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## **Capping Deforestation Emissions in Developing Countries Equitably and Effectively**

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Daniel Watts

### INTRODUCTION

As negotiators from 192 nations gathered in Copenhagen, December 2009, fifty-six of the world's newspapers published an urgent editorial in forty-five different countries.<sup>1</sup> The editorial called for "decisive action" on climate change, and admonished participating nations "not to hesitate, not to fall into dispute, not to blame each other but to seize opportunity from the greatest modern failure of politics."<sup>2</sup> The editorial soberly cautioned that failure to reach consensus "would parch continents, turning farmland into desert. Half of all species would become extinct, untold millions of people would be displaced, whole nations would be drowned by the sea."<sup>3</sup>

The conference in Copenhagen is now largely recognized as a failure.<sup>4</sup> In the words of the former executive secretary of the United Nation's Framework Convention on Climate Change (UNFCCC), "the window of opportunity that we have to come to grips with this issue is closing faster than it was before."<sup>5</sup> This reflects the ossified patterns of human behavior and thought that perpetuate climate change<sup>6</sup> and illustrates that the shift to a low-carbon economy will require massive thawing of crystallized industrial forces.

International environmental laws aimed at controlling greenhouse gas (GHG) emissions should seek to improve the relationships between human groups and their physical, social, and natural environment. Whereas the policies of environmental effectiveness and environmental justice are frequently at odds, the reality is that one policy cannot be achieved without the other. The second Kyoto commitment period will require significant,

binding agreements from both developed and developing nations in order to be effective. But such agreements will not be forthcoming if they are unjust.

Reducing Emissions from Deforestation and Forest Degradation (REDD) is a new UNFCCC program intended to address the growing problem of GHG emissions caused by deforestation. Deforestation is the second largest source of anthropogenic GHG emissions, and it is the largest source of GHG emissions in developing nations.<sup>7</sup> Consequently, it is generally accepted that no meaningful climate change commitment can be achieved without a REDD program.<sup>8</sup> Further, since it is aimed at deforestation emissions as opposed to industrial emissions,<sup>9</sup> REDD is the only plausible means to bind developing nations to environmentally effective emissions caps. And binding developing nations to emissions targets will both dramatically improve the environmental effectiveness of the next climate change treaty and make the terms more palatable to developed nations like the United States.

Roughly 20 percent of global GHG emissions are due to deforestation in developing countries.<sup>10</sup> Further, deforestation carries tremendous environmental consequences aside from GHG emissions. Half of the earth's tropical forests are now gone and deforestation marches on at a rate of one acre per second.<sup>11</sup> Deforestation has led to mass extinction due to loss of habitat.<sup>12</sup> Deforestation has led to outbreaks of mosquito-borne diseases, such as dengue fever, rift valley fever, and malaria; and deforestation has led to outbreaks of water-borne diseases, like cholera.<sup>13</sup> Deforestation has also caused the cultural collapse of forest-dependent people by displacing them from their ancestral homelands.<sup>14</sup> Finally, soil degradation and water shortages due to deforestation greatly contribute to the modern problem of famine, refugees, failed states, and terrorism.<sup>15</sup>

The major forces driving deforestation are economic. The inclusion of emissions trading in the REDD program has the potential to redirect those economic forces towards more sustainable forestry and conservation. At the

very least, emissions trading under REDD will alleviate the economic losses caused by forest conservation in developing countries.

Unfortunately, the existing design of emissions trading under Kyoto utilizes a “baseline” emissions-capping approach that is unrealistic and unfair to developing nations.<sup>16</sup> Another capping approach, the “carbon-stock” method, has been proposed to specifically address REDD emissions trading.<sup>17</sup> The carbon-stock method is more realistic for developing nations, but it fails to provide an effective incentive to slow the rate of deforestation. Furthermore, neither capping method accounts for the environmental services that all nations receive from the preservation of forests.

This article proposes an emissions market design intended to address the shortcomings of existing proposals. Part I outlines the specific dangers to human health and prosperity posed by climate change and, in particular, the dangers of doing little to slow current climate trends. Part II examines international responses to climate change and the circumstances which have made it difficult to achieve policies that are both environmentally effective and environmentally just. Part III describes the principle of Common but Differentiated Responsibilities (CBDR) which, historically, has been used to address the gaping social inequities between the nation-stakeholders of climate change mitigation. In particular, Part III addresses the misconceptions that have made the principle of CBDR an obstacle to international consensus. Part IV examines the current avenues by which rapidly industrializing developing nations may participate in international efforts to mitigate climate change and the limitations of these avenues. Part V introduces the REDD initiative, its potential for sweeping change, the existing market designs proposed to integrate it into emissions trading, and the flaws of those designs. Part VI outlines my market designs for better integration of REDD into the emissions-trading market. Finally, I conclude that, despite many challenges, a just and effective consensus-based, international solution to climate change can be reached.

## I. CONSEQUENCES: THE STAKES

Every age has its Cassandras.<sup>18</sup> But, before now, mankind has never been capable of disrupting human life and prosperity on a global scale and for generations hence through sheer inertia and procrastination.

Heat-trapping GHGs are emitted as a result of a wide range of human activity and natural phenomena occurring around the globe.<sup>19</sup> Unlike other air pollutants, GHGs spread throughout the atmosphere and remain there for hundreds of years.<sup>20</sup> Rising temperatures threaten to upset a myriad of natural processes that support human and other life all over the globe.<sup>21</sup> Therefore, any environmentally effective response to climate change must be both consensus-based and international in scope.

Global warming will necessarily affect all nations of the world. But the impact of that effect will differ—sometimes dramatically—among different nations.<sup>22</sup> All estimates point to the conclusion that poorer nations will suffer disproportionately severe injuries from global warming.<sup>23</sup> And, while wealthy nations are far from insulated, the extent of the U.S. investment in the second Kyoto commitment period will depend on the nature and extent of the risks avoided by its participation.

### *A. Economic Consequences*

The *Stern Review: The Economics of Climate Change* (hereinafter, “the Stern Review”) is the most comprehensive synthesis of data concerning the economic impacts of climate change. Furthermore, unlike similar reports, the Stern Review takes into account the probability of “extreme weather events” and “threshold effects.”<sup>24</sup> The Stern Review indicates that global temperatures are likely to rise by two to three degrees Celsius within the next fifty years.<sup>25</sup> But temperatures could rise as much as five to six degrees Celsius due to feedbacks that amplify climate change, such as the release of GHGs from thawing permafrost.<sup>26</sup> Obviously, the scope of the damage caused by climate change tends to intensify with the extent of the warming.

With that in mind, it is certain that any rise in global temperatures is likely to affect the essential components of human life and enterprise around the world—namely, water, food, health, land, and environment.<sup>27</sup> Further, increased temperatures threaten to trigger large-scale events, like the collapse of Atlantic thermohaline circulation.<sup>28</sup> Finally, and certainly the most difficult to capture through modeling, is the possibility for environmental damage of one kind to combine with others and thereby intensify the overall damage. For instance, rising sea levels may displace millions of people (land), who migrate to an area where they intensify food shortages (food), and over-stress the septic capacity (water), thereby increasing diarrheal diseases (health).

Globally, the economic costs of inaction will be the equivalent of a 5 percent loss of GDP now and forever.<sup>29</sup> But, again, the distribution of that economic loss is likely to be disproportionately borne by poorer countries. In fact, climate change may initially have some positive effects, in terms of increased food production and decreases in winter mortality at higher latitudes, where most developed nations are located.<sup>30</sup> But these advantages will disappear as temperatures continue to rise.<sup>31</sup> Plus, any increase of global temperature will increase the number and severity of extreme weather events, like hurricane Katrina in the United States and the European heat wave of 2003.<sup>32</sup> The costs of climate change in developed nations are likely to exceed several percent of GDP with the increase of extreme weather events.<sup>33</sup> Further, the uncertain combinations of environmental damage in developing nations may lead to global political instability and market contagion, thereby increasing costs for developed nations.<sup>34</sup>

### *B. Failed States*

Two groups, The Fund for Peace and the Carnegie Endowment for International Peace, track and rank the political wellbeing of nation states according to twelve indicators.<sup>35</sup> The environmentalist Lester R. Brown has identified alarming trends of freshwater shortages, topsoil degradation, and

other effects of climate change in the twenty most politically ill nations.<sup>36</sup> Unsurprisingly, these trends contribute greatly to famine locally and to the steady rise of grain prices globally.<sup>37</sup> Local food shortages are simply a prelude for the emerging global food shortage. Rises in the price of grains and rice are now understood to be trend driven. According to Brown, food shortage in the top twenty failing states is likely to overturn the proverbial applecart, creating chaos, terrorism, piracy, increased problems with drugs and weapons, and refugees.<sup>38</sup> The most severe convergence of local and global drivers of famine has yet to occur. However, according to the World Bank, 175 million South Asians subsist on grain produced from water sources that will soon be exhausted.<sup>39</sup> And, China's grain and rice crops also show diminishing yields as more aquifers run dry each year.<sup>40</sup>

### *C. Provisional Conclusion*

Developed nations may initially benefit from rising temperatures due to climate change. But they will succumb to the same dangers facing developing nations as temperatures continue to rise.<sup>41</sup> In the meantime, developing nations will suffer certain severe economic loss, and may suffer the bitter fruits of failed states, disease, political extremism, and violence, if nothing is done.

