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Cubing the Kyoto Protocol: Post-Copenhagen Regulatory Reforms to Reset the Global Thermostat

*Professor Steven Ferrey**

ABSTRACT:

The Copenhagen Conference of the Parties (COP-15), which took place in December 2009, was intended to set in stone an ambitious global climate change agreement for the post-2012 period, when the Kyoto Protocol expires. It did not succeed, resulting only in a 13-paragraph “political accord” which was not agreed to, but only “noted” because of lack of consensus. The COP-16 in December 2010 in Cancun, Mexico, met a similar, if less contentious, inconclusive end. Every fundamental issue was left unresolved at both disappointing critical Conferences. Left unreformed as an international legal regulatory mechanism, the Kyoto Protocol has no chance of success, and terminates by its own terms in 2012. A new legal architecture must address issues of participation, global warming chemical emissions, the failure in both participating developed nations and developing nations to shift power generation bases to sustainable low-carbon alternatives, misuse of carbon “offsets,” and lack of effective enforcement. This article proposes a four-sided approach towards a new international legal architecture. I describe these approaches in the following dimensions, and propose to create a “cubed” model of governance that will put into place the ideals of the Kyoto Protocol.

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Dimension 1: The legal line covering international stakeholders must be altered to include transitional developing countries. Policies must speak a new language of carbon control through adding forestation preservation protocols and including regulation of the most harmful global warming chemicals in developing countries.

Dimension 2: There is no Kyoto Protocol legal requirement whatsoever that developed economies make any shift to zero-carbon renewable power resources. A new legal architecture must construct renewable power alternatives. The successful demonstrated model for developing countries is examined in the article for a post-Kyoto legal protocol.

Dimension 3: There must be incentives for in-country zero-emission renewable compliance options rather than non-CO₂ external offsets as a default option. Legal mechanisms must be carefully tailored to different regulatory systems.

Dimension 4: The Kyoto Protocol contains no enforcement architecture or compliance mechanism. A method of legal enforcement, applicable in real time, must be implemented if international carbon control has any chance for success.

Kyoto is an international legal system that requires a dimensionally cubed reform of its basic legal architecture to become anything other than an unsuccessful historical footnote. At risk is the warming of the planet and well-publicized catastrophes. Without all of these four dimensions of legal reform, the Kyoto Protocol lacks the requisite legal depth and coverage to function as an effective limit on global warming forecasted to take place in the 21st century. If the Kyoto Protocol continues beyond 2012 in its current legal format, as the April 2008 Bangkok and 2009 Copenhagen climate change conference now plan,¹ it will fail.

Mere extension of the original Protocol will not work. There must be final alterations in the scope of the regulatory construct. This Article draws this new architecture for international carbon regulation in the above four dimensions. The final section of this Article examines whether U.S. carbon control legislation now working through the U.S. Congress could aid or remedy these Kyoto deficiencies.

1. Eric J. Lyman, "Progress" of Bangkok Talks Shows Much Still to be Done for 2009 Global Agreement, 39 ENV'T REP. (BNA) 704 (2008).

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I.

A NEW CUBIST CARBON ARCHITECTURE

For 2010 and beyond, we are in the post-Copenhagen era: The Copenhagen Conference of the Parties (COP-15), which took place in December 2009, was intended to set in stone an ambitious global climate change agreement for the post-2012 period, when the Kyoto Protocol expires. It did not succeed. Instead, the Conference only produced a thirteen-paragraph “political accord” which was not an official product of the meeting, but only “noted” by the Conference because of lack of a consensus among

world nations. Every fundamental issue COP-15 was supposed to address was left unresolved.² It was then scheduled by the Conference parties to occur at COP-16, the next formal Kyoto session held in December 2010 in Cancun, Mexico.

