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The Bali Road Map

A First Step on the Difficult Journey to a Post-Kyoto Protocol Agreement

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The Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC) and the Parties to the Kyoto Protocol met in Bali in December 2007.¹ After some high-stakes poker about emission reduction frameworks and the role of emerging economies, participants settled on a road map for negotiating a new climate agreement by the end of 2009. The Bali meeting also managed to achieve progress on a number of important issues relating to the Adaptation Fund, avoidance of deforestation through REDD, technology transfer, and CDM. Conference side events showcased emerging business opportunities in global carbon markets and provided a forum for countries to share experiences with national policies that have been put in place to meet Kyoto Protocol targets. Bali no doubt advanced international climate negotiations one step further, but it also highlighted the great challenges facing negotiators in the coming 20 months.² This article takes stock of the current status of climate negotiations and discusses key issues likely to shape future talks.

Keywords: *climate change; Kyoto Protocol; Adaptation Fund; CDM; clean development mechanism; emissions trading; carbon market; Bali conference; UNFCCC; Bali road map*

Media attention to climate change had already reached unprecedented levels in 2006, and it did not let up in 2007. This was largely due to the publication of the 4th assessment report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) that warned of serious consequences if nothing is done to control the build-up of greenhouse gases (GHGs) in the Earth's atmosphere. The AR4 contains three comprehensive volumes and one synthesis summary report for policy makers, released just before the Bali conference in November.³ It has been 5 years since the IPCC published its AR3, and the 4th assessment is a very significant update of the international peer-reviewed research on climate change, both involving data analysis of past trends and modeling of future emission scenarios and global warming potential. The public visibility of the IPCC was increased a notch when, in November 2007, the panel was awarded the Nobel Peace Prize, together with former Vice President Al Gore. Gore had already won an Oscar earlier in the year for the film "An Inconvenient Truth," which documents his effort to call attention to the climate change problem.

However, the publication of the IPCC AR4 and the Nobel Prize award were only the culmination of a continuous momentum building toward wider recognition of climate change as a serious political issue. Severe weather events in recent years around the world have clearly caught the attention of the public and of policy makers in many countries. Climate change was on the top of the agenda of recent G8 meetings: in Heiligendamm, Germany, in 2007 and in British Gleneagles in 2005. In September 2007, the new United Nations General Secretary Ban Ki-Moon, who has made climate change one of the top priorities of the U.N. system, convened a high-level special session attended by 70 heads of states to build momentum toward a successful conclusion of the upcoming climate conference in Bali.

The following article will first analyze the negotiations on the politically most sensitive questions and then consider a number of other issues that are relevant for future climate talks, among them the Adaptation Fund, the decision on a work program on Reducing Emissions from Deforestation and Degradation, technology transfer, and the Clean Development Mechanism. The article will conclude with a discussion of topics that are likely to be at the center of the coming talks.

The Bali Roadmap

The objective in Bali was essentially procedural—that is, to agree on a road map for arriving at a new post-Kyoto regime by the time the annual climate conference meets for the 15th time in Copenhagen in December 2009. A new agreement, or a follow-up to the Kyoto Protocol, has to be in place by then to ensure that it can enter into force by the time the Kyoto Protocol ends in 2012. The adoption of the Bali Action Plan may not spell out the ambitious objectives many had hoped for, but it is significant that the United States has committed to a road map that stipulates dramatic long-term GHG emissions reductions. The agreement, however, became possible only after the European Union (EU) and major developing countries gave in to unyielding U.S. positions. But without U.S. consent, there would be no formal talks on a future comprehensive climate agreement.

Climate negotiations of recent years have been strongly influenced by U.S. opposition to any mandatory emissions reductions. The United States helped negotiate the Kyoto Protocol in 1997 and is a signatory of it, but in March 2001, the administration of George W. Bush announced that the United States would not take steps to ratify and implement the Kyoto targets to be met by 2012. The United States is the largest emitter of GHGs in absolute terms and has one of the highest per capita emissions and is at the same time the wealthiest and technologically most advanced country in the world. Emerging developing economies such as China and India have refused to start talking about measurable mitigation activities of their own as long as the United States does not honor the basic premise of the original Framework Convention. One key paragraph of the preamble states that developed countries who

have historically contributed most to the accumulation of GHGs in the Earth's atmosphere must take the first steps to reduce their emissions (UNFCCC, 1992).

The significance of the Bali outcome must be appreciated in light of domestic U.S. politics on climate change. The Bush administration has had a very contentious relationship with the scientific research community in the United States. The White House has actively thought to downplay research findings of its own researchers and government scientists, who have for years now called attention to the severity of climate change and for the U.S. government to join international commitments (Shulman, 2006; Union of Concerned Scientists, 2004). Congressional hearings are currently underway to determine the extent of White House interference in government reports on climate change and on the influence of the oil, coal, and car industries on White House decisions on energy and climate policy. The White House has also been at odds with some of its own cabinet members on the issue and recently with various state governments. The latest development that came after the conclusion of Bali was the decision by the Environmental Protection Agency to deny California and 16 other U.S. states the right to set their own car CO₂ emission standards ("E.P.A. Says," 2007). California—which also presented its climate action program in one of the side events in Bali—is playing a leading role in the United States and, in 2006, challenged the federal government by issuing its own CO₂ emission standards for cars.

The Bali road map, which was formally adopted as a decision by the Conference of the Parties (COP) to the Framework Convention on Climate Change (UNFCCC) (COP13) sets out the steps "to reach an agreement on long-term cooperative action up to and beyond 2012 to be adopted at its 15th session in Copenhagen in December 2009" and "recognizing that deep cuts in global emissions will be required to achieve the ultimate objective of the Convention" (UNFCCC, 2007a). Negotiations are to be conducted by a new "Ad Hoc Working Group on Long-term Cooperative Action" under the auspices of the UNFCCC.

The new working group will meet parallel to the "Ad Hoc Working Group on Further Commitments by Annex I Parties to the Kyoto Protocol," which had been set up 2 years ago by the first Meeting of the Parties (MOPs) to the Kyoto Protocol in Montreal. The Montreal conference (which included COP11) avoided an *éclat* by adopting a complex institutional setup in the form of a two-track approach that allowed Kyoto detractors like the United States to stay engaged in the process as well as Parties to the Kyoto Protocol to consider matters related to the Protocol, including further commitments for after 2012 (Earth Negotiations Bulletin [ENB], 2005; Shipper & Boyd, 2006). The United States launched its own separate talks, called the "Major Economies Meeting on Energy Security and Climate Change," which were designed to promote climate technology cooperation based on voluntary agreements. The last such meeting prior to Bali was held in Washington on September 28, 2007.

The two ad hoc groups will meet in addition to the two regular subsidiary bodies of the convention set up in 1992 to handle the convention's complex workload: the

Subsidiary Body on Implementation (SBI), the Subsidiary Body for Scientific and Technological Advice (SBSTA), and numerous informal working groups mandated with addressing specific issues.

