficiency of current use) and to provide new energy for appliances. This sort of effort has high pay-offs in terms of development, many of which are discussed above, and is the subject of a large number of ongoing development programmes.⁹⁴ It may not, however, have such high pay-offs in terms of carbon mitigation.

By contrast, in the urban context the stakes for mitigation efforts are huge. The rush of investment needed over the next several decades in developing country energy infrastructure will lock in technologies for up to half a century thereafter. But these decisions are being made by private investors with few, if any, incentives to consider environmental externalities. Sun (2005) describes the tide of new coal generating stations being built in China as far from best available technology; until recently subcritical units dominated, but now roughly half of new orders are supercritical. Only a clutch of ultra-supercritical units are in the works. At the time of that writing, China was not slated to have its first integrated gasification combined cycle plant for at least four more years.

The differences matter. A single 600 MW ultra-supercritical unit (recall that China adds more than the equivalent capacity of two of these per week), compared to a supercritical unit, will reduce CO₂ emissions by nearly 4 million tons over a 30-year lifetime.⁹⁵ If Chinese power plants were at the average efficiency of Japanese plants, China would consume 20 per cent less coal.⁹⁶ This would conserve over 180 million tons of coal a year, avoiding 486 megatons of CO₂

⁹⁰ IEA (2006:157).

⁹¹ This is the IEA Reference Case.

⁹² IEA (2008a).

⁹³ Green (2006).

⁹⁴ See, for example, World Bank Group (2006).

⁹⁵ American Electric Power (AEP) (undated). The contrast to subcritical units would, of course, be even starker.

⁹⁶ World Bank (2007).

emissions.⁹⁷ The attendant benefits for the economy of this kind of increased efficiency, and the environmental benefits of reducing pollutants such as sulfur oxide (SO_x) and resulting acid rain, are self-evident.

The recognition that today's investments, particularly in energy infrastructure, cast long shadows into the future is behind the current efforts by the United States, Japan and others to make "green" investments a cornerstone of their stimulus packages in response to the current global economic slowdown.

While improving the efficiency of production is key, perhaps just as important is improving end-use efficiency. There is enormous potential to avoid GHG emissions through the use of efficiency standards and labeling, mandating the use of low-energy appliances such as air conditioners, refrigerators and light bulbs, and requiring efficient design in new buildings.⁹⁸ The IEA has estimated that a package of 25 energy efficiency measures could save up to 8.2 Gt of CO₂ per year, or fully one fifth of the emissions it projects for 2030 in its baseline (reference) scenario.⁹⁹ The timing of such efforts is important; replacing or retrofitting an existing capital stock is much more difficult than mandating efficiency in the early stages of demand growth for such goods, as found in such countries as India and, to a lesser extent, China.

A post-2012 regime that advances development goals sustainably must find a way to help provide the energy needed for development. But it must also find a way to help ensure that the energy in question does not lock us into decades of high-emission technologies.

How might a post-2012 regime address the need for clean energy in developing countries? The mechanisms will vary, particularly depending whether they are designed to address what were referred to above as the rural or urban energy challenges. There are at least two possible broad thrusts toward an effective approach to energy in a post-2012 regime, and they are discussed below. Within them there are many possible variations and synergies, but presenting them as two "options" seems to cover all the necessary discussion related to these possibilities.

4.2.1. Support programmes and policies for poverty-alleviating clean energy in developing countries

There are two main avenues that might simultaneously achieve the goals of development as it relates to the energy-poor, and of addressing climate change. The first is some market-based mechanism for bringing clean energy to the poor, along the lines of the current CDM. The idea here is to somehow provide a premium to investors for their investments in bringing to the energy-poor such energy technologies as micro hydro, solar photovoltaic, solar thermal and wind

⁹⁷ IEA statistics for 2004 cite China's electricity plant consumption of coal at 919,616 kilotons of coking coal and other bituminous coal. Not included in this total are gas works gas and coke oven gas. Tons of CO₂ emissions avoided are calculated using the average carbon content of coal power in China (0.736 tCO₂/tce) times 44/12, as cited in the China wind power CDM project CERUPT (2004:annex 3).

⁹⁸ The Government of Ghana projected over 3 MtCO₂e emissions reductions from its proposed air conditioner efficiency standard, submitted as a 7-year cycle CDM project (NM0159-rev – rejected by the CDM Executive Board).

⁹⁹ IEA (2008b).

power. Such a mechanism should also reward dissemination of technologies that allow more efficient use of, or replacement of, existing energy appliances, such as wood-burning stoves (see the discussion above on avoided deforestation), light bulbs and water heaters.