No additional progress occurred in Cancun, even though there were additional statements of aspiration. The last two years, 2009 in Copenhagen and 2010 in Cancun, resulted in no change and no extension of the regulatory architecture past its scheduled expiration next year. There continued a standoff between Japan and developing nations over Japan's opposition to a second commitment period of the Kyoto Protocol beyond 2012, and U.S. resistance to a new finance mechanism sought by developing nations without concessions from those nations on emissions cuts and verification.³ The United States asked that the fund be established outside the authority of the United Nations Conference of the Parties that administers the Kyoto Protocol, and wants a major role for the World Bank, which developing nations opposed.⁴ The World Bank was selected as interim Fund trustee.⁵

Left unreformed as an international legal regulatory mechanism, the Kyoto Protocol has no chance of success, and terminates by its own terms in 2012. The COP-15 accord asserts that the Kyoto mechanism must be restructured if it is extended beyond 2012. It must be revamped significantly to meet even its own targets successfully, not to mention the much more ambitious targets that many climate scientists believe necessary to prevent ecological catastrophe.⁶

Even though the Copenhagen round fell far short of all expectations, perhaps counter intuitively, there is hope for a new international architecture in some of the recent United States legislative developments. These may show the way to "cubing" new Kyoto architecture for climate change. This "cubing" is not literally arithmetic, but for purposes of analyzing various legal

2. Ian McGregor, *Disenfranchisement of Countries and Civil Society at COP-15 in Copenhagen*, 11 GLOBAL ENVTL. POL. 3-4 (2011).

3. *Cancun "Blame Game"?*, INSIDE EPA'S CLEAN ENERGY REP. (Dec. 10, 2010), <http://cleanenergyreport.com/201012102348053/Carbon-Control-Blog/In-the-Air/cancun-blame-game/menu-id-204.html>.

4. *Id.*

5. *Cancun Talks Defer Key Detail for Binding Agreement to Next Year*, INSIDE EPA'S CLEAN ENERGY REP. (Dec. 12, 2010), <http://cleanenergyreport.com/201012122348153/Carbon-Control-Daily-News/News/cancun-talks-defer-key-details-of-binding-agreement-to-next-year/menu-id-202.html>.

6. See *infra* notes 7-8 & accompanying text.

and regulatory dimensions of world policy and law, figuratively denotes adding new regulatory dimension to the now-limited legal structure of the Protocol, in four key, or “cubed,” additional aspects. This “cubing” would raise the power of the Protocol to function to a more enduring, effective and enforceable level and depth.

That change is required sooner rather than later. Chief NASA climatologist James Hansen gives the world less than a decade to significantly slow or halt the increase of greenhouse gas (GHG) emissions if we intend to make meaningful headway against irreversible climate change.⁷ Hansen notes that merely waiting until 2018 to stop the “growth of greenhouse gas emissions” may make it near impossible to avoid catastrophic effects of warming.⁸ According to Dr. John Holdren, Director of the White House Office of Science and Technology Policy, if U.S. greenhouse emissions plateau in 2015, we would already have reduced our chances of avoiding climate catastrophes by 50%.⁹ Neither the fledgling U.S. efforts by states and the federal government,¹⁰ nor forecasts by international energy agencies,¹¹ offer any assurance that there will even be an approach to a plateau by 2015. New architectural protocols are urgently required to reverse the levels of GHG emissions in an effort to avert climate-based disasters.

Limiting global warming to 2.5 degrees Centigrade increase from pre-Industrial Revolution levels will require stabilizing carbon dioxide (CO₂) concentrations in the atmosphere to no more

7. James Hansen, *The Threat to the Planet*, N.Y. REV. BOOKS, July 13, 2006, at 12, available at www.nybooks.com/articles/19131 [hereinafter *Threat to the Planet*]; James Hansen, et al., *Global Temperature Change*, 103 PROC. NAT'L ACAD. SCI. U.S. AM. 14288, 93 (2006).