The Bali Roadmap is significant because it launches a process that at least in theory could replace the Kyoto Protocol with an agreement involving all countries. But there is also a risk that some developed country parties to the Kyoto Protocol could use the new negotiating track to escape more ambitious commitments to be negotiated in the Kyoto Protocol ad hoc working group. There is a need to clarify the legal and institutional issues in the months to come.

The Bali Action Plan reiterates the common but differentiated responsibilities of countries, in light of their divergent social and economic conditions. It defines four pillars as the foundation for a new agreement: mitigation, adaptation, technology transfer, and financing. Mitigation relates to emission control and reduction. The adaptation pillar reflects the growing recognition that adaptation to climate change is becoming a necessity, and special attention will need to be given to developing countries that are least able to afford to do so, particularly low-lying and small island states. Large-scale and costly infrastructure investments are expected to become necessary to cope with many effects of climatic change. Dikes and coastlines will need to be bolstered against rising sea level and increased storm activities, and agricultural production systems will need to adjust to changing growing conditions, precipitation patterns, and water availability. The pillars technology and financing both relate to the divergent economic capacities of countries and link mitigation and adaptation activities by developing countries with commitments of developed countries to support them. Any future agreement will need to carefully balance commitments by developed and developing countries with very different socioeconomic and geophysical characteristics on all four of these pillars.

Down to the Wire

In light of the AR4 of the IPCC, most countries, particularly the EU, wanted to establish a clear framework for future talks, one that included a reference to tough emissions targets for wealthy countries to be met by 2020.⁴ The formal EU position had been adopted in March 2007 during a hard-fought EU summit of EU Heads of States. In reference to the 4th IPCC report, the EU Ministers concluded that an average global warming of more than 2°C must be avoided and that emission reduction targets need to follow from that premise. This would require that global GHG emissions plateau within 10 to 15 years and then be brought down dramatically by 2050. EU member countries jointly agreed to a 20% reduction of GHG emissions below 1990 levels by 2020 and also adopted targets for adopting renewable energy. They furthermore promised a 30% reduction if other large emitters joined with comparable reduction targets themselves.

The EU position may have set the upper limit for the targets discussion, but not all countries were satisfied with the ceiling of a 2°C temperature increase. The Alliance of

Small Island States (AOSIS) argued that a 2°C increase would threaten the very survival of their islands and the lifestyle and culture of 41 million people living on small islands and low-lying coastal states. The United States opposed any language suggesting a range of emission cuts to be considered. At the same time it pushed for strong language calling on developing countries to undertake mitigation efforts, a demand that was met with equally strong resistance from key developing countries. On the issue of targets, the United States was not alone. Canada, Japan, and Russia all stated reservations to the EU insistence on preliminary targets, although Japan changed its stance shortly after the Bali Conference concluded and announced that it will back numerical targets (Reuters, 2007a). Kyoto Protocol Parties did eventually agree to the framework targets defined by the IPCC AR4 in the ad hoc working group on further commitments.

The conference, however, opened on a positive note. Many considered findings of the IPCC AR4 to be so overwhelming that they would help bring even the most reluctant parties on board. Also contributing to an optimistic sense was the announcement by the newly elected Australian government that Australia would ratify the Kyoto Protocol. In November 2007, Labor Party Leader Kevin Rudd had pulled off a sweeping victory over incumbent conservative Prime Minister John Howard, a long-time vocal opponent of the Kyoto Protocol. Australia had been the only other major developed country besides the United States that has not ratified the Protocol.

But optimism soon gave way to a more pessimistic mood, which culminated in a contentious final plenary showdown between the main protagonists. Some issues had been resolved earlier, like the institutional setup of the adaptation fund, the work program on how to treat deforestation in a future round, and the language on technology transfer (see below). But when ministers arrived in Bali, the key stumbling blocks remained. The EU continued to insist on a reference to IPCC guidance on minimum reduction targets as an essential step for moving forward. "Logic requires that we listen to the science. I would expect others to follow that logic" said Stavros Dimas, the EU's environment commissioner.⁵ "We don't think it's prudent or reasonable to start off with some set of numbers. That's what the negotiations are going to be for," was the last public statement from the American delegation before the high-level ministerial segment started. After arriving in Bali, German Environment Minister Sigmar Gabriel, in one press briefing, said that he did not travel to Bali "just to decide that we would meet again next year." And Portugal, speaking on behalf of the EU, suggested that if no progress is made on this front, there was also no point for the EU to keep attending the "major economies" talks hosted by the United States.

Failure of the conference to reach any consensus had become a real possibility when U.N. Secretary General Ban Ki-moon opened the ministerial segment of the conference Wednesday morning of the second week. He issued a dire warning that the human race faces oblivion if it fails to confront global warming:

The situation is so desperately serious that any delay could push us past the tipping point, beyond which the ecological, financial and human costs would increase dramatically. We are at a crossroad, one path leads to a comprehensive climate change agreement, the other to oblivion. The choice is clear.

His concerns were echoed by the Indonesian President Susilo Bambang Yudhoyono and other dignitaries that followed him during the opening ceremony of the conference.

One of the informal highlights in Bali was a speech given by former Vice President and Nobel Prize winner Al Gore the day before the conference was to formally conclude. Gore held the United States “principally responsible for obstructing progress” in Bali but urged delegates to agree to an open-ended deal that can be enhanced after the Bush administration leaves office. Gore’s speech may have contributed to the ultimate willingness of the EU to drop its insistence on preliminary targets for a road map.

Negotiations in closed small-group sessions went into early Saturday morning. At 2:40 a.m., a deal between the EU and the United States was finally reached. The EU had dropped its insistence on having preliminary emission reduction targets written into the preamble in return for a footnote that refers to specific pages of the 4th IPCC assessment report where guidance on required emission reduction is spelled out. The critical paragraph now reads as follows:

Recognizing that deep cuts in global emissions will be required to achieve the ultimate objective of the Convention and emphasizing the urgency (1) to address climate change as indicated in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. . . .

The Footnote (1) refers to the “Contribution of Working Group III to the AR4 of the IPCC, Technical Summary, pages 39 and 90, and Chapter 13, page 776.” Chapter 13, page 776, referenced in the footnote contains the table reproduced below, which specifies emission-reduction targets for different stabilization scenarios.