## II. SHAPING THE INTERNATIONAL RESPONSE

There is an emerging scientific consensus regarding the existence and dangers of climate change.<sup>42</sup> Unfortunately, it has not settled the policy debate about what should be done, when, and by whom.<sup>43</sup> Many nations in the international community claim that the United States' willingness to stonewall on a range of policy issues has undermined the otherwise international effort.<sup>44</sup> However, the failure to shape an effective international consensus is not entirely due to a lack of political will and statecraft in the United States.<sup>45</sup> Achieving global consensus on an effective global strategy is a titanic undertaking. The policy issues that the United

States typically raises are highly relevant. But the United States has generally been inflexible and unwilling to negotiate.<sup>46</sup> Historically, U.S. involvement in the international effort to stabilize climate change has been wholly symbolic.

Policies are shaped largely according to data. The quality of a policy is intrinsically linked to the quality of information upon which that policy is based. Climate change science poses a number of challenges due to the complexity of the problem.<sup>47</sup> Further, due to the array of influential interested parties, gathering data that are free from bias is a constant concern.<sup>48</sup> The International Panel on Climate Change (IPCC) was founded by the United Nations in 1988 to provide policymakers with objective, relevant, and up-to-date scientific data on climate change.<sup>49</sup> The IPCC gathers the most relevant, peer-reviewed, scientific, social, and economic literature available and synthesizes the data in comprehensive reports.<sup>50</sup> In 1990, the IPCC released its first report, which was instrumental in the establishment of the UNFCCC.<sup>51</sup>

The UNFCCC is a “framework” treaty that is intended to be augmented and amended over time as better information becomes available.<sup>52</sup> Its significance was largely symbolic because it set no mandatory limits for the reduction of GHGs. However, it did provide periodic updates (called “protocols”) that set mandatory emissions caps.<sup>53</sup> Following the release of the IPCC’s Second Assessment Report in 1995, the UNFCCC member nations began work on the first of its protocols: the Kyoto Protocol.

Adopted by the UNFCCC in 1997, the Kyoto Protocol set mandatory limits on the production of six GHGs.<sup>54</sup> The United States signed the Kyoto Protocol, but never ratified it. In fact, the Kyoto Protocol was never sent to the Senate for ratification.<sup>55</sup> Anticipating a vote on the protocol, the Senate unanimously passed Senate Resolution 98, which resolved that the United States should not be a signatory to the Kyoto Protocol or any thereafter, which would “either mandate emissions reductions from developed nations

without similar commitments from developing nations, or would result in serious harm to the economy of the U.S.”<sup>56</sup>

In 1998, the Clinton administration commissioned an analysis of the costs and benefits of complying with the Kyoto Protocol, which determined that the benefits far outweighed the costs.<sup>57</sup> Later that year, the House Committee on Science commissioned a second cost-benefit analysis from the U.S. Department of Energy based on its National Energy Modeling System (the “NEMS 1998 Report”).<sup>58</sup> That analysis found that compliance with the Kyoto Protocol had the potential to cause serious harm to the U.S. economy.<sup>59</sup> The controversy between the two cost-benefit analyses was never settled, however, because U.S. participation in the Kyoto Protocol was rejected on other grounds. That is, since developing nations are not required to reduce their GHG emissions under the Kyoto Protocol, ratification by the 1998 Senate was impossible because of Senate Resolution 98. The vast majority of UNFCCC participants—183 of the 192 member nations—ratified Kyoto.<sup>60</sup> The United States was not among them.

Nevertheless, the United States is still a member nation of the UNFCCC and participates in the UNFCCC’s annual Conferences of the Parties (COP). The COP is the supreme policymaking body of the UNFCCC.<sup>61</sup> In 2005, the UNFCCC began to negotiate policy for the second Kyoto commitment period in Montreal. In 2007, the COP met in Bali, where U.S. negotiators rejected proposals by other member nations to set mandatory emissions reduction targets at the outset of the negotiations.<sup>62</sup> But the United States ultimately agreed to adoption by consensus for a framework for future negotiations wherein mandatory targets would be set for industrialized nations.<sup>63</sup> Copenhagen was intended to produce those mandatory targets.

On March 25, 2009, the Obama administration began a series of forums with fifteen of the world’s wealthiest nations, ostensibly to create a “candid dialogue” between developed and developing nations to “advance the exploration of concrete initiatives and joint ventures that increase the supply of clean energy while cutting greenhouse gas emissions.”<sup>64</sup> As the

Copenhagen UNFCCC negotiations approached, the United States appeared to be a willing participant at the bargaining table. But the policy concerns that prevented ratification in 1998 persisted. The United States' willingness to participate in the second Kyoto commitment period depended on whether the covenants therein were "environmentally effective" and "economically sustainable."<sup>65</sup> According to U.S. negotiators, environmental effectiveness requires that all the world's largest emitters (including developing nations, like China) make firm commitments to reduce emissions.<sup>66</sup> Further, the UNFCCC must develop and bring to the market clean-energy technologies at a cost that nations can justify to their citizens.<sup>67</sup> As we approach negotiations in Mexico, we face the same obstacles.

### III. JUSTICE IMPLICATIONS OF COMMON BUT DIFFERENTIATED RESPONSIBILITIES

The parties to the UNFCCC treaty are divided into three groups: (1) Annex I parties, (2) Annex II parties, and (3) Non-Annex I parties.<sup>68</sup> Annex I parties are industrialized nations that were members of the Organisation for Economic Co-ordination and Development (OECD) in 1992, and nations with Economies in Transition (EIT). Annex II nations are the same as Annex I nations excluding the EIT nations—that is, Annex II nations are the wealthiest and most stable of the Annex I nations. Finally, Non-Annex I nations are the developing member nations of the UNFCCC.<sup>69</sup>

The obstacles to international consensus are economic,<sup>70</sup> technological,<sup>71</sup> diplomatic,<sup>72</sup> historical,<sup>73</sup> and natural.<sup>74</sup> While it is beyond the scope of this article to address all obstacles, international policymakers who lose sight of the big picture do so at their own peril. It may be impossible to attain optimal balance of all the competing policies. But, policymakers should not be too eager to sacrifice one policy for another.

Under the Kyoto Protocol, Annex I nations make mandatory commitments, but Non-Annex I nations participate on a strictly voluntary basis.<sup>75</sup> This policy is based on a principle called "common but

differentiated responsibilities” (CBDR), which is a novel principle in international law that is peculiar to environmental treaties.<sup>76</sup> This principle of differentiated responsibilities appears structurally unfair because duties do not flow to all parties. This imbalance is aggravated by the fact that certain developing nations, like China and India, are also among the largest emitters.<sup>77</sup> This policy was intended to build consensus by making it easier for developing nations to ratify the treaty, but it proved to be a policy mistake.<sup>78</sup> First, the United States refused to ratify Kyoto based, nominally, on this policy.<sup>79</sup> Second, considering the speed at which developing nations are industrializing, this policy was simply not environmentally effective.<sup>80</sup> However, as a practical issue and as a matter of simple justice, developing nations are unable to undertake the same kind of commitments that developed nations assume under Kyoto.<sup>81</sup> Therefore, some incarnation of CBDR must be preserved.

#### *A. Normative Implications*

Internationally, there is a growing consciousness of the biological, economic, and human costs of inaction.<sup>82</sup> But even as the fog of ignorance clears, academic mediocrity and ideology threaten to perpetuate inertial human thought and behavior. Principal among the phalanx of mediocrity is the positivistic ideology that rejects the international environmental policy of CBDR.<sup>83</sup>

Facially, an agreement wherein duties do not flow proportionately to all parties seems unfair. However, when viewed in context, the principle of CBDR prevents far more unfairness than it causes. That is, it would be fundamentally unfair to hobble the economic development of poorer nations by imposing environmental mandates that did not exist when Annex I nations developed their own economies. And it is fundamentally unfair to fill the atmosphere with our wastes and then cry foul when Non-Annex I nations begin to industrialize.

Furthermore, when placed in the proper context, it is clear that there are other moral considerations that far outweigh the superficial issue of facial fairness. The de facto suppression of Non-Annex I economies is unjustifiable where people are suffering from malnutrition, disease, and illiteracy at rates that are morally unacceptable. Describing all of the possible normative considerations that support the application of the principle of CBDR is beyond the scope of this article. Articles of high quality concerning this subject already exist. One of the earliest and most influential articles following the establishment of the UNFCCC was written by Henry Shue. Shue's article, *Subsistence Emissions and Luxury Emissions*, provides an analytical context for environmental policymaking at the international level, which rejects "[a]ny strategy of maintaining affluence for some people by keeping other people at or below subsistence" as "patently unfair . . . extraordinarily unequal—intolerably unequal."<sup>84</sup>

#### *B. Corrective Justice Implications*

Corrective justice is also implicated by the principle of CBDR.<sup>85</sup> The argument is that, since Annex I nations are responsible for most of the existing stock of anthropogenic carbon dioxide in the atmosphere, they are morally responsible for correcting the problem.<sup>86</sup> Further, since climate change is likely to cause disproportionate injury to developing (Non-Annex I) nations, the responsible Annex I nations should compensate developing nations for damages.<sup>87</sup> Initially, corrective justice is an attractive rationale for applying the principle of differentiated responsibilities. One could argue that the responsibilities of Annex I and Non-Annex I nations under an international agreement should reflect the damages that are owed to developing nations by Annex I nations.