The current CDM does this by awarding carbon credits to the investor, but it might be improved in a number of ways to better serve the goal of development for the poor and/or energy-poor. One obvious way is the approval of new methodologies for programmes of activities. Previously the CDM was more or less restricted to project-level activities, which limited its usefulness in reaching numerous dispersed individuals in need of identical small-scale interventions (e.g., converting from incandescent to compact fluorescent light bulbs). To register each small intervention as a project would be prohibitively expensive, but the current roster contains a number of registered projects with programmatic characteristics (see box 1), and the CDM's Executive Board has recently approved and set guidelines for programmes of activities under the CDM, including those that would implement a government-issued policy, such as an efficiency standard.¹⁰⁰ This should make such activities much more prevalent in the evolving CDM roster, and any iteration of the CDM in a post-2012 world will almost certainly involve a strong component of such programmatic and policy-based CDM. The fate of the CDM, however, while it garners widespread support from the negotiating parties in their public statements, is not entirely clear within the mandate of the Bali Action Plan. Paragraph 1(b)(v) pledges that in addressing mitigation parties will consider "various approaches, including opportunities for using markets, to enhance the cost-effectiveness of, and to promote, mitigation actions, bearing in mind different circumstances of developed and developing countries". This is hardly a promise of a future CDM, much less an enhanced version. However, given its popularity among key parties, the CDM will very likely figure in the post-2012 regime in one form or another.

The other option for pursuing more clean energy investment for the poor and/or energy poor involves policy alone, and does not involve the private sector explicitly, nor crediting for Annex I countries of the involved reductions. It was noted above that the SD-PAMS approach has been promoted as a way of supporting developing country governments in their voluntary pledges to pursue their own development goals in ways that also reduced GHG emissions, and that these might constitute the Bali-mandated measurable, reportable and verifiable actions of paragraph 1(b)(ii). Either in this context or by means of some other dedicated funding/support mechanism

Box 1. CDM with Programmatic Characteristics

The CDM's roster of registered projects includes the following:

- Distributing solar cookers in Aceh, Indonesia;
- Retrofitting public buildings in the Republic of Moldova with high efficiency biomass heating systems;
- Installing household-level biogas digesters in India and Nepal;
- Distributing photovoltaic kits to rural households in Morocco;
- Retrofitting low-income housing with insulation, compact fluorescent bulbs and solar water heaters in South Africa.

Source: Cosbey et al. (2006)

¹⁰⁰ See CDM Executive Board (2006). Mollet (2005) argues for the enormous potential of standards and labeling to mitigate GHG emissions, calculating that standards and labeling for four products (including refrigerators and air conditioners) could reduce global emissions by more than 500 MtCO₂e by 2020.

the international community might encourage developing country government policies that seek to promote development through clean energy and energy efficiency. The discussion above on SD-PAMS and, separately, on energy, should make it clear that the UNFCCC would not be the only, or probably even the primary, player in such an arena. There are numerous ongoing and planned development agency and MDB projects focusing on just such support.

4.2.2 Technology cooperation

Technology cooperation includes a number of supporting elements that go beyond the simple transfer of a given technology, to the “soft” elements of technology transfer that work to ensure successful adoption of the “hard” elements: a focus on absorption and capacity, on best practice in public policy and regulation, on effective diffusion and so on. In the UNFCCC context, much of the discussion on these issues has been around enabling environments and capacity-building for technology transfer.¹⁰¹

Successful efforts at technology cooperation are key to addressing what was called the “urban” challenge above — providing energy to developing countries for expanding industries and to meet growing residential demand — and this must be a focus of technology cooperation. Specifically, any efforts to promote climate change objectives through advancing sustainable development goals will involve support for developing countries in fundamentally altering their energy paths, such as:

- (a) Subsidies for private energy infrastructure investors, altering incentives so that low-carbon technologies are attractive;
- (b) Subsidizing developing country acquisition of intellectual property in the area of clean energy;¹⁰²
- (c) Capacity-building for regulatory infrastructure to promote clean energy development (including, for example, regulatory initiatives in support of demand-side management);
- (d) Financial support for developing country adoption and implementation of high energy efficiency standards and for labeling programmes;
- (e) Programmes aimed at facilitating regulatory reform, in pursuit of an enabling environment for increased clean energy investment.¹⁰³

Effective cooperation in this area is the only hope to ensure that the world can meet the needs of energy for development, while at the same time encouraging the wide uptake of low-carbon technologies.

¹⁰¹ UNFCCC (2006b).

¹⁰² See the proposals for a Multilateral Technology Acquisition Fund in South African Government Department of Environmental Affairs and Tourism (2006) and UNFCCC (2006c).

¹⁰³ See Cosbey (2008) and Neuhoff (forthcoming).

4.3. Clean transportation options

An approach to climate change that advances development goals needs to focus on transportation in developing countries – in particular on providing clean transportation options for the increasingly affluent growing population of large urban centres.

The United Nations Population Fund (UNFPA) (2008) shows that as of 2008, for the first time in history, half of the human population is living in urban centres. UNFPA (2004) predicts that by 2030 the figure will be 60 per cent, or some 5 billion people. Almost all of the world's growth between now and that time will take place in developing country cities.