After the agreement was announced on the UNFCCC Web page, most delegates arrived in the plenary Saturday morning ready to celebrate the compromise reached by the United States and the EU. However, a new twist unfolded. India—worried about a weakening of the developing country stance with little to show for in return—demanded a change to language that referred to the mitigation action to be considered by developing countries. The first paragraph that follows the preambular paragraph on which the United States and the EU had just reached agreement specifies considerations to guide the coming negotiations. The critical language is found in Article 1 that refers to developed countries in 1, b, i, and to developing countries in 1, b, ii. It now reads as follows:

Figure 1
GHG Concentration Levels and Related
Emissions Reduction Requirements According to the IPCC (2007b, p.776)

Box 13.7 The range of the difference between emissions in 1990 and emission allowances in 2020/2050 for various GHG concentration levels for Annex I and non-Annex I countries as a group^a

Scenario category	Region	2020	2050
A-450 ppm CO ₂ -eq ^b	Annex I	–25% to –40%	–80% to –95%
	Non-Annex I	Substantial deviation from baseline in Latin America, Middle East, East Asia and Centrally-Planned Asia	Substantial deviation from baseline in all regions
B-550 ppm CO ₂ -eq	Annex I	–10% to –30%	–40% to –90%
	Non-Annex I	Deviation from baseline in Latin America and Middle East, East Asia	Deviation from baseline in most regions, especially in Latin America and Middle East
C-650 ppm CO ₂ -eq	Annex I	0% to –25%	–30% to –80%
	Non-Annex I	Baseline	Deviation from baseline in Latin America and Middle East, East Asia

a The aggregate is based on multiple approaches to apportion emissions between regions (contraction and convergence, multistage, Triptych and intensity targets, among others). Each approach makes different assumptions, about the pathway, specific national efforts and other variables. Additional extreme cases – in which Annex I undertakes all reductions, or non-Annex I undertakes all reductions – are not included. The ranges presented here do not imply political feasibility, nor do the results reflect cost variances.

b Only the studies aiming at stabilization at 450 ppm CO₂-eq assume a (temporary) overshoot of about 50 ppm (See Den Elzen and Meinshausen, 2006).

[The Conference of the Parties] *Decides* to launch a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action . . . by addressing, inter alia:

- (a) . . .
- (b) Enhanced national/international action on mitigation of climate change, including, inter alia, consideration of:
 - (i) Measurable, reportable and verifiable nationally appropriate mitigation commitments or actions, including quantified emission limitation and reduction objectives, by all developed country Parties, while ensuring the comparability of efforts among them, taking into account differences in their national circumstances;
 - (ii) Nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner. (UNFCCC, 2007a, p. 2)

The problems emerged with Article 1(b)(ii). Originally, the beginning of the sentence had read “measurable, reportable and verifiable nationally appropriate mitigation actions by developing country Parties.” India, supported by China, demanded that the first part of this sentence should come at the end instead, effectively linking “measurable, reportable and verifiable” to “supported and enabled by technology, financing and capacity building.” The change in language is subtle but shifts the emphasis from mitigation actions to technology and financing without fundamentally changing the overall meaning of the paragraph.

The Indian demand led to adjournment of the plenary to allow for consultations. The dramatic highpoint came in the midafternoon of Saturday, when the plenary reconvened for final consideration of the Indian proposal that now had the sponsorship of China and the G77. The U.N. General Secretary Ban Kim-moon and the Indonesian President Bambang Yudhoyono had returned to Bali to plead with delegates to find a consensus. A succession of speeches from developing countries supported the proposal. Portugal, on behalf of the EU, also accepted the new language. But the United States, the last speaker, opposed the new formulation. The conference erupted in boos, an unprecedented occurrence at such otherwise staid diplomatic events, and a sign of the highly charged atmosphere.

But the last word had not been spoken. Pressure on the U.S. delegation was now obviously intense. What followed was another series of short interventions by several countries who implored the United States to reconsider. South Africa pointed out that developing countries in response to the U.S. insistence had voluntarily moved to accept new obligations for their national actions on climate change that only a year ago “would have been unthinkable.” The delegate from Papua New Guinea, Kevin Conrad, perhaps most succinctly captured the sentiment of the conference when he pleaded that “the world is waiting for the U.S. to lead but if for some reason you are not willing to lead, leave it to the rest of us. Please, get out of the way.” The head of the U.S. delegation Under Secretary of State Paula Dobriansky—who was said to have been in regular contact with the White House—took the floor again, expressed her appreciation for what had been said, and reiterated the U.S. desire to “go forward as part of a new framework.” She said she was encouraged by the “firm commitments that in fact have been expressed by the developing countries, especially those major emerging economies” before she concluded “we will go forward and join consensus.” Now her intervention was greeted by relieved lengthy applause, when it sunk in that a deal had been reached.

The differences in language on the two issues that in the end held up the conference for an additional day are not huge, and the concrete implication of having had one or the other version finally adopted is far from clear to this observer. However, the two sticking points exemplify not only the frazzled nerves of delegates at the conference but perhaps also the insecurity of negotiators to firmly grasp the implications of ceding on seemingly minor points, given the complex road ahead. The importance of this battle between the United States and the EU and the United States and developing countries undoubtedly is symbolic; both sides, however, can report some gains.

Participation of developing countries in a future agreement will continue to be a major issue in the follow-up process and, in the end, more significant than the question of reduction targets for developed countries. A familiar exchange of arguments took place repeatedly between the United States and developing countries in official and side events. The U.S. insistence that these large and rapidly growing countries must do more to reduce their GHGs was repeatedly and firmly met with the rebuke

that per capita emissions in the United States are many times higher than in both China and India and that both these countries have passed more strict renewable energy targets and fuel efficiency standards than the United States.

Bali may come to be seen as a watershed when the United States began to rejoin the world community in a comprehensive climate agreement, after 7 years of stand-off. But the difficulties on the road to a comprehensive agreement can be seen in the fact that the public posturing of the negotiating partners resumed the moment the conference ended. The White House issued a press release minutes after the Bali conference ended voicing its “serious concerns” with some aspects of the Bali outcome and contending that developing countries have to take on more responsibility. A senior EU official retorted that the criticism was “extraordinary” given that the U.S. delegation had been in touch with the White House throughout the final stages of the talks (Reuters, 2007c). China’s climate change ambassador, Yu Qingtai, in a press conference, replied that given the United States’ contribution to total emissions, its per capita emissions, and the fact that it has both advanced technology and ample funds, “America should display a more positive, more constructive role” in the talks ahead.

Additional Decisions Taken

The Bali conference was not all about high politics. The meeting produced a number of important decisions on issues that eventually will be critical for the proper functioning of any future binding agreement. These decisions relate to (a) the operation of the adaptation fund, (b) how to include avoidance of deforestation in a future agreement, (c) technology transfer, and (d) the Clean Development Mechanism (CDM), among other issues. Discussions on these issues are summarized in the following pages, including a look at the outlook for emissions trading, which dominated some of the side events.

The Adaptation Fund

The issue of adapting to climate change was not high on the agenda when countries agreed on the Framework Convention in 1992, nor during the Kyoto Protocol negotiations in 1997. But in the past few years, as evidence has been mounting that the world is already warming, developing countries have intensified demands that assistance for adaptation be an integral part of any future climate agreement. The contribution to global GHG emissions of many of the poorest developing countries has been and continues to be marginal, but these are among the countries most affected by climate change. The decision to establish an adaptation fund was taken by COP7 in Marrakesh in 2001, but the fund could become operational only with the enforcement of the Kyoto Protocol in 2005 and pending resolution of governance issues. The Adaptation Fund will assist particularly least developed countries. What is unique about this fund is that it is not funded by

contributions from donor countries but through a 2% levy charged on transactions under the CDM (see below).