However, corrective justice arguments are difficult to sustain in the context of international relations. As Eric Posner and Cass Sunstein points out in *Climate Change Justice*, the weakness of the corrective justice argument in international relations is due to four considerations, which

essentially parallel the basic tort inquiry.<sup>88</sup> First, corrective justice assumes a culpable agent or entity. Annex I nations are the culpable agents in the calculation of corrective justice. But most of the GHGs in the atmosphere were emitted by Annex I citizens who are now dead. So, if the costs of remedying climate-change injuries are shifted to Annex I nations, most of the payers will be paying damages that are disproportionately high in comparison to their actual emissions. Further, the damages paid would be drawn under a tax structure that does not account for individual GHG emissions. So, again, citizens who have emitted little will pay the same as those who have emitted a lot. Posner and Sunstein refer to this as “the wrongdoer identity problem.”<sup>89</sup>

Second, corrective justice assumes an injured victim or entity. Although Non-Annex I nations will be the early victims of climate change, most of the victims live in the future. Further, the injuries might only be suffered by a small proportion of Non-Annex I citizens whereas the damages would be distributed equally among all citizens (if at all). Posner and Sunstein refer to this as “the victim/claimant identity problem.”<sup>90</sup>

Third, corrective justice assumes that the culpable agent’s wrongdoing actually caused the injuries sustained by the victim. If a citizen of a Non-Annex I nation dies from malaria, there may be a direct link between the malaria and global warming arising from GHG emissions. But proving that such a link exists with any degree of accuracy would be impossible. So, in the context of climate change, causation might pose an evidence problem that would effectively preclude correction. Posner and Sunstein refer to this as “the causation problem.”<sup>91</sup>

Finally, corrective justice assumes a culpable state of mind—negligence.<sup>92</sup> Under the present paradigms of negligence, only those emissions that occurred after the achievement of scientific consensus would be negligent.<sup>93</sup> That is, the emitters of GHGs cannot be held negligent for emissions that occurred before the dangers of climate change were known.

Thus, the vast majority of injurious emissions are not actionable. Posner and Sunstein refer to this as “the culpability problem.”<sup>94</sup>

For those of us who are inclined to take responsibility for the damages caused by our nation’s industrialization, Posner and Sunstein’s arguments ring hollow. Whatever weaknesses may exist in corrective justice rationales for CBDR under our common-law tort analysis, it cannot be denied that we have reaped the lion’s share of the benefits from our nation’s GHG-emitting activities, and we should therefore internalize the costs. Furthermore, it is self-serving, even pedantic, to avoid responsibility by mechanistically applying our own common-law analysis, which, not incidentally, did not contemplate nations as tortfeasors.

Writing in a similar vein, Eric Posner and Jack Goldsmith attempt to cast international cooperation as purely a function of self-interest through the application of “game theory.”<sup>95</sup> Their scholarship advances the idea that neither custom nor treaty can overcome a nation’s self-interest under the right circumstances.<sup>96</sup> This descriptive analysis of actual international positivism is sobering, but there is no reason to advance positivism prescriptively. That is, it is irrational to aspire to the way things *have been*, instead of aspiring to the way things *should be*. As law professor Mark Chinen opines, “a descriptive critique is inapposite because rules of law are used primarily to evaluate behavior, not describe it.”<sup>97</sup> Implicit in scholarship of positivism is the idea that any action that is not taken purely for reasons of self-interest is foolish and naive. However, Chinen cautions that the legitimacy of that evaluation is called into question “if there is a broad mismatch between how states actually behave and how their behavior is evaluated.”<sup>98</sup> Another lesson from Copenhagen is that there may be a broad mismatch between the aspirations of corrective justice and the actual behavior of the UNFCCC nation states. So, it is unfortunate that corrective justice is the sole moral rationale that is usually alluded to in the public debate.<sup>99</sup>

*C. Distributive Justice Implications*

Distributive justice arguments do not rely on blame. Rather, distributive justice recognizes gaping social inequities and prescribes more equitable distributions of wealth simply as a matter of course.<sup>100</sup> Neoclassical and neoliberal economists are likely to reject this argument on principle as patently socialist. However, if you are inclined to accept the theory that achieving a more equitable distribution of wealth internationally is desirable, then the principle of CBDR would be desirable as well.

But, as Posner and Sunstein point out, if you are inclined to accept the righteousness of distributive justice, the differentiation of responsibilities under international treaty might not be the most practical means by which to achieve optimal distribution.<sup>101</sup> Cash payments would get money to poorer nations faster and allow those nations to use the funds in the ways that they deem fit. Cash payments would also avoid the collateral consequences of hurting poor people in rich nations (who are likely to bear much of the costs of low emissions caps in their household energy costs) and benefitting wealthy people in poor nations (who are likely to be the emitters).<sup>102</sup>

For those of us who are so inclined, the distributive justice rationale for differentiating responsibilities is valid. But it might not be the most effective means to the end of equitable wealth distribution.

*D. Provisional Conclusion*

Justice-based moral arguments for CBDR are powerful and compelling. But, if considerations of justice do not suffice as a basis for applying the principle of CBDR, certain practical considerations are undeniable. The “polluter pays” principle need not be based in fault, but in pragmatism. As Henry Shue advocates, “the polluter should pay because this assignment of clean-up burdens creates the strongest disincentive to pollute.”<sup>103</sup> Further, were the Kyoto Protocol to abandon the practice of CBDR, most of the Non-Annex I nations would simply be unable to comply.<sup>104</sup> Effectively this would alienate most or all of the developing nations from the Kyoto

Protocol and would be catastrophic to the international effort. Developing nations hold the vast majority of the earth's people and environmental resources. The fact that they are *developing* means that vast numbers of human beings are beginning to consume energy, goods, and the natural resources that are abundantly available to them (like coal and wood) at rates that are likely to grow rapidly during the second Kyoto commitment period.<sup>105</sup>

These human activities will absolutely create GHGs and will significantly intensify climate change.<sup>106</sup> The question is, by how much? Alienation of the Non-Annex I nations at this stage will undoubtedly frustrate future attempts to curb emissions in those nations. So, the participation of developing nations in international efforts to stabilize GHG emissions is absolutely essential.<sup>107</sup> CBDR may appear to strain the generosity of wealthy nations, but, in the final analysis, it may be a necessary concession to protect our self-interest.

But, while CBDR is *intended* to address competing policy issues, it is not clear whether it is practical to stabilize GHG emissions while simultaneously protecting the growth of new economies. The problem with global warming is that it is a global problem: one that will require a consensus-based, international legal process in spite of the fact that different member nations will necessarily have different interests in reducing emissions. For the reasons outlined above, it is clear that, ethically and pragmatically, Annex I nations should bear the greatest share of the responsibilities. But, developing nations might also have to take significant action if the international response is to be effective.<sup>108</sup>

The following section describes the current avenues afforded to developing nations for participation in Kyoto's emissions-reduction programs. As explained, these avenues are woefully insufficient to achieve the goal of environmental effectiveness.

#### IV. CURRENT AVENUES FOR DEVELOPING NATION PARTICIPATION

Developing countries will continue to industrialize. Inevitably, emissions will increase. Developed countries will continue to consume energy, goods, and services, which will increase emissions as well. These emissions will add to the existing stock of GHG in the atmosphere.<sup>109</sup> So, U.S. negotiators' concern that a complete lack of mandatory commitments on the part of Non-Annex I nations could undermine the environmental effectiveness of the Kyoto Protocol is not without a rational basis.<sup>110</sup>

Under the Kyoto Protocol, developing nations are limited to three avenues of participation—all of which are voluntary. First, developing nations may initiate their own national GHG mitigation projects. Second, developing nations may assist Annex I nations through the Clean Development Mechanism. Finally, developing nations may adopt legally binding emissions-limitation targets.<sup>111</sup>

##### *A. National Mitigation Projects*

National mitigation projects are encouraged by UNFCCC Article 4(1)(b) which requires: "All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall . . . [f]ormulate . . . national and, where appropriate, regional programmes containing measures to mitigate climate change."<sup>112</sup> The Kyoto Protocol Article 10(a) reaffirms the requirements of the UNFCCC.<sup>113</sup> But the Kyoto Protocol adds "in order to achieve sustainable development"<sup>114</sup> and Article 10(b)(i) specifies the sectors of the economy that are implicated by the rule: "energy, transport, and industry sectors as well as agriculture, forestry, and waste management."<sup>115</sup>

Since 1994, several developing nations have successfully implemented national GHG mitigation programs, beginning with Costa Rica.<sup>116</sup> But such national programs are voluntary; thus, the programs are not legally enforceable. Further, the nature and extent of mitigation programs in

developing nations depends on the funding received from developed nations.<sup>117</sup> As a result, national mitigation programs in developing countries are rare, heterogeneous, and small in scope.<sup>118</sup>