Increasing prosperity in those cities (particularly in the fast-growing economies of Asia) and falling prices for private automobiles due to trade and investment liberalization mean that increasing numbers of people are choosing private transport.¹⁰⁴ In China, national car sales grew by an astonishing 75 per cent between 2002 and 2003, and domestic production increased by 177 per cent between 1999 and 2004.¹⁰⁵ In Santiago, Chile, private vehicle use doubled between 1991 and 2001 from 15 per cent of trips to 30 per cent, accompanied by a 50 per cent increase in vehicle ownership.¹⁰⁶ These general trends are expected to continue, though the current financial and economic crisis are sure to dampen sales for several years to come. Car ownership in China, for example, is still very low by international standards at 9 per 1,000 inhabitants. By way of comparison, the corresponding figure for United States in 2004 was 700, and for middle income economies like Mexico, Brazil and Korea, 150–200.¹⁰⁷

This trend represents a critical challenge for development and for climate change. The development implications of increased automobile use in urban developing country centres are well documented; while increased personal mobility is a definite benefit for those that can afford it, the social costs are considerable, and include:

- (a) Increased air pollution (carbon monoxide, nitrogen dioxide, volatile organic compounds, particulates), and the health effects that accompany it;¹⁰⁸
- (b) Increased traffic fatalities;¹⁰⁹
- (c) Loss of arable land (highway construction);¹¹⁰
- (d) Increased congestion.

Energy security and balance of payments concerns are also important. China in 1993 went from being a major oil exporter to a net importer, and today is the second-largest importer in the world. IEA (2008a:105) projects that by 2030 China's imports of oil will have more than tripled as compared to 2007 levels, to levels exceeding OECD Europe's total imports, and with a

¹⁰⁴ IISD (2004).

¹⁰⁵ Bradley and Baumert (2005).

¹⁰⁶ Barías et al. (2005).

¹⁰⁷ Bradley and Baumert (2005).

¹⁰⁸ IISD (2004) notes that even China's strict new emission standards will be easily swamped by the scale of increased automobile use.

¹⁰⁹ See Tiwari (2003) on the case of Delhi.

¹¹⁰ See Bradley and Baumert (2005) on the case of China.

resulting import dependence of 75 per cent. India's import dependence in 2030 is projected to be almost complete, at over 90 per cent. Most of that will be used for transport. The key issue is obviously energy security, particularly in the face of potential supply shocks – a concern that increases in light of the predicted tightening of geographic supply diversity.¹¹¹

Transportation choices are also a matter of concern from a climate change perspective. Some 18 per cent of global CO₂ emissions come from transportation, with road transport constituting 72 per cent of that total.¹¹² If the urban planners of fast-growing developing countries do not plan today for clean transportation solutions, the resulting GHG emissions growth will be significant. IEA's baseline case projects increases in road transport-related CO₂ emissions of almost 40 per cent between 2006 and 2030.¹¹³

But many developing countries will exceed that. Baumert et al. (2006:64) predict increases in China of 143 per cent, in India of 67 per cent, in Indonesia of 122 per cent, in Mexico of 71 per cent and in the Middle East of 68 per cent by 2020.¹¹⁴

At the national level there are three types of solutions to these challenges. First, developing countries can set efficiency standards for vehicles, and requirements for fuels, at stringent levels. China, for example, has upgraded auto emission standards to the EURO III level, with plans to increase them to EURO IV levels by 2010.¹¹⁵ Most countries have by now phased out leaded gasoline.¹¹⁶

A second strategy, which may be more effective overall, is to reduce the number of vehicles on the road by providing attractive alternatives. Box 2 describes such an effort in Bogotá, Colombia. Mass rapid transit efforts of this type, if successful, can speed transit, lower congestion, lower accident rates and pollution, and cut GHG emissions.¹¹⁷ While options include rail, light rail and subway, the most cost-effective measures in developing country urban centres are typically bus right-of-way efforts.¹¹⁸

Box 2. Transmilenio: Rapid Mass Transit in Bogotá

The Transmilenio project, begun in 2000 and running through to 2012, is designed to make public transit more attractive to riders in Bogotá, Colombia.

- By 2012, 130 km of dedicated bus lanes and new stations;
- Larger capacity EURO III buses with smaller feeders to main stations;
- Elevated bus stations, pre-ticketing and free transfers;
- Centralized system management.

Two years into the project, the results were impressive:

- Travel time reduced by 32 per cent;
- Traffic accidents down by 80 per cent;
- Noise pollution cut by 30 per cent;
- SO₂ levels 43 per cent lower;
- NO₂ and particulate levels cut by 18 per cent.

Sources: IISD (2004); Grütter Consulting (2006).

¹¹¹ IEA (2008a:106).

¹¹² Baumert et al. (2005)

¹¹³ IEA (2008a).

¹¹⁴ These projections are calculated based on IEA (2004).

¹¹⁵ EURO III standards were in effect in the EU from 1999–2005; EURO IV standards were in effect until 2008.

¹¹⁶ While it is a significant development issue because of its human health impacts, lead in gasoline is not, of course, a climate change issue.

¹¹⁷ The Transmilenio Project's phases II–IV are registered as a CDM project with projected emission reductions of over 1.7 Mt CO₂e by 2012.

A third strategy is to avoid the need for transport through appropriate urban planning. Situating residences close to places of work and other destinations is probably the most effective policy option, though it has limited applicability for urban areas that have already been built.

How might a post-2012 regime focus on supporting these types of efforts? There are at least two ways in which it might do so.