The Bali conference succeeded in finalizing the modalities for managing the fund, which enables it to become operational now. This is generally considered the major concrete achievement. The main issues to be resolved related to governance of the fund and the respective influence of developed and developing countries on its operation. The issue has grown in importance, as the funds available to the Adaptation Fund will swell in relation to the value of the CDM portfolio and could reach up to \$300 million by 2012.

Most traditional donor countries wanted to see the fund administered by the Global Environment Facility (GEF).⁶ Developing countries, however, have long been less than enthusiastic about the GEF because of its complex and cumbersome project cycle and the recent adoption of a controversial resource allocation framework (Cléménçon, 2006). Because funding for the Adaptation Fund comes from a levy on mitigation activities in developing countries, developing countries demanded that it be set up as a separate entity with its own executive board (EB) made up mostly of developing countries.

Specific concerns were with some of the eligibility criteria of the GEF. The first relates to incremental cost financing, the stipulation that the GEF can only fund those costs that result from turning a traditional development project into one that realizes global environmental benefits. A related criteria is that GEF funds must leverage cofinancing from other sources. Least developing countries in particular objected to the possibility that these GEF criteria could be applied to the Adaptation Fund, which could dramatically reduce their ability to access its funds. Some of the eligibility questions were resolved a year ago in Nairobi, when COP12 adopted a decision that funding shall be on a full adaptation cost basis and that the decision-making body should have a majority of developing country participants. The details, however, were left to be worked out in Bali (ENB, 2006; Sterk, Ott, Watanabe, & Wittneben, 2007).

Developing countries in the end accepted an interim role of the GEF to provide secretariat services in an "independent and effective manner," but developed countries conceded the fund's operational independence by agreeing that the Fund should be governed by its own board and have its own secretariat. The significant breakthrough in Bali related to the composition of the 16-member board, which now will be elected from the five U.N. regions and in addition include one representative from Small Island States and one from the Least Developed Countries. Two of the remaining four seats go to two more developing countries (Non-Annex 1 countries under the Convention) and two more seats to developed countries (Annex 1 Parties under the Convention). The modalities are unique in the international arena, with developing countries firmly in control of this fund. Agreement on the governance modalities of the Adaptation Fund is an important accomplishment, although the Adaptation Fund alone will not be able to cover the large financial needs of developing countries measured related to future adaption.

REDD: Reducing Emissions From Deforestation and Degradation

The Bali conference also took an important decision to advance work on how to deal with deforestation in a future agreement (i.e., how to credit countries for avoidance of deforestation). At the Montreal conference (COP11), Papua New Guinea and Costa Rica had called for innovative approaches in this area, including making forest conservation activities eligible under the CDM. A Brazilian proposal submitted a year later called for direct payments for reducing deforestation from an international fund. The COP in Bali decided on a work program called "Reducing Emissions From Deforestation and Degradation (REDD)," which will involve work on methodological issues related to a range of policy approaches and positive incentives that aim to reduce emissions from deforestation and forest degradation in developing countries (UNFCCC, 2007c). The objective is to come up with recommendations on methodologies that could result in REDD projects becoming eligible for funding by the CDM (see following section). Reforestation projects are already eligible, but only a few have been validated so far.

Deforestation presently may account for roughly 20% of anthropogenic emissions worldwide, and if deforestation is included in countries' national emission inventories, Indonesia and Brazil end up among the top GHG emitters. Ecoservice compensation for carbon sequestration could be a powerful incentive to reduce deforestation rates in regions now particularly vulnerable to deforestation from illegal logging or slash and burn subsistence farming practices. In theory, such compensatory financing could provide some of the most effective and cheapest emission reduction measures (see Stern, 2006). In one of the Bali conference side events, the Woods Hole Research Center presented results from research that indicated that forest maintenance could achieve carbon sequestration at the cost of only \$1.2 to \$3 per ton, while leading to a doubling of the income of people living in the forest and avoiding \$10 to 80 million per year in fire-related damages (Woods Hole Research Center, 2007). REDD has the potential to shift the balance of underlying economic market forces that currently favor deforestation.

Methodological problems abound, however.⁷ Establishing a baseline against which to measure avoided deforestation and degradation is the first issue to be addressed. Other issues in need of resolution include how local governments or private landholders can ensure that forest carbon savings are permanent. Private businesses interested in emission certificates from REDD point to the serious governance problems in countries with the highest REDD potential. Investing in REDD therefore would entail significant risks, which few currently are willing to take. "Leakage" is a problem that concerns the overall additionality of REDD activities. Conservation activities in one region may simply lead to accelerated deforestation in another region.

Some forest-rich countries that have low deforestation rates have expressed concern that they will be left out of the process because their forests are not under immediate threat. The need to develop historic deforestation rate baselines may give

perverse incentives to countries that have been chopping down their forests, while it punishes those countries that have been good stewards of the land. Additional issues relate to stakeholder rights. Nongovernmental organizations (NGOs) and community groups fear that REDD could trigger a land rush by industrial agriculture giants and forestry firms, which could lead to widespread problems for local communities and small-scale forest holders who could lose access to their forests. They will be hard pressed to establish and register land rights because the necessary legal process is costly. Close attention needs to be paid to these issues before REDD can produce verifiable real Carbon Emission Reductions (CERs).

Some also worry about the impact that CERs from REDD projects could have on global carbon markets if the huge potential of REDD programs is realized on a large scale. REDD CERs could depress carbon prices and thereby reduce the incentive of businesses and industries in developed countries to invest in home-grown emissions reduction activities (Karaousaksi & Corfee-Morlot, 2007).

Despite all these potential problems, REDD is moving forward with real money behind it. In Bali, the World Bank announced the launching of the \$250 million Forest Carbon Partnership Facility, which its Board had approved in September 2007.⁸ So far, nine industrialized country governments have announced plans to put US\$165 million toward the newly created facility, which will help 20 developing countries assess the carbon value of their forests and offer carbon offset credits to preserve forests. In Bali, Norway committed itself to spending more than \$500 million a year to preserve the world's endangered rainforests. Bali side events also demonstrated that many voluntary REDD initiatives are being developed, so far mostly by governments trying to identify REDD projects in their territories.