*B. The Clean Development Mechanism*

The Kyoto Protocol mandates that the Annex I nations reduce their aggregate GHG emissions to 5 percent below 1990 levels.<sup>119</sup> In the main, developed nations meet their targets through national measures. But the Kyoto Protocol utilizes several market mechanisms to allow member nations to help each other meet their respective goals: (1) the Clean Development Mechanism (CDM), (2) Joint Implementation (JI), and (3) emissions trading.<sup>120</sup> The CDM allows developing nations to assist Annex I nations in reaching their emissions targets while simultaneously promoting sustainable development in Non-Annex I nations.<sup>121</sup>

Codified under Article 12 of the Kyoto Protocol, the CDM is a rather ingenious economic mechanism. As developed nations progress toward their target goals, the measures that they must take are likely to become increasingly expensive. At a certain point, the expense may cease to be cost-effective. For example, suppose that an Annex I nation has to limit its emissions to five thousand metric tons of carbon dioxide. But the nation has projected that it will emit ten thousand metric tons. The nation begins to pass regulations for its industrial emitters and, at a cost of \$8 million, the emitters reduce the nation's projections to six million tons. But, to cut the remaining one thousand tons of carbon dioxide, the industries will have to spend \$800 million. In the event that an Annex I nation finds that it will be cost prohibitive to meet its emissions target, it can fulfill its obligation by reducing emissions in a developing nation.<sup>122</sup> So, the hypothetical nation could conduct a \$2 million technology transfer to a developing nation that would reduce that nation's emissions by one thousand tons. In this way the Annex I nations can meet their targets efficiently, and developing nations can benefit from the project.

The CDM requires an extensive certification process to ensure that the emissions reductions are “additional to any that would occur in the absence of the certified project activity.”<sup>123</sup> For this reason CDM projects are easier to evaluate than national mitigation projects. Developing nations participate in CDM projects on a strictly voluntary basis.<sup>124</sup> But participation requires only that the developing nation accept the benefit of the CDM project. So, the CDM requires much less commitment from the developing nation than national mitigation projects. Further, CDM projects exist only when Annex I nations encounter difficulty meeting their targets. Consequently, the amount and scope of potential CDM projects was dramatically reduced when the United States backed out of Kyoto.<sup>125</sup> Regardless, the CDM projects are usually small and lack the capacity to address the scope of the problem.<sup>126</sup>

### *C. Binding Targets Through a Status Change*

For a developing nation to undertake binding emissions targets it must successfully change its status from Non-Annex I to Annex I under both the UNFCCC and the Kyoto Protocol.<sup>127</sup> The transitioning party is required to petition the COP six months prior to the following COP. At the COP, the status can be changed by a consensus or a three-fourths majority vote by the member nations.<sup>128</sup>

To date, no Non-Annex I nation has successfully transitioned to Annex I status. Developing nations that resist being pressured into joining Annex I have precluded the amendment of the treaties for the nations that seek to transition.<sup>129</sup> But, even if a developing nation were able to make the desired transition, it is unlikely that it would be able to adopt a Kyoto-style emissions cap.<sup>130</sup> Under Kyoto, Annex I nations set their emissions caps according to emissions levels from a previous year. But developing nations are growing so rapidly that to cap their progress in this way would unreasonably burden their growth. Also, a would-be transitioning nation is

not likely to have the institutional, financial, or technical capacities to monitor and enforce an emissions cap.<sup>131</sup>

*D. Provisional Conclusion*

To review, there are three avenues available for Non-Annex I parties to participate in GHG mitigation under Kyoto: national mitigation programs, the CDM, and taking on binding targets. National mitigation programs are unenforceable, heterogeneous, and difficult to assess. Consequently, the environmental effectiveness of such programs is likely to vary widely. The CDM is an innovative means by which to encourage sustainable development in developing nations and assist developed nations in meeting their targets efficiently. Unfortunately, CDM projects are small and inadequately incentivized. Binding targets require a long and difficult amendment process, which, to date, has wholly precluded developing nations from undertaking binding targets.<sup>132</sup>

As we approach negotiations in Mexico, we must evaluate these avenues candidly. The CDM and the national mitigation projects should be preserved because they do not create a disincentive. However, the difficulties of transitioning from Non-Annex I to Annex I status are counterproductive and should be reformed. Ultimately, these avenues simply are not sufficient to address the magnitude of the global warming problem. Additional avenues must be opened. The following section describes and analyzes the proposed avenue of REDD, which, as explained below, has tremendous potential to reduce GHG emissions from developing countries if implemented correctly.

V. A NEW AVENUE FOR DEVELOPING NATION PARTICIPATION:  
REDD

The UNFCCC program REDD (Reducing Emissions from Deforestation and Forest Degradation) includes an initiative to introduce forestry and land use into the Kyoto emissions-trading mechanism.<sup>133</sup> Emissions trading is a

market-based scheme designed to transfer the burden of reducing emissions to the most efficient actors. Emissions trading can only occur in a market where emissions have been limited in some way; so, under Kyoto, it is currently only available to the Annex I nations that have undertaken binding emissions targets.

Suppose that a private emitter in Japan (emitter J) discovers that, due to increased production, it will definitely exceed the emissions permitted to it under the Kyoto cap. In order to avoid exceeding its allotted units, emitter J can either cut production or invest in novel and expensive proprietary technology. Now suppose that there is an emitter in Germany (emitter G), which will fall well below its permitted emissions due to technological improvements. Under the emissions trading mechanism, emitter J can pay emitter G in exchange for the rights to emitter G's unused emissions. As long as the cost of purchasing the rights from emitter G is less than the costs of forgoing production or purchasing the new technology, emitter J would be wise to make a deal with emitter G. Through emissions trading, the economic costs of an emissions cap are minimized, but the efficient actor is financially rewarded and the inefficient actor is financially punished.

Emissions trading is an attractive solution because it mitigates the economic costs of reducing emissions. But, both policy goals of environmental effectiveness and environmental justice may be undermined by the particular design features of a given emissions-trading scheme. For example, if the annual cap on emissions is set too high, then emitters will not have the economic incentive to reduce their emissions. Or, if the emissions cap is set too low, particularly for developing nations, then economic growth can be stifled right where it is needed most.

REDD will utilize the emissions-trading mechanism to stabilize the GHGs that result from deforestation. According to the Stern Review, deforestation currently accounts for 18 percent of the carbon dioxide released annually into the atmosphere.<sup>134</sup> This is because forest soils and vegetation contain half of the earth's terrestrial carbon pool.<sup>135</sup> The

remaining carbon is contained in other life forms, fossil fuels, and the oceans. In the global carbon cycle, carbon is exchanged between terrestrial ecosystems (forests, for example), and the atmosphere through the processes of photosynthesis, respiration, decomposition, and land-use changes.<sup>136</sup>

When forests are leveled, they (1) cease to absorb carbon dioxide out of the atmosphere, (2) release large quantities of carbon dioxide from the soil, and (3) release substantial quantities of carbon dioxide from the vegetation if it is burned or allowed to decompose.<sup>137</sup>

Many of the poorest Non-Annex I nations contain the earth's great tropical forests and REDD is targeted, almost exclusively, at the deforestation taking place in these rapidly industrializing nations. Tropical forests are particularly important to the earth's carbon cycles because of their photosynthetic capabilities. In fact, tropical forests have been analogized to a septic tank for the atmosphere because of the quantities of carbon dioxide they absorb.<sup>138</sup> According to the IPCC, tropical forests absorb and contain more carbon than the temperate and boreal forests combined.<sup>139</sup> But, for a number of reasons,<sup>140</sup> deforestation in the tropics occurs at an alarming rate of one acre per second.<sup>141</sup> As a result, the permanent conversion of forested to non-forested land in developing countries is one of the major causes of the accumulation of GHGs in the atmosphere.<sup>142</sup> Additionally, as more tropical forests are leveled, the earth becomes less capable of absorbing GHGs. So, REDD will both prevent dangerous emissions and preserve vital environmental services.

The drivers of deforestation are largely due to subsistence activity, which, if capriciously halted, could cause tremendous human hardship. The UNFCCC studies of the drivers of deforestation in developing countries identify both proximate causes (such as logging, infrastructure development, and agriculture),<sup>143</sup> and underlying causes (such as public policy, institutional weakness, and corruption, as well as weak land tenure and property rights).<sup>144</sup>

Poverty and scarce income opportunities can force landless people to the forested frontier to clear marginal land for subsistence crops.<sup>145</sup> In fact, according to the UNFCCC, the single greatest driver of deforestation in developing countries is the clearing of land for agriculture.<sup>146</sup> Land that is appropriate for agriculture is scarce in the tropics. The forested frontier provides displaced or unemployed people with land upon which to plant a crop or pasture a small herd.<sup>147</sup> So, it should be emphasized that avoiding deforestation in the tropics literally means preventing human subsistence activities in developing nations.