8. Robin Chase, Op-Ed., *Get Real on Global Warming Goals*, BOSTON GLOBE, Apr. 22, 2008, at A15.

9. *Id.*

10. See *Regional Greenhouse Gas Initiative CO₂ Budget Trading Program*, REG'L GREENHOUSE GAS INITIATIVE, <http://www.rggi.org/home> (last visited Feb. 27, 2011) (affecting ten Northeastern states in the U.S.); *Regional Greenhouse Gas Initiative CO₂ Budget Trading Program—CO₂ Auctions, Tracking & Offsets*, REG'L GREENHOUSE GAS INITIATIVE, <http://www.rggi.org/market> (last visited Feb. 27, 2011). Federal climate control legislation was not enacted in either 2009 or 2010.

11. INT'L ENERGY AGENCY, *WORLD ENERGY OUTLOOK 2004* 34, 57, 240 (2004), available at <http://www.iea.org/textbase/nppdf/free/2004/weo2004.pdf>. The International Energy Agency predicts that by 2030, world demand for energy will grow by 60% and fossil fuel sources will still supply 82% of the total, with non-carbon renewable energy sources supplying only 6%. *Id.*

than 450 parts per million (ppm).¹² “A top official with the Intergovernmental Panel on Climate Change (IPCC) has indicated that developed nations will need to slash CO₂ emissions almost entirely by 80-95% by 2050 to hold GHGs to 450 ppm in the atmosphere.”¹³ Complicating this, CO₂ lingers in the atmosphere, thus causing concentrations to hold steady for decades.¹⁴ Within a century, if all nations of the world do not limit their greenhouse gas emissions, “the average global temperature will climb anywhere from 1.4° to 5.8° Celsius” (or 2.5° to 10° Fahrenheit).¹⁵

According to some scientists, we may even need to limit the increase in Earth “surface temperature to no more than 2–2.5 degrees Centigrade above . . . the 15° Centigrade” Earth temperature at the time of the American Revolution to avoid catastrophic effects of global warming.¹⁶ The current Earth mean temperature has increased by about 0.7 degrees Centigrade in the past 125 years;¹⁷ over the past 10,000 years, mean temperature has only varied by about 1 degree Celsius (less than 2 degrees Fahrenheit).¹⁸ This will require a sharp reduction of emissions over the next generation, and to “near zero by 2100.”¹⁹ This will only be possible if we “can demonstrate that a modern

12. See STEVEN FERREY, ENVIRONMENTAL LAW: EXAMPLES & EXPLANATIONS 235 (5th ed. 2010). At such modest levels, the degree of warming is not expected to result in radical loss of ice sheet, sea level rise, and shift of agricultural areas. *Id.*

13. Steven Ferrey, *The Failure of International Global Warming Regulation to Promote Needed Renewable Energy*, 37 B.C. ENVTL. AFF. L. REV. 67, 72 (2010) (citing Rick Mitchell, *IPCC Official Says Industrialized Nations Must Cut Emissions up to 95 Percent*, 39 ENV'T REP. (BNA) 1917 (2008)).

14. NAT. ACAD. OF SCI. ET AL., UNDERSTANDING AND RESPONDING TO CLIMATE CHANGE 16 (2006).

15. Ferrey, *supra* note 13, at 73 (citing WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE [IPCC], CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY 45 tbl.3.1 (Martin Parry et al. eds., 2007). The IPCC 4th Assessment Report, talks of temperature increases of a range of increasing 2.4-6.4 degrees C. This would yield a 0.26–0.59 meter rise in sea levels during the 21st century, a wide range. *Id.*

16. See Michael MacCracken, *Prospects for Future Climate Change and the Reasons for Early Action*, 58 J. AIR & WASTE MGMT. ASS'N, 735, 735 (2008); see also Tony Blair, THE CLIMATE GROUP, BREAKING THE CLIMATE DEADLOCK: A GLOBAL DEAL FOR OUR LOW-CARBON FUTURE 9 (2008).

17. See *GISS Surface Temperature Analysis*, NASA GODDARD INSTITUTE FOR SPACE STUDIES, <http://data.giss.nasa.gov/gistemp/graphs/> (last visited Feb. 27, 2011).