Technological advances may help resolve some of the measurement problems for determining baselines and for monitoring changes in forest density. Several side events in Bali showcased impressive recent advances in remote sensing techniques that can help monitor land use change and can be used to estimate the carbon content of forests.⁹

The prospect that avoidance of further deforestation could have an economic value in a future global carbon market has helped motivate local governments in key countries to intensify efforts against illegal logging and deforestation. Until about 2002, the Government of Amazonas State distributed free chainsaws to its population as a strategy to promote development. A new conservation law has led to a number of important changes and triggered innovative pilot programs such as "Bolsa Floresta," which rewards traditional and indigenous populations for committing to stopping deforestation (Government of the State of Amazonas, 2007). The governors from the Indonesian provinces of Aceh, Papua, and West Papua have issued a moratorium on logging until the carbon values of their forest lands is assessed.

Technology Transfer

An issue that regularly surfaces in all international negotiations is that of technology transfer and capacity building and how to encourage such transfer to developing countries. In the UNFCCC framework, this issue has, over the years, been deliberated in an Expert Group on Technology Transfer (EGTT). At the core of negotiations is how the transfer of clean technologies from developed to developing countries through financial and other measures can be advanced in support of mitigation and adaptation activities and what the responsibility of developed countries in this should be.

Discussions on technology transfer in Bali revolved around basically three issues: institutional arrangements, performance indicators, and financing. Disagreement existed first on the mandate of the EGTT. Developing countries wished to turn this group into a more formal Convention working group to elevate technology transfer—one of the four pillars of a future agreement—to a level closer in importance to mitigation. Related to this effort is the attempt to establish performance indicators for measuring and reporting on technology transfer activities. On financing for technology transfer, developing countries wanted a new funding mechanism directly under the Convention.

The agreement reached in Bali on this issue was predictable. Instead of establishing a new more formal working group, the EGTT will be given an additional 5-year mandate, but one of the new tasks of the group will be to develop performance indicators to measure progress on clean technology transfer. The call for a new technology fund was met with firm resistance by developed countries and the final decision calls for the development of a “strategic” program under the GEF instead, as well as for training programs and workshops on technologies for mitigation and adaptation, which will be implemented by the UNFCCC secretariat.

No fundamental breakthroughs can be accomplished on this topic. There is little that governments can do to force the private sector to share technologies with developing country counterparts, even if they wanted to, and the protection of intellectual property rights is a key concern of developed countries. But the technology transfer fault line no longer runs just between the developing and developed countries. Rapidly growing economies like those in China, India, and Brazil have all reached the space age in terms of technology. Even though these countries have not fully caught up with the leading industries in the North, their interests with respect to protecting technological innovation in their industries is getting more aligned with those of developed countries. They are already competitive in the energy technology sector, be it in biofuel, wind, or solar photovoltaic technology.

Developed countries also like to point out the domestic measures that developing countries can take on their own to promote and disseminate the clean technologies to which they already have access. This relates to domestic promotion of research and development through the use of policy instruments, such as guaranteeing the

protection of intellectual property rights, differential taxation, direct payments and subsidies, and the reduction of barriers to the market penetration of available technology through measures like education and technical training. Roll-back of perverse subsidies in the energy sector, which are still widespread in most countries, is another important tool to increase the attractiveness of environmental technologies.

The CDM¹⁰

Negotiations on a future climate agreement will be greatly influenced by the experience with the so-called flexibility instruments called for under the Kyoto Protocol, which are based on the idea that emissions reductions should be pursued at the lowest possible cost. In other words, money to reduce emissions should be spent where it has the greatest effect in terms of the amount of carbon reduced or avoided. Because CO₂ is harmless in a local context, it does not matter where on the planet emissions are being reduced.

The Kyoto Protocol allows for the use of three distinct flexibility mechanisms: emissions trading, joint implementation, and the CDM. Emissions trading can take place between countries that have committed to emissions reduction under the Kyoto Protocol or among entities that are regulated under the Protocol. It has the potential of turning into a global market worth several \$100 billion. Joint implementation can take place between developed countries and economies in transition—Eastern European countries and Russia—and involves financing emissions reductions in these countries in return for emission credits that accrue to the financial donor.¹¹

Of most interest to developing countries is the CDM, which allows for financial transfers in return for emissions credits between countries that have accepted reduction targets and developing countries that have not committed to any emission control or reduction measures. The CDM was included in the Kyoto Protocol after an initiative by Brazil that an incentive needs to be created to allow for financing of reduction measures in developing countries to get things started. An argument against the CDM originally was that it created a loophole that undermined the commitments made by developed countries, because it allowed them to acquire Certified Emissions Credits from countries that have not committed to any caps, which results in “leakage.” The argument for the CDM was that it generates funding to immediately engage developing countries in mitigation activities that will help build the necessary capacity in these countries to address climate change mitigation. A key requirement of CDM projects is to prove that they are additional to business as usual.

The Bali conference took place after a year of explosive growth of CDM activities, and the annual report by the CDM Executive Board (EB) to the Conference of Parties highlights the rapid progress and some of the growing pains this mechanism is going through (UNFCCC, 2007b). Of the projects, 819 are currently already registered, but the CDM project pipeline is expected to grow to more than 2,600 project

activities by the end of the first commitment period of the Kyoto Protocol in 2012. The newly launched *CDM Bazaar* provides an excellent first stop for information and news on CDM for buyers and sellers (<http://www.cdmbazaar.net>).

The EB estimates that \$7 billion will be invested in CDM projects registered during 2006, and the investment volume for projects that entered the pipeline in 2007 may reach \$25 billion. This compares to total investments leveraged through the GEF of about \$1 billion annually in the climate change area since its start in 1994. CDM investments into renewable energy and energy efficiency projects, furthermore, were roughly triple the official development assistance support for energy policy and renewable energy projects in the same countries during 2006 (UNFCCC, 2007b, p. 4).

The Bali COP adopted a decision that called on the Board to strengthen its executive and supervisory role, to simplify operational aspects, to broaden the application of project methodologies, and to develop and consolidate additional methodologies for emissions baseline setting and monitoring. A decision on whether CO₂ capture and storage (CCS) should be eligible for CDM financing was deferred to the next meeting pending results from a workshop to be convened in 2008. CCS technology holds out the promise of allowing exploitation of coal resources for energy production without the emissions. But it is still expensive compared to other mitigation options, and long-term underground storage cannot be guaranteed. But CCS is certain to play an increasingly important role in future negotiations because of the large coal reserves around the world that will fuel economic growth in many countries for decades to come.

CDM projects represent a wide range of project types. So far, 15 sectoral scopes and many methodologies for specific project types have been developed (UNFCCC/CDM, 2007). Developing CDM projects requires meeting many eligibility criteria, and the project cycle involves three basic steps: The first is identification of project ideas and calculation of baselines and certifiable emissions reduction potential, the second is validation of project proposals as viable, and the third is certification of realized emissions reductions as real and permanent following completion of project implementation. The determination of project baselines and emissions reduction potential based on a business-as-usual scenario are critical tasks for every project developer. In the initial phase, the EB has rejected many CDM proposals and requested further documentation. One criticism has been that developing CDM projects in a way that real and permanent emissions reduction can be proven is an expensive investment that few poor developing countries can afford.