The UNFCCC has outlined a number of policy approaches to address the problem of deforestation in developing countries. Some are preventative, such as the effort to reduce prices and demand for forest-related products.<sup>148</sup> Others are punitive, such as the effort to increase the costs and risks of deforestation.<sup>149</sup> Still other approaches, like the effort to improve land tenure rights, address the underlying policy and institutional causes of deforestation.<sup>150</sup>

So, REDD emissions trading is only one of many incentives aimed at slowing deforestation in developing countries. But of all the initiatives, it is the only one that will require developing nations to undertake binding commitments under an international treaty. Unfortunately, the existing Kyoto Protocol did not contemplate binding commitments from Non-Annex I nations. Article 17 of the Kyoto Protocol authorizes the COP to “define the relevant principles, modalities, rules, and guidelines, in particular for verification, reporting, and accountability for emissions trading.”<sup>151</sup> This gives the COP broad discretion to shape the emissions-trading market. But the existing market design is not suited for Non-Annex I nations and avoided deforestation. Under Kyoto, developed nations undertake binding reductions of their industrial emissions under Article 3. Developed nations are only permitted to engage in emissions trading “for the purposes of fulfilling their commitments under Article 3” and only as a supplement to domestic emissions-reduction programs.

REDD will differ from conventional emissions trading because it will not require Non-Annex I nations to limit their *industrial* GHG emissions in any way. Furthermore, the existing emissions-capping scheme, codified under Article 3 of the Kyoto Protocol, was designed under different assumptions and is unsuited to cap deforestation emissions. The following describes conventional emissions trading and explains why REDD will require a creative new capping scheme if it is to be both environmentally effective and environmentally just.

*A. The Baseline Model: Capping Emissions Under Article 3*

The capping method adopted by the COP for the first Kyoto Protocol is best described as a “baseline” model. Under the baseline model, Annex I nations take on a binding emissions target based on emissions levels from a previous year. The emissions level of the year chosen is the baseline. For the wealthiest member nations, the baseline year is 1990 and the target is 5 percent below 1990 levels. For the EIT member nations, the baseline year and emissions target vary because many EIT nations’ economies were relatively small in 1990.<sup>152</sup>

The targets are measured in tons of carbon emissions. Each ton of carbon under a baseline cap is equal to one “assigned amount unit” (AAU), which the emitter is permitted to emit or sell to another emitter.<sup>153</sup> So if Nation “Q” emitted thirty thousand tons of carbon into the atmosphere in 1990, it is permitted to emit thirty thousand tons of carbon during each year of the Kyoto commitment period. If Nation Q emits less carbon than it is allotted, say ten thousand tons less, then it can sell all ten thousand tons to Annex I nations that failed to meet their baseline targets.

Additionally, there are three methods under Kyoto by which an Annex I nation can earn emissions rights over and above their baseline AAUs. First, Annex I nations that participate in the CDM<sup>154</sup> will earn additional emissions rights for every ton of carbon emissions avoided in Non-Annex I nations by a CDM project. The units generated through the CDM are called

“certified emission reduction units” (CERs).<sup>155</sup> So, if Nation Q were to build a wind farm in a Non-Annex I nation, like China, which produced power that would otherwise have come from coal, thereby avoiding ten thousand tons of carbon emissions, then Nation Q would acquire the rights to emit ten thousand tons of carbon or sell ten thousand CERs.

Second, any Annex I nation that participates in Joint Implementation (JI) projects wherein it reduces the emissions of other Annex I nations will earn additional emissions rights for every ton of carbon dioxide avoided. Units generated through JI are called “emission reduction units” (ERUs).<sup>156</sup> So, if Nation Q builds a solar power plant in an Annex I nation, like Italy, thereby avoiding ten thousand tons of carbon emissions, then Nation Q acquires the right to sell ten thousand ERUs or emit ten thousand tons of carbon.

Third, Annex I nations that participate in land use changes leading to the absorption of carbon dioxide through the carbon cycle, such as reforestation, earn additional rights for every metric ton of carbon that will be absorbed annually by the planted forest through photosynthesis and respiration. Units generated through land use and forestry projects are called “removal units” (RMUs). So, if Nation Q plants enough trees to annually remove ten thousand tons of carbon from the atmosphere, then Nation Q will have earned the right to emit ten thousand tons of carbon or to sell ten thousand ERUs.

To implement REDD under the baseline approach, developing nations would have to limit their deforestation emissions according to emissions from a previous year. For convenience, I will call the allotment of emissions rights under the baseline “REDD Units” (“RDUs”) and each RDU will be equal to one metric ton of carbon dioxide. So, if a Non-Annex I nation does not use all of its RDUs, it is free to sell its unused units either to (1) other Non-Annex I nations that failed to meet their REDD emissions targets, or (2) Annex I nations that failed to meet their industrial emissions targets.

There are several features of the baseline approach that make it unsuitable for REDD. First and foremost, it did not contemplate the erratic

rates of deforestation that occur in developing countries. A baseline works well for industrial emissions which tend to grow at relatively predictable rates.<sup>157</sup> Rates of tropical deforestation, on the other hand, tend to ebb and flow according to a complex set of factors.<sup>158</sup> For example, the Brazilian Amazon lost twenty thousand square kilometers of tropical rainforests in 1988, eleven thousand square kilometers in 1991, twenty-nine thousand square kilometers in 1995, and eighteen thousand and one hundred square kilometers in 1996.<sup>159</sup> So, if the deforestation baseline for Brazil was arbitrarily set at 1995 levels of deforestation, the cap may be set too high to be environmentally effective. That is, Brazil might have such a glut of RDUs that it would have no incentive to slow deforestation during the commitment period. If the deforestation baseline was set at 1988 levels, the cap may be too low to be environmentally just. That is, Brazil might have too few RDUs to allow for human sustenance activities, thereby creating unacceptable human hardship among vulnerable communities.

Second, the Kyoto Protocol requires nations that participate in emissions trading to develop monitoring procedures which may be cost prohibitive if there is no early money available from the emissions market to pay for it. That is, developing nations will have to organize (1) a national system to estimate anthropogenic deforestation emissions to set the target, (2) a governmental body to monitor and facilitate emissions-trading transactions, (3) a national program to educate deforestation-emitters about the program, and (4) a system to preserve and protect a certain amount of forest, *before* making any REDD money. The baseline approach assumes that a participating nation has the wherewithal to front-load this kind of national endeavor. If Brazil is unsure of the kind of returns it will receive from the emissions market, it may forgo participation in the emissions market.

Third, it is unlikely that the baseline approach will replace the income provided by deforestation. The value of an emissions-trading unit is set by the market and will be negotiated between the private sellers and buyers. RDUs will be adding to the other units available on the market, which will

lower demand and dilute the value of the trading units. This problem can be remedied if Annex I nations agree to undertake radically lower emissions caps, but the COP has not yet negotiated the modalities for accounting for AAUs.<sup>160</sup>

The final problem with the baseline approach involves valuation. Under conventional emissions trading, the value of the RDU would be exactly equal to the value of the AAU, because both units represent the right to emit one ton of carbon. The first reason this is a problem is because the monetary valuation of the emissions-trading units does not distinguish between the sustenance activity forgone by avoiding deforestation in developing nations and the economic activity forgone by avoiding industrial emissions in developed countries. As a matter of simple equity, it is unjust to ignore the fact that the participation of developing nations comes at much greater costs to their human health and prosperity. The emissions market will fail if it does not reflect the gaping social inequities between the developed and the developing world.

Furthermore, the equivalence of emissions-trading units in the conventional emissions market fails to account for the abundant environmental services that are preserved by avoiding deforestation, such as biological diversity, water cycle regulation, and soil conservation. Biological diversity alone provides humankind with essential medical research, maintains the resilience of ecosystems to cope with inevitable climate change, and provides potential adaptation measures for reducing climate-related losses to agriculture.

However, the most troubling problem of equating RDU values to AAU values is that it fails to account for the environmental service of removing GHGs from the atmosphere through respiration and photosynthesis. Standing forests in the tropics continue to absorb carbon dioxide, so long as they are standing. Millions of square kilometers of tropical forests in developing countries are absorbing carbon emissions without compensation. This is a public good that goes unrewarded. The value of RDUs must

compensate this public good if the carbon market is to be environmentally effective.

A just, practical, and effective emissions market will reflect both the gaping social inequities between Annex I and Non-Annex I nations, and the tremendous global public goods that accompany the preservation of tropical forests. But conventional emissions trading can do neither effectively. Thankfully, the emissions market can be made to reflect our shared values. The following describes a popular effort to design a more practical and just REDD mechanism: the “carbon stock” design. However, this design fails to address all of the shortcomings of conventional emissions trading. Furthermore, the carbon stock design does not promise to be environmentally effective.

*B. The Carbon Stock Model*

The carbon stock model is advocated by the Center for International Sustainable Development Law.<sup>161</sup> Under this model, developing nations are permitted to emit all of the carbon dioxide stored in their forests and soils. The cap is limited only to the amount of carbon stored terrestrially within the nation’s boundaries. This allows forest landowners to collect on every acre of preserved forest.<sup>162</sup>

The carbon stock model has several advantages over the baseline approach. First, it would mobilize faster investment and capital flows.<sup>163</sup> Rather than post facto, developing nations could begin selling credits immediately based on lands that have been set aside for protection. Second, the carbon stock method avoids the problem of setting a baseline according to a prior year. This would prevent setting arbitrary caps that may be too high to be environmentally effective or too low to be environmentally just. Finally, by setting a cap based on the entire available stock of forest, the carbon stock method is more permissive of the human subsistence activity that often drives deforestation in developing countries.