18. *Global Warming*, HISTORY, <http://www.history.com/topics/global-warming> (last visited Mar. 25 2011).

19. MacCracken, *supra* note 16, at 735.

society can function without reliance on technologies that release carbon dioxide”²⁰

Furthermore, Hansen suggests that even a 450 ppm limit would not be sufficient. He forecasts a scenario in which we will exceed the tipping point of runaway global warming once the atmospheric concentration of CO₂ exceeds 400 to 425 ppm.²¹ At 450 ppm, Hansen contends there will be no glacial or polar ice left on the planet.²² In 2009, the United Nations Environment Programme also forecast the seriousness of coming “tipping points . . . that will alter regional and global environmental balances . . . irreversible within the time span of our current civilization.”²³ Biologic carbon sinks, such as forest and ocean carbon uptake, are already showing signs of increased stress under rising temperatures.²⁴

All of these data and predictions show the situation we face as a planet is already dire; that global warming is a *current* threat, not an impending one. Creators of the Kyoto Protocol realized this, and made an effort to reverse the trend. But the Kyoto Protocol²⁵ confronts two real-world constraints in halting global warming: its own scheduled 2012 termination, and its lack of a quick reduction mechanism resilient against if emission reduction is delayed by recession or otherwise ineffective. After the collapse of any discernible movement or measurable progress towards the implementation of Kyoto goals at the Copenhagen talks, there is need for new architecture and new mechanics to be implemented quickly. This has implications as to whether the existing Protocol is adapted or replaced. The current Kyoto two-class world model is stiff and inconsistent in its groupings. There must be a more graduated approach to induce and incentivize broader participation. In this Article, I contend that carbon regulation will need modification in at least four architectural dimensions—each changing programmatic structure:

20. *Id.*

21. Dean Scott, *NASA Scientist Recalls 1988 Testimony by Seeking Phaseout of Coal-Fired Plants*, 39 ENV'T REP. (BNA) 1273 (2008).

22. *Id.*

23. 2009 U.N. Env'tl. Programme Y.B. 21 U.N. Doc. UNEP/GC.25/INF/2, at 1, available at <http://www.unep.org/yearbook/2009>.

24. *Id.* at 25.

25. Kyoto Protocol to the U.N. Framework Convention on Climate Change, Dec. 11, 1997, 2303 U.N.T.S. 148 (1998) [hereinafter *Kyoto Protocol*].

A. *Legally Covered Countries*

The first dimension draws the legal line between covered and uncovered countries. Three out of five of the largest carbon emitters are not part of the Kyoto Protocol. To deal equitably with global warming, two fundamental changes are required in addition to graduated commitments: adding forestation preservation and regulation of GHG chemicals of concern in developing countries.

B. *CDM Zero-CO₂ Technology-Transfer*

There must be technology transfer and renewable energy technologies to reduce atmospheric carbon concentrations. There is no Kyoto requirement that developed economies make any shift to zero-carbon renewable power, and the Clean Development Mechanism(CDM)²⁶ arrangement has navigated another direction. This Article sets forth the proven successful model demonstrated in several developing countries to remedy this misallocation of resources. There will need to be revision of the CDM architecture.

C. *Increasing In-Country Compliance*

There must be incentives for In-Country Annex 1 zero-emission renewable energy compliance options rather than the non-CO₂ CDM external compliance default option used to date.

D. *Enforceable Implementation in Real Time*

The Kyoto Protocol contains no enforcement architecture of any kind and there is evidence of errors in verification of offsets.

These changes require implementation of new regulatory mechanisms. It is essential to get the infrastructure right, as it controls the form and function of long-term GHG reduction mechanisms. If the institutional response is correct, it will embed the framework for progressive GHG reductions: "The stakes, for all life on the planet, surpass those of any previous crisis."²⁷

The April 2008 Bangkok talks following the 2007 United Nations Climate Change conference in Bali, concluded that a post-2012 international carbon scheme should look much like the pre-

26. See *The Clean Development Mechanism*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, <http://cdm.unfccc.int/index.html> (last visited Feb. 27, 2011).