During several side event discussions, businesses with stakes in the CDM voiced criticism that the EB was not up to the task of validating CDM projects quickly enough. Firms like the U.K.-based EcoSecurities maintain that the slow pace of moving projects through EB approval is negatively affecting their interest in the CDM and may undermine the potential of the CDM, as may the uncertainty of what will become of the CDM after 2012 (EcoSecurities, 2007a, 2007b). An increasing number of private companies are building portfolios of CDM projects with the objective of banking

resulting in CERs for future use in a global carbon market. By bundling CDM projects, they spread investment risks, as some projects in the end will not receive certification. These companies so far show little interest in REDD because of the inherent problems with producing real and permanent CERs in the forestry sector.

Many private businesses advocate full outsourcing of validation and certification to the private sector to make the operation more efficient and to allow it to handle a growing volume. The EB does rely on Designated Operational Entities to validate and certify CDM projects. However, the Board still maintains responsibility for final approval. One problem with relaxing the oversight function of the Board involves avoiding conflicts of interest between project implementers and firms serving as project validators and certifiers. In the past, there have been a number of problems with the environmental integrity of CDM projects, which the EB says have been addressed but others say persist.

One way to deal with such uncertainties is to build a large safety margin into projects by granting emission reduction credits only for parts of the expected emission reductions. Some point out that leakage from CDM projects is a negligible problem compared to the large inaccuracies with national emission inventories, which still do not follow uniform mandatory standards and are not subject to formal international review.

A political issue besetting the CDM is the very uneven regional distribution of CDM projects, with China registering the bulk of projects and Africa having access to very few. This led to the adoption, at the COP12 in Nairobi, of a decision to consider initiatives to support identifying and developing CDM projects in countries that so far have not benefited from such investments, particularly African countries and small island states. Relevant U.N. organizations together with the World Bank Group have developed activities to help especially sub-Saharan Africa to improve its level of participation in the CDM. But it is clear that some countries provide much larger and more cost-effective opportunities for CDM projects than do others, and this is not likely to change considerably in the near future. A new emphasis on avoidance of deforestation could change this.

The CDM is widely expected to remain a key instrument for promoting financial transfer to developing countries for carbon mitigation efforts in return for emissions credits accruing to developed countries, at least in the medium term. The initial success has demonstrated that there is a lot of interest in this innovative mechanism. However, a range of concerns with CDM linger, chief among them ensuring that reductions for which CERs are issued are really additional to what otherwise would have happened. Many NGOs remain very critical about the CDM. The organization International Rivers (Haya, 2007), for example, charges that close to a quarter of all CDM projects involve hydropower and that the vast majority of these would have been built without promising investors carbon credits.

A related criticism is that the CDM allows developed country investors to accumulate carbon reduction credits cheaply by “picking the low hanging fruits” in developing countries and selling emission credits for big profits. CDM activities

today are clearly driven by project-related business interests and not by the convention objective of real global emissions reductions. The climate conference will have to carefully look at the role that the CDM should play in the period after Kyoto. The CDM is a Kyoto Protocol mechanism but will have to be carried over in some form into a future regime to make use of the growing institutional and personal capacity that is being created. How this will happen is an open question.

Emissions Trading

Many side events in Bali were devoted to emissions trading and carbon markets. These drew much interest from both governments and private-sector participants. The EU Emissions Trading System (ETS) is by far the largest and most comprehensive scheme today, but carbon markets are emerging in the Northeastern United States, Japan, and Norway, and they are being considered elsewhere (Reinaud & Philibert, 2007). The EU ETS covers more than 11,000 industries and utilities in EU member countries, and the carbon market was worth \$30 billion in 2006.

How large a role emissions trading can play in helping to promote stabilization of GHG concentration in the atmosphere in the 450 to 550 ppm range is far from clear. Although emissions trading works well among large businesses and industries, it may not be the most effective instrument for addressing emissions from smaller businesses and industries and is difficult to apply to the transportation and household sectors. Interest of individual firms in trading emission certificates may not be as high as expected, even if this would be economically beneficial to them. The *Economist* (August 2, 2007) looked at recent surveys of European firms involved in the ETS and concluded that companies have, for a variety of reasons, not yet taken full advantage of trading opportunities. Uncertainty about the price development is one problem (World Bank, 2007). A sudden glut of unused emissions allocations at the beginning of 2007 made carbon prices drop dramatically. If CERs can be bought too cheaply, there is no incentive for firms to pursue emission reductions on their own.

Several speakers at side events in Bali—notably government representatives from Europe and Japan—pointed out that emissions trading is not a panacea and can complement but not replace other policy instruments like energy taxes. Countries that have come furthest in improving energy efficiency and reducing CO₂ emissions have in fact done so with little or no emissions trading. This holds true for Germany, the United Kingdom, Japan, and several smaller European countries. These countries have relied largely on a mix of stringent emissions or performance standards and a range of targeted taxes and charges. They are likely to keep relying on these instruments, which—if they work well—may reduce the need for companies to buy carbon offsets on the international market.

It is somewhat ironic that the EU is first to implement an emissions trading scheme, as it had first strongly opposed the idea, whereas the United States insisted on its inclusion in the Kyoto Protocol.

The Challenge Ahead

A bottom-up look at the myriad opportunities for reducing emissions—many of them showcased during side events in Bali—would make one hopeful about prospects for achieving emissions reduction by the amount suggested by the IPCC (compare Figure 1). But a top-down analysis of global emission trends provides less ground for optimism. Many countries committed to meeting Kyoto targets have problems doing so under current policies. Other countries, among them the world's two largest polluters—the United States and China—have yet to accept emission control targets, and their emissions continue to grow.

In its report on emission trends in developed countries based on national communications, the UNFCCC secretariat projected total emissions of Annex I Parties under “with measures scenario” to be 4.2% higher in 2010 than in 1990, not taking into account land-use change and forestry (UNFCCC, 2007c). This increase results from projected growth in emissions from the energy sector, particularly the transport sub-sector. The transport sector is the fastest growing contributor to global CO₂ emissions, and its share of CO₂ emissions is increasing in all regions of the world. Transport sector emissions grew by 31% worldwide between 1990 and 2003 and even by 26% in advanced developed countries with mature transportation systems. Transport emissions from these countries accounted for 71% of worldwide CO₂ emissions from transport (European Conference of Ministers of Transport [ECMT], 2007).

During side event presentations, several EU member countries discussed the national challenges they face in trying to meet their Kyoto Protocol targets.¹² The pre-2004 EU members (EU-15) have committed to reducing GHG emissions to 8% below 1990 levels by 2008-2012. A report by the European Environment Agency (EEA, 2007) projects that existing domestic policies and measures will reduce EU-15 GHG emissions only by 4% below base-year 1990 levels. The projections, however, are that additional domestic policies and measures planned but not yet implemented should allow the EU to reduce emissions by an additional 3.9%. If emissions trading is taken into account, overall reductions could reach 11.4% below 1990 levels, exceeding the Kyoto target. It remains to be seen whether this optimistic projection plays out. Some countries, such as Germany and the United Kingdom, are able to meet at least one third of their ambitious targets because their economies have become less coal dependent as a result of structural change that has little to do with policy design. This suggests that the road to much deeper reductions will be difficult.