4.3.1. CDM-like mechanism

The Transmilenio project described in box 2 has actually been registered as a CDM project. Three other projects using the same methodology are now in the process of validation.¹¹⁹ The Transmilenio project in its project design document made a strong case (which was eventually accepted by the CDM's Executive Board and the Methodology Panel – the expert group that reviews CDM methodologies and makes recommendations to the Executive Board to accept, revise or reject) that the main obstacle to implementing the project was financial. As such, it argued, the revenues from certified emission reductions were essential to allowing the project to proceed.

A market mechanism like the CDM, allowing and providing carbon finance for such projects, would be one manner in which to focus on transportation. Again, it is worth noting that such projects are in fact more like a programme of activities, explicit approval for which has recently been given by the CDM's Executive Board. As the methodological questions surrounding such projects are answered, and the way is cleared for others to follow, there will certainly be more of them in the roster, building up a potential foundation for a similar mechanism post-2012.

It is also worth repeating that the Bali Action Plan does not contain any explicit mandate for a CDM, much less details about what types of projects it might cover, but there is reason to believe that the current foundations will be preserved, with some changes currently under negotiation, in a new regime.

4.3.2. SD-PAMS

Another possibility would be to support developing country voluntary pledges to reduce GHG emissions in the transportation sector, through projects like Transmilenio, counting these as measurable, reportable and verifiable actions. As in the SD-PAMs proposal described above, the funding and support could come through any number of sources, from a dedicated sectoral fund under the UNFCCC to diverse sources of development assistance. It might complicate matters that SD-PAM-type pledges would presumably come from national governments, while mass rapid transit projects are typically conceived and implemented at the municipal level, but this would not be an insurmountable obstacle.

¹¹⁸ Fouracre et al. (2003). See also Grütter Consulting (2006:section 3b).

¹¹⁹MIO Cali, MEGABUS and Cable Cars Metro Medellín, all hosted in Colombia.

4.3.3. Technology cooperation

The first type of action discussed above to address transport-related concerns was a technological solution: more efficient private vehicles and cleaner blends of fuel. This is clearly an area suitable for technology cooperation. In fact, however, the opportunities for government action might be limited, given the fierce competition that prevails in the automobile sector as it rushes to develop proprietary technology for cleaner vehicles. In the final event, most technology transfer under the Bali mandate is likely to be focused on clean energy generation, absent a push for sectors such as transport to be given greater attention.

In terms of “soft” technology, there should be scope for sharing the lessons learned in developing country projects like Transmilenio, assisted by a post-2012 commitment to support this type of South–South cooperation.

5. Regime Implications

The previous section explored the essential elements of any post-2012 regime that seeks to address climate change objectives by advancing development goals sustainably. Each of those elements has implications for the shape of an international regime. This section explores those implications, asking what they mean for developing countries.

There are three elements from the preceding discussion that merit further consideration here:

- (a) A market mechanism for developing country initiatives;
- (b) SD-PAMS approach;
- (c) Developing country targets.

5.1. A market mechanism for developing country initiatives

Each of the elements discussed above considered a regime that contained a market mechanism, similar to the CDM, which allowed developing countries to help finance their efforts to simultaneously reduce GHG emissions and to foster sustainable development. In the context of deforestation, this was mooted in the Papua New Guinea/Costa Rica proposal and implied as a possibility in the Brazilian proposal and the UN-REDD approach. It is already in use to various degrees in the context of energy and transport, though it could certainly be given a greater role in both.

It bears noting at the outset that there has not been explicit agreement from the UNFCCC or Kyoto parties on the inclusion of a market mechanism in the post-2012 climate regime — it was noted above that there is no explicit indication in the Bali Action Plan that such a mechanism is indeed being contemplated — though it is widely understood that some incarnation of the CDM will be part of any final mix.¹²⁰

The need for such a mechanism probably implies a need for quantitative targets and a two-track Kyoto-style regime of the type that now distinguishes between Annex B parties, which have quantitative targets, and non-Annex B parties, which do not. The targets are necessary to grant some value to carbon; without them there is no market for the products of a CDM-like mechanism. The two-track distinction is a prerequisite for a CDM-like structure where emission reductions in countries without quantitative targets can be traded to countries (or firms in countries) that do have such targets. This involves a particular interpretation of the mandate given in Bali under paragraphs 1(b)(i) and 1(b)(ii), which were deliberately left with a great deal of scope for further refinement in the run-up to COP 15 in 2009.

It is possible that such a mechanism could survive in a regime structure that involved linking of various regional/national cap-and-trade schemes, as opposed to a multilateral approach like the

¹²⁰ For a more in-depth discussion of the types of possible future market mechanisms that might be compatible with what types of regimes, see Cosbey et al. (2008).

CDM. But its functioning would be greatly complicated in such a setting, perhaps to the point where the necessary administrative burden would make it unfeasible. There would need to be a harmonization across various schemes of the methodologies for crediting projects in countries outside their jurisdictions, similar to that now used in the CDM setting. Moreover, in the context of deforestation the methodologies used would be entirely new, since no such methodologies would have been developed under the CDM (assuming no amendment of the Marrakesh Accords).