27. James Hansen et al., *Target Atmospheric CO₂: Where Should Humanity Aim?*, 2 OPEN ATMOSPHERIC SCI. J. 217, 229 (2008).

2012 Kyoto regime, including trading of allowances and the creation of additional credits or “offsets” through the existing Joint Implementation (JI) and CDM Kyoto mechanisms.²⁸ During the mid-year G8 summit in 2009, the major developing countries of India and China again rejected the suggestion of any controls on their carbon emissions.²⁹ Indian officials reiterated this to Secretary of State Clinton in July 2009.³⁰ A complete standoff between developed and developing nations occurred at the Copenhagen talks. In fact, as discussed below, the Kyoto Protocol has not shown significant enough technical success within the necessary time frames for the immense tasks at hand.³¹ The basic architecture must be modified. This Article offers the structural changes to construct each side of the new legal and policy carbon cube, and additionally looks in the final section at whether the U.S. can salvage the international climate change effort.

II.

THE FIRST DIMENSION: PARTICIPATION

Copenhagen broke apart on the basic issue of participation among the world’s countries. The fissure was deep and near complete. This first dimension of the existing Kyoto architecture must be remedied. In fact, earlier in the December 2007 compromise guidelines from the UN Climate Change Conference in Bali, the upcoming Copenhagen fissure lines were evident, when the Bali conference:

- Backed off specific targets for Annex 1 countries³² to cut GHGs by 2020, and instead generally referenced IPCC rec-

28. Lyman, *supra* note 1, at 704. For discussion of Joint Implementation (JI) see *Joint Implementation*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/kyoto_protocol/mechanisms/joint_implementation/items/1674.php (last visited Feb. 27, 2011); for information on CDM see *supra* note 26.

29. James Kirkup, *G8 summit: China and India Reject G8 Calls for Climate Targets*, TELEGRAPH, July 8, 2009, <http://i.telegraph.co.uk/news/worldnews/g8/5780617/G8-summit-China-and-India-reject-G8-calls-for-climate-targets.html>; see also Quirin Schiermeier, *G8 leaders fail to agree on carbon cuts before 2050*, NATURE NEWS (July 9, 2009), <http://www.nature.com/news/2009/090709/full/news.2009.660.html>.

30. Mark Landler, *Meeting Shows U.S.-India Split on Emissions*, N.Y. TIMES, July 20, 2009, at A6, available at <http://www.nytimes.com/2009/07/20/world/asia/20dipl.html>; Glenn Kessler, *Clinton, Indian Minister Clash over Emission Reduction Pact*, WASH. POST, July 20, 2009, at A11, available at <http://www.washingtonpost.com/wpdyn/content/article/2009/07/19/AR2009071900705.html>.

31. See *infra* section III.A. (discussing the basic mechanics of the Kyoto Regime).

32. Annex 1 countries are the world’s 40 most industrialized nations (and the European Union), and are thus subject to requirements of emissions reduction under

ommendations of a 25-40% cut that the IPCC indicated is required to curb runaway warming

- Backed off any binding commitments
- Backed off any requirements of developing countries; and
- Set in motion the “Bali Roadmap” of two years of discussions aimed at cutting GHGs by 2050, rather than by 2020.

A. *The New Math of Effective Kyoto Architecture*

The quantitative goals in the Kyoto Protocol are not the core problem—it is their application to only 20% of the nations that developed and signed the Protocol. The regulatory body is the United Nations Framework Convention on Climate Change (UNFCCC).³³ There are 194 members of the UNFCCC, including 193 countries and the European Union (“E.U.”) as a regional economic integration.³⁴ While originally gaining 84 signatures, now, all of these 194, except for the United States, have ratified the Protocol.³⁵