So, the carbon stock model would solve the practical problem of providing early investment for national emissions monitoring and it would better reflect the social inequities between Annex I and Non-Annex I nations. However, it accomplishes these goals at great cost to environmental effectiveness. The carbon stock model would flood the emissions market with millions of fungible RDUs and inevitably dilute the value of all emissions units. Further, it would allow developing countries to participate in the emissions market without undertaking meaningful, binding emissions targets. These features would combine to severely dilute the economic incentives of avoiding both deforestation and industrial emissions. That is, a developing nation could do nothing to slow deforestation and sell the remaining deforestation AAUs for a net gain. And a developed nation could continue industrial business as usual because of the availability of inexpensive emissions units in a glutted, buyer's market.

The baseline model is aligned with the Kyoto Protocol's modality for determining AAUs for emissions trading. But the baseline method is not aligned with the principle of CBDR. The carbon stock model is more aligned with the principle of CBDR, but it is unlikely to slow the rate of deforestation in the tropics. The competing policy concerns of environmental effectiveness and environmental justice are poorly served by either model. But a just, practical, and effective emissions market can be had. The following section describes my proposal for an emissions market intended to address the shortcomings of conventional emissions trading, without sacrificing environmental effectiveness.

## VI. PROPOSALS

This article was written with the assumption that pragmatism, not orthodoxy, will lead to the best solutions. Plato liked to tell the story of Thales, who was so enamored by the stars that he stumbled into a well.<sup>164</sup> Similarly, pure-of-heart ideologues will not solve this problem. Staring into the fixed stars of their ideals, they will fail to see what is at their very feet.

Nevertheless, as a practical matter, ideology must not be ignored and the failure in Copenhagen also reflects our collective naivety. As the editorial posited, the transition to a low-carbon economy “will require a feat of engineering and innovation to match anything in our history. But whereas putting a man on the moon or splitting the atom were born of conflict and competition, the coming carbon race must be driven by a collaborative effort to achieve collective salvation.”<sup>165</sup> After the failure of Copenhagen, the insight of this mandate is more acute. That is, the transition to a low-carbon economy will require degrees of both credulity and skepticism. It is now clear that we must be skeptical enough to harness the forces of self-interest, but credulous enough to devote them, not only to our own prosperity, but also to that of human beings who live in other regions of the world, and who have not yet been born.

Conventional emissions trading fails to provide developing nations with the capital needed to build the institutions to monitor their emissions trading and deforestation activities. Conventional emissions trading also fails to account for the tremendous amount of carbon that standing tropical forests annually remove from the atmosphere. The practical problem of raising early capital could easily be addressed if Annex I nations simply made cash payments to Non-Annex I nations in exchange for this quantifiable environmental service. Voluntary contributions to support REDD have already begun, and most REDD advocates hope voluntary contributions will suffice as the primary finance mechanism.<sup>166</sup> According to the Meridian Institute, a phased approach to mobilizing international finance is required. But the distributive and corrective rationales for voluntary finance make it vulnerable.<sup>167</sup>

I propose that developed nations begin to compensate developing nations for the environmental services that their forests provide. Early money to support REDD could barely begin to account for these services.

Second, Non-Annex I nations will have to cap their emissions in a way that is less arbitrary than the baseline method. The carbon stock method

would eliminate binding emissions targets altogether, thereby throwing the baby out with the bathwater. In 2006, Kevin Baumert proposed a sensible capping method for industrial emissions coming from developing countries. Baumert's method utilizes what he called "action targets,"<sup>168</sup> which are equally applicable to capping deforestation emissions.

Action targets are not hard targets. Instead of relying on a baseline that may be too high or low, a developing nation would have to show that it took measures to prevent a certain number of emissions based on the amount of emissions emitted.<sup>169</sup> The "target" is not a specific number of tons of emissions based on the emissions of a previous year; it is the ratio of emissions forgone to emissions emitted. This method requires that the nation take progressively more environmentally effective measures to reduce emissions and focus on emissions-reduction activities rather than a fixed emissions level. Capping emissions in this way effectively incentivizes avoiding deforestation without subjecting developing nations to the same kind of targets that developed nations undertake. This kind of cap is both environmentally effective and environmentally just because it requires Non-Annex I nations to undertake binding emissions-reduction commitments with a sober understanding of the greater costs to human health and prosperity that it entails.

Finally, the emissions market should not blindly equate industrial AAUs with deforestation RDUs. Instead, the market should reflect the fact that RDUs not only prevent the release of carbon into the atmosphere but also preserve an ecosystem. Placing a dollar value on the preservation of an ecosystem is illusory. No one can quantify the value of a potential medicine or a potential strain of fruit or vegetable that might be hiding in the great, biologically diverse tropical ecosystems of the planet. But the value of an RDU when compared with an AAU should reflect this discrepancy in some way to better incentivize avoiding REDD emissions.

Under conventional emissions trading, Annex I nations typically award their allotted AAUs to their domestic industries for free. In the future,

Annex I nations should be required to auction their AAUs off to their industries. This would raise the value of all emissions-trading units. But, assuming that RDUs are not auctioned, this would increase the rate of return for RDUs relative to AAUs. Designing the emissions market in this way gives an advantage to the holder of an RDU, thereby accounting, to some degree, for the tremendous environmental services that an RDU represents.

#### CONCLUSION

New thinking and creativity are desperately needed. Market designs frequently betray a hierarchy of value placed on the competing policies, so that one policy goal is advanced at the expense of another. However, an emissions market that is just, practical, and effective can be conceived. The salient features of the future emissions market should include: (1) cash payments to REDD countries for the carbon removal achieved by their tropical carbon sinks, (2) an action target style capping method for RDUs, and (3) compulsory auctioning of AAUs to industrial emitters. Since it is incentive-based, emissions trading is an appropriate response to global climate change in an international arena where command and control would be unenforceable. Emissions trading is also appropriate because it mitigates the economic costs of reducing GHG emissions most effectively when applied to large geographical regions. But the conventional emissions-trading market is roughly hewn and unsuited for emissions trading with Non-Annex I nations.

By including Non-Annex I nations in emissions trading through REDD, the international community can dramatically reduce the environmental damage of climate change and the attendant human suffering that it entails. However, the competing policies of economic efficiency, environmental justice, and environmental effectiveness must be given appropriate weight as we design the emissions market of the future. With these policy objectives in mind, policymakers can begin to shape a new market where poor nations can acquire the needed capital to gain access to the market in

exchange for their environmental services; and where wealthy nations can continue to reap the tremendous environmental benefits flowing from developing nations while simultaneously mitigating the economic costs of their commitments more efficiently.

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<sup>1</sup> Anonymous, *Copenhagen climate change conference: Fourteen days to seal history's judgment on this generation*, THE GUARDIAN, Dec. 7, 2009, at A1.

<sup>2</sup> *Id.*

<sup>3</sup> *Id.*

<sup>4</sup> See Interview with Yvo De Boer, Secretary General of the UNFCCC, AM With Tony Eastley, ABC News Radio, in Australia (Jan. 21, 2010), available at <http://www.abc.net.au/am/content/2010/s2797520.htm> (“It’s fair to say that Copenhagen did not deliver the full agreement that the world needs to address the collective climate change challenge. And that actually just makes the task at hand more urgent”). See also ET Bureau, *Copenhagen Accord disappointing: PM*, THE ECONOMIC TIMES, Jan. 4, 2010, available at <http://iplextra.indiatimes.com/article/0crifa38eHdzR?q=Jairam+Ramesh>.

<sup>5</sup> Interview, *supra* note 4.

<sup>6</sup> NICHOLAS STERN ET AL., THE STERN REVIEW ON THE ECONOMICS OF CLIMATE CHANGE 169 (2007).

<sup>7</sup> *Id.*

<sup>8</sup> ARILD ANGELSEN ET AL., REDUCING EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION (REDD): AN OPTIONS ASSESSMENT REPORT vii (2009).

<sup>9</sup> Bryan Walsh, *Green Banks: Paying Countries to Keep their Trees*, TIME, Dec. 4, 2008, available at <http://www.time.com/time/magazine/article/0,9171,1864302,00.html>.

<sup>10</sup> STERN ET AL., *supra* note 6, at iv.

<sup>11</sup> JAMES GUSTAVE SPETH, THE BRIDGE AT THE END OF THE WORLD: CAPITALISM, THE ENVIRONMENT, AND CROSSING FROM CRISIS TO SUSTAINABILITY 1 (2008).

<sup>12</sup> *Id.* at 1–2.

<sup>13</sup> See generally Mongabay.com, *Rainforests*, <http://rainforests.mongabay.com/> (last visited Mar. 2, 2010).