As for the implications for the CDM itself (on the fairly safe assumption that the CDM would survive into any post-2012 regime structure), the elements noted here seem to imply an evolution. In the case of afforestation, reforestation and avoided deforestation it would involve large amounts of credits for areas that are now disallowed or limited, though the basic question of whether REDD credits could count toward Annex I obligations is unsettled. In the areas of energy and transport it was noted that the most effective approach seemed to involve an evolution of the CDM from a project-based mechanism to one that also covers policies and programmes – a more “top-down” structure. In either case, the result would probably be a significantly greater number of certified emission reductions supplied at any given price. A projected emission of 40 gigatons from tropical deforestation over the first commitment period compares with estimated shortfalls from Annex I countries in meeting their commitments of some five gigatons over that same time.¹²¹ Even a moderately successful effort at avoided deforestation would have major market impacts under this scenario. And it was noted above that the IEA estimates energy efficiency policies (albeit in both developed and developing countries) have potential to reduce CO₂ emissions by over eight gigatons by 2030, or fully one fifth of IEA estimates for global annual emissions for that date under the baseline scenario.¹²²

If the level of demand is seriously out of synch with supply (for example, due to unambitious targets, highly effective domestic action or, more significant for this discussion, a flood of new sources of credits) the market will force prices to a level where quality small-scale CDM projects are unviable and the only credits available will be from large top-down programmes, or from large-scale, low-cost, end-of-pipe projects such as industrial hydrofluorocarbon and nitrous oxide (N₂O) capture. This would both tarnish the image of the CDM and thwart the objectives of the instrument. As such, a market analysis is probably necessary as a foundation for any final decisions on this regime option.

5.2. Sustainable development policies and measures (SD-PAMs) approach

The SD-PAMs approach is also featured as a possible element in all the discussions above. This approach would see developing countries supported financially, and in other ways, in their voluntary pledges to undertake development actions that would also reduce GHG emissions, as part of the fulfillment of the Bali mandate on the provision of financial resources and investment. Presumably this would cover areas such as avoided deforestation, clean energy, clean

¹²¹ Projected emissions from deforestation from Baumert et al. (2005). Estimate of compliance gap from UNDP (2006b).

¹²² IEA (2008b).

transportation and adaptation, all of which are covered to varying degrees in the other three pillars of the Bali Action Plan.

This approach as enunciated by its major proponents does not contribute to the market for compliance credits, the GHG reductions being additional to those to which Annex I parties are committed. It would of course assume, like the market mechanism approach discussed above, that there are parties that do not have quantified emissions reductions obligations, though whether any parties have such obligations does not affect its viability. That is, it is possible to imagine an SD-PAMs approach as a part of a regime that does not involve Kyoto-style targets for either developing or developed countries. There is enough flexibility in the Bali mandate to admit this sort of regime structure as a possibility, though this is hardly the most straightforward or widely shared interpretation.

If the post-2012 regime indeed looks this way, lacking quantified emission reduction targets for developed countries, then it would in effect amount to a channel for additional official development assistance, either bilateral or through existing intermediaries (GEF, World Bank). The overall effort could come either through a multilateral agreement or via bilateral and regional arrangements, and the challenge from a developing country perspective would be to found the system on a stable, predictable and adequate funding base.

If, on the other hand, the post-2012 international efforts to address climate change do involve quantified emission reduction targets for developed countries (as seems more likely), then the SD-PAMs approach might feature as a vehicle for developing countries to take on commitments of a sort under a post-2012 regime. If those commitments were “no lose”, as has been discussed to date, then this approach offers an appealing manner of fulfilling the Bali Action Plan objective of nationally appropriate mitigation actions from developing countries. One advantage of such an approach would be that it would retain the differential commitments that make the CDM a possibility. That is, the CDM would cover emission reductions that fall outside the scope of the SD-PAMs approach and would thus represent legitimate additional reductions available for trade in the carbon market.

5.3. Developing country targets

One of the options discussed for addressing deforestation is a regime that assigned quantified emission reduction targets to developing countries, but also allowed them to meet those targets by means of avoided deforestation (as well, obviously, as by means of policy measures in other sectors). This is along the lines of either the Brazilian or the Papua New Guinea/Costa Rica proposal, both of which however assume that developing countries will not have such targets under a post-2012 regime. It is possible that the Brazilian approach could countenance such targets for developing countries (either at the outset or through some form of graduation) without having them cover deforestation. But it seems highly unlikely that the international community would negotiate targets for developing countries and leave the matter of avoided deforestation (the largest single source of developing country emissions) out of those targets, to be addressed under a separate, incentive-based mechanism.

It is, of course, clear that any developing country targets regime could encompass efforts to make good policies in the area of energy and transportation as well. The focus here is on deforestation because it is the single largest developing country contributor to GHG emissions by some margin, and if developing countries are to take on targets — contrary to their current positions — it would likely be as a result of major incentives like the inclusion of avoided deforestation.¹²³

It is possible that under such a regime there would be a large quantity of forest-related AAU-like units available for trade. It was noted above that emissions from deforestation are significant relative to current Annex I shortfalls. Even moderate success in avoiding deforestation under such a scheme could conceivably produce a large quantity of tradable credits from developing countries that had exceeded their reduction obligations. Note, however, that relative to the CDM option this scenario loses some of its ability to distinguish the “hot air,” which is tainted in developed country public opinion, from simple purchases of AAUs, with possible implications for prices. Note also the caveat expressed above about the need to ensure that supply does not significantly outpace demand for compliance units.