Most government experts attribute the failure to reach Kyoto targets with the originally planned measures not to the failure of policies to have an effect but rather to an unanticipated increase in demand for energy-consuming activities. Transportation is proving to be a particularly intractable issue even in countries with well-developed public transportation systems. The increase in mobility as measured in kilometers

traveled per person and year, and the trend toward more powerful engines and larger cars are offsetting many effects of specific policies (ECMT, 2007). Countries also still have a long way to go to reduce emissions from households. The energy savings potential in households is large and still far from exploited. The IPCC AR4 discusses the mitigation potential for the seven key sectors: energy supply, transport, buildings, industry, agriculture, forestry/forests, and waste in great detail (IPCC, 2007b).

The Future Climate Regime

What should a future climate regime look like? While government negotiations in Bali were concerned with preventing outright failure and taking at least an incremental step forward, a slew of side events focused on what types of agreement would have the most chance of success and what design elements could help encourage all major polluters to come on board.¹³ It is clear that there is no silver bullet for resolving a collective action problem in the absence of a supranational entity that can regulate and enforce emission caps against the opposition of even only a few countries.

The Kyoto Protocol obviously has major flaws. The major polluter among the developed countries, the United States, stepped away from it; developing countries, particularly those with rapidly growing emissions, are not included; and countries like Canada and Russia in the end were given exceptionally attractive terms so they would ratify the Protocol. The criticism often leveled at the Kyoto Protocol, however, misses the point that this agreement provides not only the essential legal backing that European countries and Japan needed to push through significant energy and climate policies at home but has also had a significant normative influence on the public in many other countries, notably the United States. It is difficult to imagine that the types of voluntary city- and state-level initiatives that have sprung up in recent years in the United States would have occurred without the normative legitimation provided by this international agreement. But how closely a follow-up agreement should be modeled after the Kyoto Protocol architecture remains an open question. There are many possible starting points for future international cooperation on climate change, which relate to perhaps three basic approaches: global emission targets and time tables, sector performance objectives, and policy instrument coordination. These are briefly discussed below.

The UNFCCC/Kyoto process is entirely state centered. Emission targets are negotiated for countries, and equity and fairness considerations are measured against aggregated socioeconomic indicators. Global reduction targets and subsequent national emission targets have a compelling simplicity to them, but they are difficult to negotiate. Experience with other environmental agreements shows that countries' willingness to subscribe to mandatory commitments depends to a large extent on what a particular country believes it can easily achieve and much less on the push from above. International negotiations can, on the other hand, delay national-level efforts, because they provide incentives for states to postpone stringent mitigation

efforts if they believe this may help them secure a comparatively better deal down the road. This suggests that what is needed is a two-pronged approach that nudges countries along to the point where they feel that they are able to make commitments and then negotiate global targets. We may be in the “nudging-along” phase, and Bali may signal the transition to the second stage of setting global targets.

A target and time table approach for the post-Kyoto period would require finding a formula to calculate what the Bali Action Plan considers comparable and appropriate quantified emission limitation and reduction objectives by both developed and developing country parties. Various proposals suggest grouping countries into more than just the developed and developing country category or calculating emission targets for every country using various indicators, including historic and future emissions, per capita emissions, economic and technological capacity, and the degree of vulnerability to climate change. Japan plans to present a proposal to group China and India (among others) into a separate third group, next to the traditional developed and developing country groups (Reuters, 2007b). Japan is apparently also ready to announce a 5-year, \$10 billion “finance mechanism” to help these countries tackle global warming with low-interest loans. Some European leaders, including German Chancellor Angela Merkel, who helped negotiate the Kyoto Protocol as Germany’s environment minister, have moved closer to developing country positions and have suggested that developed and developing countries’ per capita emissions should eventually converge (Reuters, 2007c). Negotiations on future targets and timetables are likely to consider all these ideas.

Some advocate negotiating a climate regime that maintains a high degree of flexibility by replacing mandatory emission targets with other types of national commitments that could involve carbon intensity, technology cooperation, efficiency standards, renewable energy targets, measures to reduce deforestation, sectoral performance agreements, or emission standards.¹⁴ It is not clear how the comparability of such different commitments can be measured unless emission trends are used as indicators. There is a danger that moving away from attempts to negotiate hard emission targets at least as a global ceiling will not result in adequate emissions reductions in the case of some countries and undermine the willingness of more ambitious countries to move ahead.

A third emphasis could involve coordination of policy approaches, for example, of energy tax levels. Tax rates can be adjusted easily, can be designed to be fair and predictable, and can be set to achieve economic incentive effects as well as generate revenues that can be used to reinforce public policy objectives.¹⁵ But taxes are of course also politically radioactive. This may change, though, if the general public can be made to understand that many of the policy alternatives that are now pursued are less effective, less transparent, and more administratively costly than taxing environmentally damaging activities and using the revenue to subsidize environmentally beneficial activities.

A viable future climate regime might focus on promoting the widespread phase-in of progressive carbon taxes, while giving countries leeway concerning tax rates and use of tax revenues. A small percentage of national tax revenues—as well as a

carbon tax on international aviation and bunker fuels—could be channeled into both adaptation and mitigation activities in developing countries. Existing mechanisms and private-sector enterprises now active could serve as the implementing entities for identifying and developing adaptation and mitigation projects.

However, serious talks on carbon taxes must involve the World Trade Organization (WTO). Past experience shows that one of the strongest impediments for countries to adopt taxes is their concern for international competitiveness. All countries that have adopted environmentally motivated carbon taxes have done so at relatively low levels, and they have largely exempted their most energy-intensive export-oriented industries (EEA, 2006; Organization for Co-operation and Economic Development [OECD], 2001). A carbon tax proposal by the European Commission never made it past the design stage. Trade rules do not allow countries to tax products based on their carbon content, which would be the only way to protect domestic industries with high emission standards from foreign competitors with lower standards.

In 2004, approximately 1,109 million tons of CO₂ were emitted by China as a result of net exports (exports minus imports), which accounted for an estimated 23% of China's GHG emissions (Wang & Watson, 2007). But the trade and environment debate has not advanced much since the Rio Declaration of 1992 declared that environmental protection and trade liberalization should be mutually supportive (Cléménçon, 1995; Williams, 2001). Developing countries have consistently opposed any move toward what they consider "green conditionality." This is in large part attributable to the long-prevailing neoliberal economic ideology of deregulation and globalization that is propagated by the WTO, the World Bank, and most OECD countries. Ultimately, solving this problem will require a combination of carrot and stick trade measures aimed at "decarbonizing" industrial production and energy generation in all countries.