<sup>14</sup> Rebecca Lindsey, *Tropical Deforestation*, NASA EARTH OBSERVATORY, Mar. 30, 2007, [http://earthobservatory.nasa.gov/Features/Deforestation/deforestation\\_update.php](http://earthobservatory.nasa.gov/Features/Deforestation/deforestation_update.php).

<sup>15</sup> Lester R. Brown, *Could Food Shortages Bring Down Civilization?*, 53–55 SCIENTIFIC AMERICAN, May 2009.

<sup>16</sup> See discussion *infra* Part VI.A.

<sup>17</sup> See *infra* Part VI.

<sup>18</sup> In Greek mythology, Cassandra was the princess of Troy, whom Apollo bestowed with the art of prophesy. But, after Cassandra refused to have sex with the god, Apollo cursed her by ensuring that no one would believe her prophesies. Subsequently, Cassandra was abandoned by her family, and cast out of Troy as a mad liar. See THOMAS BULFINCH, BULFINCH’S MYTHOLOGY 210–18, (Modern Library 1998) (1855).

<sup>19</sup> HERVE LE TREUT ET AL., *Historical Overview of Climate Change Science*, in CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS 93 (2007).

<sup>20</sup> PIERS FORESTER ET AL., *Changes in Atmospheric Constituents and in Radiative Forcing*, in CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS 138 (2007), available at <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter2.pdf>.

<sup>21</sup> STERN ET AL., *supra* note 6, at 56.

<sup>22</sup> *Id.* at vii.

<sup>23</sup> *Id.*

<sup>24</sup> *Id.* at 58.

<sup>25</sup> *Id.*

<sup>26</sup> *Id.* The changes in temperature are expressed relative to preindustrial levels.

<sup>27</sup> *Id.* at 56.

<sup>28</sup> *Id.* at 14.

<sup>29</sup> *Id.* at vi.

<sup>30</sup> *Id.* at 1.

<sup>31</sup> *Id.* at 17.

<sup>32</sup> *Id.* at 18.

<sup>33</sup> *Id.* at 18.

<sup>34</sup> *Id.* at 14.

<sup>35</sup> Brown, *supra* note 15. The twelve indicators are demographic pressures, refugees, group grievance, human flight, uneven development, economic decline, delegitimization of the state, public services, human rights, security apparatus, factionalized elites, and external intervention.

<sup>36</sup> *Id.*

<sup>37</sup> *Id.*

<sup>38</sup> *Id.*

<sup>39</sup> *Id.*

<sup>40</sup> *Id.*

<sup>41</sup> *Id.* at 122.

<sup>42</sup> Rajendra Pachauri, *Climate change has no time for delay or denial*, GUARDIAN.CO.UK, Jan. 4, 2010, <http://www.guardian.co.uk/environment/cif-green/2010/jan/04/climate-change-delay-denial>.

<sup>43</sup> Philip Rucker & Juliet Elpern, *Obama Sets International Climate Forum*, WASHINGTON POST, Mar. 28, 2009, [http://voices.washingtonpost.com/44/2009/03/28/obama\\_sets\\_international\\_clima.html?wprss=44](http://voices.washingtonpost.com/44/2009/03/28/obama_sets_international_clima.html?wprss=44).

<sup>44</sup> Anonymous, *supra* note 1.

<sup>45</sup> The author is nevertheless of the opinion that political will and statecraft have been sorely lacking on the part of the United States in international negotiations.

<sup>46</sup> Press Release, Kathleen Sullivan, World Wildlife Federation, Bush Administration Undermining Successful Passage of Kyoto Climate Treaty? (Jan. 29, 2002), available at <http://www.worldwildlife.org/who/media/press/2002/WWFPresitem10740.html>.

<sup>47</sup> LE TREUT ET AL., *supra* note 19, at 96.

<sup>48</sup> *See id.*

<sup>49</sup> Intergovernmental Panel on Climate Change, <http://www.ipcc.ch/organization/organization.htm> (last visited Mar. 2, 2010).

- <sup>50</sup> *Id.* at [http://www.ipcc.ch/organization/organization\\_history.htm](http://www.ipcc.ch/organization/organization_history.htm).
- <sup>51</sup> *Id.* at <http://www.ipcc.ch/organization/organization.htm>.
- <sup>52</sup> United Nations Framework Convention on Climate Change, [http://unfccc.int/essential\\_background/items/2877.php](http://unfccc.int/essential_background/items/2877.php) (last visited Mar. 2, 2010) [hereinafter UNFCCC website].
- <sup>53</sup> United Nations Framework Convention on Climate Change, art. 17, June 12, 1992, 1771 U.N.T.S. 107, available at [http://unfccc.int/essential\\_background/items/2877.php](http://unfccc.int/essential_background/items/2877.php).
- <sup>54</sup> David Suzuki Foundation, Science: Greenhouse Gases, [http://www.davidsuzuki.org/Climate\\_Change/Science/Greenhouse\\_Gases.asp](http://www.davidsuzuki.org/Climate_Change/Science/Greenhouse_Gases.asp) (last visited Mar. 2, 2010).
- <sup>55</sup> See Myron Ebel, *Kyoto Anniversary: What it Means Today*, COMPETITIVE ENTERPRISE INST., July 25, 2007, <http://cei.org/gencon/019,06060.cfm>.
- <sup>56</sup> S. Res. 98, 105th Cong. (as passed by Senate, July 25, 1997).
- <sup>57</sup> THE KYOTO PROTOCOL AND THE PRESIDENT'S POLICIES TO ADDRESS CLIMATE CHANGE: ADMINISTRATION ECONOMIC ANALYSIS i (1998) [hereinafter ADMINISTRATION ANALYSIS].
- <sup>58</sup> ENERGY INFORMATION ADMINISTRATION, WHAT DOES THE KYOTO PROTOCOL MEAN TO U.S. ENERGY MARKETS AND THE U.S. ECONOMY? (1998), available at <http://www.eia.doe.gov/oiaf/kyoto/pdf/kyotobbrf.pdf>.
- <sup>59</sup> See *id.*
- <sup>60</sup> UNFCCC website, *supra* note 52.
- <sup>61</sup> *Id.* at <http://unfccc.int/documentation/decisions/items/3597.php?such=j&volltext=/CP.13#beg>.
- <sup>62</sup> John R. Crook, *U.S. Positions in International Climate Change Negotiations*, 102 AM. J. INT'L L. 164, 165 (2008).
- <sup>63</sup> *Id.*
- <sup>64</sup> Press Release, The Whitehouse, President Obama Announces Launch of the Major Economies Forum on Energy and Climate (Mar. 28, 2009), available at [http://www.whitehouse.gov/the\\_press\\_office/president-obama-announces-launch-of-the-major-economies-forum-on-energy-and-climate/](http://www.whitehouse.gov/the_press_office/president-obama-announces-launch-of-the-major-economies-forum-on-energy-and-climate/).
- <sup>65</sup> *International Climate Change Negotiations: Restoring U.S. Leadership: Hearing Before the S. Comm. on Foreign Relations*, 110<sup>th</sup> Cong. (Nov. 13, 2007) (statement of Paula J. Dobriansky, Under Secretary for Democracy and Global Affairs) [hereinafter Dobriansky statement].
- <sup>66</sup> *Id.* Like Senate Resolution 98, *supra* note 56, this argument calls for mandatory commitments from all of the UNFCCC member nations. The rationale given by Ms. Dobriansky is based in pragmatism rather than in structural fairness.
- <sup>67</sup> Dobriansky statement, *supra* note 65.
- <sup>68</sup> United Nations Framework Convention on Climate Change, annexes I, II, June 12, 1992, 1771 U.N.T.S. 107.
- <sup>69</sup> UNFCCC website, *supra* note 52.
- <sup>70</sup> See generally Henry Shue, *Subsistence Emissions and Luxury Emissions*, 15 L. & POL'Y 1 (1993).
- <sup>71</sup> *Id.*
- <sup>72</sup> See generally Crook, *supra* note 62.
- <sup>73</sup> See generally Shue, *supra* note 70.

<sup>74</sup> LE TREUT ET AL., *supra* note 19, at 103.

<sup>75</sup> Kevin A. Baumert, *Participation of Developing Countries in the International Climate Change Regime: Lessons for the Future*, 38 GEO. WASH. INT'L L. REV. 365, 366, 381–82 (2006).

<sup>76</sup> See generally Michael Weisslitz, *Rethinking the Principle of Common but Differentiated Responsibility: Differential Versus Absolute Norms of Compliance and Contribution in the Global Climate Change Context*, 13 COLO. J. ENVTL. L. & POL'Y 473 (2002).

<sup>77</sup> Will Gerber, *Defining "Developing Country" in the Second Commitment Period of the Kyoto Protocol*, 31 B.C. INT'L & COMP. L. REV. 327, 333 (2008).

<sup>78</sup> Weisslitz, *supra* note 76 at 477–78, 484.

<sup>79</sup> S. Res. 98, 105th Cong. (as passed by Senate, July 25, 1997).

<sup>80</sup> See generally Weisslitz, *supra* note 76.

<sup>81</sup> See discussion *infra* Part IV.A.

<sup>82</sup> Anonymous, *supra* note 1.