¹²³ It was noted in the discussion on deforestation that this sort of incentive would not be uniformly attractive to all developing countries. In fact, depending on how it was elaborated, it might hold major attraction for only Brazil, Indonesia and China.

6. Conclusion

This paper has argued that there are potential synergies between developing country action on climate change and progress on nationally enunciated development objectives. Any multilateral approach to addressing climate change should take these synergies into account, and developed countries have a key role to play in supporting the enunciation and implementation of the necessary policies. The negotiations now ongoing in the lead-up to UNFCCC COP 15 are working to clarify the modalities for such support.

Developing countries have an important role to play in shaping the post-2012 climate regime so as to take advantage of those synergies. This paper has offered three examples of areas where developing countries have a strategic interest in seeing that any multilateral climate regime can help them simultaneously achieve development and climate change objectives: energy, transportation and avoided deforestation. There are, of course, other areas of synergy, but these are offered as particularly strong candidates.

The shape of any regime that can do this will of course have implications for the carbon market, and perhaps most significantly for the Kyoto Protocol's Clean Development Mechanism. Any strategic approach to achieving synergy also needs to consider how the shape of the post-2012 regime will affect the carbon market, and what that means for those developing countries that benefit from, or aspire to benefit from, the CDM's promise to deliver sustainable development, technology transfer and investment in host countries.

References

- AEP (undated). Ultra-supercritical generation. www.swepco.com/news/hempstead/ultrasuper.asp. Accessed 13 February 2007.
- African Union (2007). Decision on climate change and development in Africa. (DOC. ASSEMBLY/AU/12 (VIII)).
- Alcott B (2005). Jevons' paradox. *Ecological Economics*. 54: 9–21.
- ASEAN et al. (2007). *Cebu Declaration on East Asian Energy Security*.
- Bacon R and Mattar A (2005). The vulnerability of African countries to oil price shocks: major factors and policy options. The case of oil importing countries. *Energy Sector Management Assistance Program (ESMAP) Report*. 308 (05).
- Baer P (2007). *The Worth of an Ice Sheet: A Critique of the Treatment of Catastrophic Events by the Stern Review*. EcoEquity Discussion Paper.
- Barías J et al. (2005). *Getting on Track: Finding a Path for Transportation in the CDM*. Winnipeg, International Institute for Sustainable Development.
- Barnett T et al. (2005). Potential impacts of a warming climate on water availability in snow-dominated regions. *Nature*. 438: 303–309.
- Baumert K et al. (2005). *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy*. Washington, World Resources Institute.
- Boarini R et al. (2006). Alternative measures of well-being. OECD Social, Employment and Migration Working Papers No. 33. (DELSA/ELSA/WD/SEM(2006)2). Organization for Economic Cooperation and Development. Paris.
- Bradley R and Baumert K, eds. (2005). *Growing in the Greenhouse: Protecting the Climate by Putting Development First*. Washington, World Resources Institute.
- CDM Executive Board (2006). Guidance on the registration of project activities under a programme of activities as a single CDM project activity (Version 01). EB 28 Meeting Report, Annex 15.
- CERUPT (2004). Huitengxile Windfarm Project: project development document for a CDM project, registered as Project 0064, using methodology AM0005.
- Copeland B and Taylor S (1994). North-South trade and the environment. *Quarterly Journal of Economics*. 109(3): 755–87.
- Cosbey A (2008). Clean energy investment as technology transfer. *Joint Implementation Quarterly*. 14 (3).

- Cosbey A (2004). *A Capabilities Approach to Trade and Sustainable Development: Using Sen's Concept of Development to Re-Examine the Debates*. Winnipeg, International Institute for Sustainable Development.
- Cosbey A et al. (2008). Market mechanisms for sustainable development: in a post-2012 climate regime. In: Olsen K and Fenhann J, eds. *A Reformed CDM – Including New Mechanisms for Sustainable Development*. Copenhagen, UNEP Risø Centre.
- Cosbey A et al. (2006). *Making Development Work in the CDM (Report of phase II of the Development Dividend Project)*. Winnipeg, International Institute for Sustainable Development.
- Chevalier P et al. (2005). *Climate change impact on the water resources from the mountains in Peru*. Paper presented at the OECD Forum on Sustainable Development.
- Danish Ministry of Foreign Affairs (2005). *Danish Climate and Development Action Programme: A Toolkit for Climate Proofing Danish Development Cooperation*.
- Dasgupta S et al. (2007). The impact of sea level rise on developing countries: a comparative analysis. World Bank Policy Research Paper 4136. World Bank. Washington.
- Enkvist P-A et al. (2007). A cost curve for greenhouse gas reduction. *The McKinsey Quarterly*. 1.
- FAO (2005). *Global forest resources assessment: progress towards sustainable forest management*. FAO Forestry Paper 147. Food and Agriculture Organization of the United Nations. Rome.
- Fouracre P et al. (2003). Mass rapid transit systems for cities in the developing world. *Transport Review*. 23(3): 299–310.
- Frankel J and Rose A (2005). Is trade good or bad for the environment? Sorting out the causality. *Review of Economics and Statistics*. 87 (1).
- G5 (2008). G5 statement issued by Brazil, China, India, Mexico and South Africa. Hokkaido Toyako Summit. Sapporo. July 8.
- G8 (2008). G8 summit declaration on environment and climate change. Hokkaido Tokayo Summit. Sapporo. July 8.
- Green S (2006). Never-ending circles. *Power Engineering International*. March.
- Grütter Consulting (2006). BRT Bogotá, Colombia: Transmilenio Phase II – IV, CDM Project Design Document.
- Hadley Centre (2006). *Effects of Climate Change in Developing Countries*. London, Met Office.
- IEA (2008a). *World Energy Outlook 2008*. Paris, International Energy Agency.