For now, the way forward will have to be much less ambitious. First, it is paramount that negotiations in the Kyoto Protocol Ad Hoc Working Group on Further Commitments continue without too much regard for the parallel negotiations in the newly established Bali Ad Hoc Working Group on Long-term Cooperative Action under the Convention. The danger is that some countries in the former group will relax their commitment while they wait for results in the latter group to emerge.

Second, the international trade regime must become a partner in seeking effective emission reductions. The Bali conference was the first time ever that trade and finance ministers from some 20 countries met in a separate meeting to discuss the economic costs of climate change. The emphasis was more on preventing the interference of climate action with economic growth than on seriously considering how the trade system can support effective action on climate change. One key issue involved disagreements between Brazil and the United States over "green" exports (Reuters, 2007a). The next U.N. Heads of State Summit and G8 meeting should consider how the trade and climate policy debate could be moved forward productively.

Third, emission trading and the CDM will have their place in a future climate regime. Bali has demonstrated the tremendous interest in these flexibility mechanisms by all stakeholders, including the private sector. But trading certified emission rights is not a panacea. Three things need to be considered: The first is that emissions trading is only a viable market instrument to the extent that governments manage to set ambitious overall emission caps that drive carbon markets and do not give away too many emission allocations for free. Carbon price fluctuations can be unpredictable and make planning more difficult for businesses and industries, particularly small ones than a carbon tax would. A second consideration is that tremendous advances in water and air quality in OECD countries since the 1960s are entirely the result of old-fashioned regulatory command and control measures and have only over the last decade involved environmental taxes and charges. Finally, allocation of emission rights combined with the ability to purchase carbon offsets is not likely to be an effective solution for reducing growing emissions in the transport and household sectors.

As many speakers in Bali observed, the window of opportunity for the world to achieve stabilization of GHGs in the atmosphere at a level below 450ppm is closing very quickly. There is a real danger that even those countries who have taken first steps to reducing emissions under the Kyoto Protocol are starting to capitulate. Citizens in Europe and Japan can be forgiven to feel increasingly wary of government policies designed to make energy and individual transport ever more expensive (Eurobarometer, 2006; “Green Fatigue’ Leads to Fear,” 2007). They see that their national emissions are barely coming down and that the world at large does not seem to be willing to even contemplate the first concrete steps. At the same time, they understand that their own share to global emissions is declining. It will be up to the largest few emitters, who have not yet committed to concrete action, to take the next step. We can only hope that Bali set the stage for this.

Notes

1. The UNFCCC was signed in 1992 and entered into force on March 21, 1994. The COP to the UNFCCC has since met 13 times. The meetings are commonly referred to as COPs (Conference of the Parties), the Bali conference being COP13. The Kyoto Protocol that sets out reduction targets for Annex 1 countries of the UNFCCC (developed countries) was signed in 1997 but only entered into force February 16, 2005, when the required number of ratifications had been deposited, after Russia finally ratified the Protocol in 2004. The COPs serving as the Meetings of the Parties (MOPs) to the Kyoto Protocol met for the first time alongside COP11 in Montreal in December 2005. Bali hosted both COP13 and MOP3. Separate meetings are necessary, as not all countries are part of the Kyoto Protocol. Throughout the text, I often use “climate conference” to mean the COP13/MOP3 tandem.

2. The most complete blow-by-blow reporting on climate conferences including on meetings of subsidiary groups that take place between annual meetings can be found in the Earth Negotiations Bulletin published by the International Institute for Sustainable Development at <http://www.iisd.ca/>. The ENB also provides limited coverage of official side events that took place during the official conferences.

3. The IPCC was established in 1989 by governments and mandated to periodically review scientific information on climate change as input to the negotiating process. All its reports can be downloaded at no charge at www.ipcc.ch.

4. A key conclusion of the AR4 of the IPCC was that “warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level” (IPCC/Fourth Assessment Report, 2007a, p. 1). AR4 further states that “most of the observed increase in globally-averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations” (IPCC/Fourth Assessment Report, 2007a, p. 4). Eleven of the last 12 years (1995 to 2006) rank among the 12 warmest years in the instrumental record of global surface temperature (since 1850). The 100-year linear trend (1906 to 2005) of 0.74°C is larger than the corresponding trend of 0.6°C (1901 to 2000) given in the AR3. AR4 provides a more urgent call for action than did its predecessor, the third report published in 2001, which itself was a significant upward revision from the second assessment.

5. All official statements made at the Bali conference can be found at the on-demand webcast of the UNFCCC (<http://www.un.org/webcast/unfccc/>). They are not further referenced here.

6. The GEF is a funding mechanism that serves all global environmental conventions and is built on collaboration between its implementing agencies the World Bank, the United Nations Development Program, and the United Nations Environment Program. The GEF was launched as a pilot phase in 1991 and officially established in 1994. It already administers the UNFCCC’s Special Climate Change Fund and the Least Developed Countries Fund, two small financing windows funded through voluntary contributions by some donor countries.

7. See Karaousaksi and Corfee-Morlot (2007) for a good discussion of the literature on this topic.

8. See <http://carbonfinance.org>

9. For some recent advances, see some of the following Web sites: European Space Agency at <http://www.esa.int/esaCP/index.html>; Remote Sensing Technology Center Japan at http://www.alos-restec.jp/aboutalos2_e.html; and LIDAR at <http://lidar.cr.usgs.gov/>. For carbon content analysis, see particularly the Woods Hole Research Center at http://www.terradyaily.com/reports/WHRC_Releases_4_Key_Reports_999.html

10. For detailed information on the CDM, go to <http://cdm.unfccc.int>. Also check the *CDM Bazaar* at <http://www.cdmabazaar.net>. The *CDM Bazaar* was officially launched on September 5, 2007, and is a Web-based information exchange platform that facilitates access to, and sharing of, information among all stakeholders involved in the CDM process.

11. See Sterk et al. (2007) and ENB (2006) for more information on joint implementation and on a Russian proposal on this issue that was discussed at COP13 but with no decision taken.

12. For a list of EU side events in Bali and supporting material, see http://ec.europa.eu/environment/climat/bali_07_conf.htm

13. See, for example, the German Wuppertal Institute for Climate, Environment and Energy (<http://www.wupperinst.org/en/home/index.html>), the PEW Center on Global Climate Change (<http://www.pewclimate.org>), and the Harvard University (http://belfercenter.ksg.harvard.edu/project/56/harvard_project_on_international_climate_agreements.html).

14. See, for example, Bodansky and Diringner (2007) from the Pew Center for Global Climate Change.

15. On the role of environmental taxation, see for example Eighth Global Conference on Environmental Taxation (in press), Clinch, Dunne, and Dresner (2006), OECD (2001), and O’Riordan (1997).

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