<sup>83</sup> Eric A. Posner & Cass R. Sunstein, *Climate Change Justice*, 96 GEO. L.J. 1565, 1607 (2008).

<sup>84</sup> Shue, *supra* note 70, at 42.

<sup>85</sup> Anonymous, *supra* note 1.

<sup>86</sup> UNFCCC website, *supra* note 52.

<sup>87</sup> See generally Daniel A. Farber, *Basic Compensation for Victims of Climate Change*, 155 U. PA. L. REV. 1605 (2007).

<sup>88</sup> Posner & Sunstein, *supra* note 83.

<sup>89</sup> *Id.* at 1593.

<sup>90</sup> *Id.* at 1595.

<sup>91</sup> *Id.* at 1597.

<sup>92</sup> Posner and Sunstein note that philosophers differ in their opinions as to whether an actor needs to be culpable in order to be liable under corrective justice. I am distinguishing corrective justice as a moral consideration which would require some degree of blame on the part of the wrongdoer. So, as I use the term, corrective justice requires a culpable state of mind. I focus on negligence as the threshold degree of culpability and not to the exclusion of reckless or purposeful states of mind.

<sup>93</sup> This would be true under an economic paradigm of negligence, where wrongdoers fail to justify the cost of their actions, and under a community standard paradigm of negligence, where wrongdoers fail to exercise due care.

<sup>94</sup> Posner & Sunstein, *supra* note 83, at 1597.

<sup>95</sup> Jack L. Goldsmith & Eric A. Posner, *A Theory of Customary International Law*, 66 U. CHI. L. REV. 1113 (1999) [hereinafter *Theory*]; Jack L. Goldsmith & Eric A. Posner, *Understanding the Resemblance Between Modern and Traditional Customary Law*, 40 VA. J. INT'L L. 639 (2000) [hereinafter *Understanding*].

<sup>96</sup> *Theory*, *supra* note 95, at 1170–72.

<sup>97</sup> Mark A. Chinen, *Game Theory and Customary International Law: A Response to Professors Goldsmith and Posner*, 23 MICH. J. INT'L L. 143, 145 (2001).

<sup>98</sup> *Id.*

<sup>99</sup> UNFCCC website, *supra* note 52.

- <sup>100</sup> Posner & Sunstein, *supra* note 83, at 1584.
- <sup>101</sup> *Id.* at 1591.
- <sup>102</sup> *Id.* at 1586.
- <sup>103</sup> Shue, *supra* note 70, at 52.
- <sup>104</sup> Daniel Barstow Magraw, *Legal Treatment of Developing Countries: Differential, Contextual, and Absolute Norms*, 1 COLO. J. INT'L ENVTL. L. & POL'Y 69, 69–70 (1990).
- <sup>105</sup> STERN ET AL., *supra* note 6, at 169.
- <sup>106</sup> ADMINISTRATION ANALYSIS, *supra* note 57, at 1–2.
- <sup>107</sup> Magraw, *supra* note 104 at 70.
- <sup>108</sup> STERN ET AL., *supra* note 6, at vii.
- <sup>109</sup> Baumert, *supra* note 75, at 369.
- <sup>110</sup> Dobriansky statement, *supra* note 65.
- <sup>111</sup> Baumert, *supra* note 75, at 389.
- <sup>112</sup> United Nations Framework Convention on Climate Change, art. 4(1)(b), June 12, 1992, 1771 U.N.T.S. 107.
- <sup>113</sup> The Kyoto Protocol to the United Nations Framework Convention on Climate Change, art. 10(a), Mar. 16, 1998, ILM 30822, 1771 U.N.T.S. 107.
- <sup>114</sup> *Id.*
- <sup>115</sup> *Id.* at art. 10(b)(i).
- <sup>116</sup> Baumert, *supra* note 75, at 377–78.
- <sup>117</sup> United Nations Framework Convention on Climate Change, art. 4(7), June 12, 1992, 1771 U.N.T.S. 107. *See also* Baumert, *supra* note 75, at 375–77.
- <sup>118</sup> Baumert, *supra* note 75, at 382–83.
- <sup>119</sup> Annex I nations with economies in transition are not mandated to pick 1990 as their target year. The important distinction here is that all Annex I nations are required to make mandatory commitments.
- <sup>120</sup> Kyoto Protocol to the United Nations Framework Convention on Climate Change, arts. 10, 12 & 17, Dec. 10, 1997, 2302 U.N.T.S. 148.
- <sup>121</sup> *Id.* at art. 12 ¶ 2.
- <sup>122</sup> *Id.* at art. 12 ¶ 3.
- <sup>123</sup> *Id.* at art. 12 ¶ 5(c).
- <sup>124</sup> *Id.* at art. 12 ¶ 5(a).
- <sup>125</sup> Baumert, *supra* note 75, at 386.
- <sup>126</sup> *Id.* at 387–88.
- <sup>127</sup> *Id.* at 390.
- <sup>128</sup> *Id.* at 391.
- <sup>129</sup> *Id.* at 393 (outlining the failed attempt of Argentina).
- <sup>130</sup> *Id.* at 394.
- <sup>131</sup> *Id.* at 394–95.
- <sup>132</sup> *See generally* Gerber, *supra* note 77; Weisslitz, *supra* note 76.
- <sup>133</sup> WORLD AGROFORESTRY CENTER & ALTERNATIVE TO SLASH-BURN, AVOIDED DEFORESTATION WITH SUSTAINABLE BENEFITS 2 (2007), available at <http://www.asb.cgiar.org/pdfwebdocs/avoided-deforestation-with-sustainable-benefits-flyer.pdf>.
- <sup>134</sup> STERN ET AL., *supra* note 6, at i.

<sup>135</sup> United Nations Framework Convention on Climate Change, Subsidiary Body for Scientific and Technological Advice [SBSTA], *Working Paper: Background Paper for the Workshop on Reducing Emissions from Deforestation in Developing Countries*, Part I, 6 (Aug. 30–Sept. 1, 2006) [hereinafter UNFCCC Background Paper Part I].

<sup>136</sup> *Id.*

<sup>137</sup> *Id.* at 22.

<sup>138</sup> BURNING SEASON (2008), available at <http://www.pbs.org/wnet/wideangle/episodes/burning-season/video-full-episode/1987/>.

<sup>139</sup> UNFCCC Background Paper Part I, *supra* note 135, at 7.

<sup>140</sup> *Infra* Part VI.

<sup>141</sup> SPETH, *supra* note 11, at 1.

<sup>142</sup> UNFCCC Background Paper Part I, *supra* note 135, at 7.

<sup>143</sup> *Id.* at 6.

<sup>144</sup> *Id.*

<sup>145</sup> *Id.* at 5.

<sup>146</sup> *Id.*

<sup>147</sup> *Id.*

<sup>148</sup> *Id.* at 10.

<sup>149</sup> *Id.* at 11.

<sup>150</sup> *Id.* at 12.

<sup>151</sup> Kyoto Protocol art. 17, Mar. 16, 1998, ILM 30822, 1771 U.N.T.S. 107.

<sup>152</sup> *Id.*

<sup>153</sup> Conference of the Parties to the UNFCCC, Marrakesh, Morocco, Oct. 29–Nov. 10, 2001, *Report of the Conference of the Parties on its Seventh Session*, Part II at 57–58 [hereinafter Marrakesh Accords].

<sup>154</sup> See *supra* Part V.B.

<sup>155</sup> Marrakesh Accords, *supra* note 153, at 57–58.

<sup>156</sup> *Id.*

<sup>157</sup> U.S. ENERGY INFORMATION ADMINISTRATION, INDEPENDENT STATISTICS AND ANALYSIS, EMISSIONS OF GREENHOUSE GASES REPORT, Fig. 5 (2009), <http://www.eia.doe.gov/oiaf/1605/ggrpt/>.

<sup>158</sup> UNFCCC Background Paper Part I, *supra* note 135, at 9.

<sup>159</sup> See WORLD RESOURCES INSTITUTE, DEFORESTATION: THE GLOBAL ASSAULT CONTINUES, available at <http://www.wri.org/publication/content/8368> (last visited Mar. 4, 2010) (citing United Nations Population Division, *World Population Prospects 1950–2050: The 1996 Revision*, Annex 1: Demographic Indicators, 11–45(1997)).

<sup>160</sup> See generally Crook, *supra* note 62.

<sup>161</sup> Letter from Steve Prior, Charlotte Streck & Robert O’Sullivan, Centre for International Sustainable Development Law, to COP UNFCCC (Mar. 2006), available at <http://unfccc.int/resource/docs/2006/smsn/ngo/005.pdf>.

<sup>162</sup> *Id.*

<sup>163</sup> *Id.*

<sup>164</sup> ARTHUR KOESTLER, *THE SLEEPWALKERS: A HISTORY OF MAN’S CHANGING VISION OF THE UNIVERSE* 22 (Penguin Books 1989) (1959).

<sup>165</sup> Anonymous, *supra* note 1.

<sup>166</sup> ANGELSEN ET AL., *supra* note 8, at 3.

<sup>167</sup> *Id.* at vii.

<sup>168</sup> Baumert, *supra* note 75, at 396.

<sup>169</sup> *Id.*