- IEA (2008b). *In Support of the G8 Plan of Action: Energy Efficiency Policy Recommendations*. Paris, International Energy Agency.
- IEA (2008c). *Energy Technology Perspectives 2008*. Paris, International Energy Agency.
- IEA (2007). *Contribution of Renewables to Energy Security*. Paris, International Energy Agency.
- IEA (2006). *World Energy Outlook 2006*. Paris, International Energy Agency.
- IEA (2004). *World Energy Outlook 2004*. Paris, International Energy Agency.
- IISD (2004). *An Environmental Impact Assessment of China's WTO Accession: An Analysis of Six Sectors*. Winnipeg, International Institute for Sustainable Development.
- ILO (2004). *World Employment Report 2004-2005*. Geneva, International Labour Office.
- IMF (2008). *World Economic Outlook Update*. Washington, International Monetary Fund.
- International Scientific Steering Committee (2005). *Avoiding dangerous climate change: International Symposium on the Stabilization of Greenhouse Gas Concentrations*. Exeter. 1–3 February.
- IPCC (2007). *Climate change 2007: the physical science basis. Summary for policymakers. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. February 5.
- Kjorven O (2006). *Climate change and achieving the Millennium Development Goals. Presentation to the 2nd workshop of the Dialogue on Long-Term Cooperative Action to Address Climate Change by Enhancing Implementation of the Convention*. Nairobi. 15-16 November.
- Lemmen D et al., eds. (2008). *From Impacts to Adaptation: Canada in a Changing Climate 2007*. Ottawa, Government of Canada.
- Magrath J (2006). *Africa: Up in Smoke 2 (The Second Report on Africa and Global Warming from the Working Group on Climate Change and Development)*. London, New Economics Foundation.
- Major economies' leaders (2008). *Declaration of leaders meeting of major economies on energy security and climate change*. Tokyo, Hokkaido. July 9.
- Malhotra P and Rehman I (2004). *Fire without Smoke*. Delhi, The Energy Research Institute.
- McKinsey Global Institute (2008). *The Carbon Productivity Challenge: Curbing Climate Change and Sustaining Economic Growth*. McKinsey & Company.
- Michaelowa A and Michaelowa K (2005). *Climate or development: is ODA diverted from its original purpose? HWWI Research Paper 2*. Hamburg Institute of International Economics (HWWI). Hamburg.

Milanovic B (2005). Global income equalities. Presentation to the Council on Foreign Relations. New York. December 13.

Mollet J (2005). Presentation to the UNFCCC COP 11 and Kyoto Protocol COP/MOP 1 side event “Energy Efficiency Measures.” Montreal. December 3.

Nakicenovic N and Swart R, eds. (2000a). *Emission Scenarios. A Special Report of the Intergovernmental Panel on Climate Change*. Cambridge, Cambridge University Press.

Netherlands Environmental Assessment Agency (2007). China now no. 1 in CO₂ emissions; USA in second position.

www.mnp.nl/en/dossiers/Climatechange/moreinfo/Chinanowno1inCO2emissionsUSAinsecondposition.html. Accessed 15 October.

Neuhoff K (forthcoming). *International Support for Domestic Climate Policies: Policy Summary*. Cambridge, University of Cambridge Electricity Policy Research Group/Climate Strategies.

OECD (2005). *Bridge over Troubled Waters: Linking Climate Change and Development*. Paris, Organization for Economic Cooperation and Development.

OECD (1994). *The Environmental Effects of Trade*. Paris, Organization for Economic Cooperation and Development.

Pabst M (2007). Energy diversification: political buzzword or real goal? *Petroleum Africa Monthly Focus*. 38.

Papua New Guinea and Costa Rica (2005). Reducing emissions from deforestation in developing countries: approaches to stimulate action. Submitted to the UNFCCC with reference to item 6 of the provisional agenda of COP 11. 11 November.

Prescott-Allen, R (2001). *The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment*. Washington, Island Press.

Rai S (2005). *An Overview of Glaciers, Glacial Retreat and Subsequent Impacts in Nepal, India and China*. Kathmandu, WWF Nepal Program.

Sen A (1999). *Development as Freedom*. New York, Anchor Books

Shafik N and Banyopadhyay S (1992). *Economic growth and environmental quality: time series and cross-sectional evidence*. World Bank Working Paper 904. World Bank. Washington.

South African Government Department of Environmental Affairs and Tourism (2006). Ministerial indaba on climate action: chair’s summary. Kapama Lodge. 17–21 June.

Stavins R and Richards K (2005). *The Cost of US Forest-Based Carbon Sequestration*. Washington, Pew Center on Global Climate Change.

- Stern N (2006). *Stern Review on the Economics of Climate Change*. London, Her Majesty's Treasury.
- Sun G (2005). Global climate change and coal-fueled energy system: the case of IGCC-CCS in China. Presentation made to the Dialogue on Future International Actions to Address Global Climate Change. Oslo. April 22.
- The New York Times* (2007). The price of keeping cool in Asia; use of air-conditioning refrigerant is widening the hole in the ozone layer. February 23: C-1.
- Tiwari G (2003). Transport and land-use policies in Delhi. *Bulletin of the World Health Organization*. 81(6): 444–450.
- UNCTAD (2008a). *Trade and Development Report, 2008*. Geneva, United Nations Conference on Trade and Development.
- UNCTAD (2008b). *UNCTAD Handbook of Statistics 2008*. Geneva, United Nations Conference on Trade and Development.
- UNDP (2006a). *Human Development Report 2006: Beyond Scarcity: Power, Poverty and the Global Water Crisis*. New York, United Nations Development Programme.
- UNDP (2006b). *An Assessment of Progress with Establishing the Clean Development Mechanism*. New York, United Nations Development Programme.
- UNDP (2005). *Energizing the Millennium Development Goals: A Guide to Energy's Role in Reducing Poverty*. New York, United Nations Development Programme.
- United Nations (2002). *Report of the International Conference on Financing for Development*. A/CONF.198.11.
- United Nations General Assembly (2000). *United Nations Millennium Declaration*. Resolution 55/2. 8 September.
- UNFCCC (2006a). *Dialogue on Long-Term Cooperative Action to Address Climate Change by Enhancing Implementation of the Convention*. Decision 1/CP.11. March 30.
- UNFCCC (2006b). *Recommendations of the Expert Group on Technology Transfer for Enhancing the Implementation of the Framework for Meaningful and Effective Actions to Enhance the Implementation of Article 4, Paragraph 5, of the Convention: Note by the Chair of the Expert Group on Technology Transfer*. FCCC/SBSTA/2006/INF.4.
- UNFCCC (2006c). *Development and Transfer of Technologies: Draft Conclusions Proposed by the Co-Chairs*. Report of SBSTA 25, Annex II. FCCC/SBSTA/2006/11.
- UNFCCC (2006d). *Five-year Programme of Work of the Subsidiary Body for Scientific and Technological Advice on Impacts, Vulnerability and Adaptation to Climate Change*. Decision 2/CP.11. March 30.

- UNFCCC (1997). *Proposed Elements of a Protocol to the United Nations Framework Convention on Climate Change, Presented By Brazil in Response to the Berlin Mandate, Paper No. 1 of the Note by the Secretariat: Implementation of the Berlin Mandate: Additional Proposals from Parties, Addendum*. FCCC/AGBM/1997/MISC.1/Add.3.
- UNFCCC (1992). *United Nations Framework Convention on Climate Change*. FCCC/INFORMAL/84.
- UNFPA (2008). *State of World Population 2008*. New York, United Nations Population Fund.
- UNFPA (2004). *State of World Population 2004*. New York, United Nations Population Fund.
- van Geel P (2005). Energy for development in the real world. *IAEA Bulletin*. 47(1): 52–54.
- van Lieshout M et al. (2004). Climate change and malaria: analysis of the SRES climate and socio-economic scenarios. *Global Environmental Change*. 14: 87–99.
- Venetoulis J and Cobb C (2004). *The Genuine Progress Indicator 1950–2002 (2004 update)*. Oakland, Redefining Progress.
- Watson R et al., eds. (2000b). *Land Use, Land Use Change and Forestry: Special Report of the IPCC*. Cambridge, Cambridge University Press.
- Winkler H and Thorne S (2002). Baselines for suppressed demand: CDM projects' contribution to poverty alleviation. Paper presented to the Annual Conference of the Forum for Economics and Environment.
- World Bank (2007). *Global Economic Prospects 2007: Managing the Next Wave of Globalization*. Washington, World Bank.
- World Bank (2006a). *World Development Indicators*. Washington, World Bank.
- World Bank (2006b). *Energy Poverty Issues and G8 Actions: Discussion Paper*. Moscow-Washington, World Bank.
- World Bank (1997). *World Development Report*. Washington, World Bank.
- World Bank Group (2006). *Improving Lives: World Bank Group Progress on Renewable Energy and Energy Efficiency Fiscal Year 2006*. Washington, World Bank Group.
- World Summit on Sustainable Development (2002). *Plan of Implementation of the World Summit on Sustainable Development*. New York, United Nations Department of Economic and Social Affairs.
- Zhang L (2003). Economic diversification in the context of climate change. Background paper at the UNFCCC Workshop on Economic Diversification. Tehran. 18-19 October.



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