Nonetheless, most of these 193 signatory and ratifying nations have no carbon reduction amount imposed on them under the Protocol. There are forty so-called “Annex I” countries other than the United States, which geographically are very European-centric, including 27 members of the European Union, plus eight other non-EU nations in Europe, and Australia, Canada, Japan, New Zealand, and Turkey.³⁶ Only Annex I countries have imposed on them carbon emission reduction amount, which countries emit 63.7 of all world carbon emissions.³⁷ However, since the United States, an Annex I country, has not ratified the Protocol and is not therefore subject to its restrictions, after subtracting its approximately one-quarter of world carbon emissions, remaining Annex I countries subject to Kyoto Protocol carbon

the Kyoto Protocol. See *List of Annex I Parties to the Convention*, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/parties_and_observers/parties/annex_i/items/2774.php (last visited Feb. 26, 2011).

33. See *Essential Background*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/essential_background/items/2877.php (last visited Feb. 27, 2011).

34. See *Status of Ratification of the Kyoto Protocol*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php (last visited Feb. 27, 2011).

35. *Id.*

36. See *List of Annex I Parties to the Convention*, *supra* note 32.

37. See *Status of Ratification of the Kyoto*, *supra* note 34.

emission reductions represent less than 40% of world carbon sources.³⁸

Numerators are critical in the equation of Kyoto. The denominator of participating carbon contributors is a known operand of 193 world countries.³⁹ The numerator of the Kyoto Protocol is the critical operand to determine the effective participation of carbon emitters. That numerator within the Kyoto Protocol only includes 40 Annex I countries, which while representing 20% of all countries, covers much less than half of carbon emissions. The uncaptured percentage is increasing over time under this dynamic carbon equation.⁴⁰ Therein lays a major shortcoming of the Protocol as an effective legal instrument on an international scale.

In 1997, the Kyoto Protocol assigned to each Annex I country a quantity of GHG emissions for the period 2008 to 2012.⁴¹ Developing nations resisted efforts to include them in binding obligations and opposed encouraging their voluntary commitments to GHG reduction.⁴² Copenhagen was unable to reverse this basic architecture, with a deep fissure occurring between covered and uncovered nations.

The largest CO₂ emitter in the world, China, is not covered as an Annex I country.⁴³ According to former British Prime Minister Tony Blair, “the vast majority of new power stations in China and India will be coal-fired; *not ‘may be coal-fired,’ will be.*”⁴⁴ In 2007 alone, China built more new coal-fired power plants than Britain—the seat of the coal-fired industrial revolution—ever built in its entire history.⁴⁵ This creates “leakage” of greater emissions to countries not covered by the Kyoto Protocol. Over the past decade of the Kyoto Protocol’s existence, there has been

38. See *Green House Gas Data*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/ghg_data/ghg_data_unfccc/items/4146.php (last visited Feb. 27, 2011).

39. See *Status of Ratification of the Kyoto Protocol*, *supra* note 34.

40. See *infra* text accompanying notes 50–59.

41. Stephen Gardner, *EU Parliament, Council Making Progress on Post-2012 Emissions Trading Scheme*, 39 ENV'T REP. (BNA) 1417, 1419 (2008).

42. Paul G. Harris, *Common but Differentiated Responsibility: The Kyoto Protocol and United States Policy*, 7 N.Y.U. ENVTL. L.J. 27, 34 (1999).

43. *List of Annex I Parties to the Convention*, *supra* note 32.

44. Blair, *supra* note 16, at 6 (emphasis added).

45. Keith Bradsher, *China's Green Energy Gap*, N.Y. TIMES, Oct. 24, 2007, at C1, available at <http://www.nytimes.com/2007/10/24/business/worldbusiness/24power.html>; see also Mark Clayton, *Global Boom in Coal Power—and Emissions*, CHRISTIAN SCI. MONITOR, Mar. 22, 2007, at 1, available at <http://www.csmonitor.com/2007/0322/p01s04-wogi.htm>.

a significant increase of CO₂ emissions from activities in China.⁴⁶ Similarly, just before the G8 conference in June 2008, and again at the Copenhagen round in 2009, India rejected any commitment to mandatory GHG cuts.⁴⁷ However, developing countries also have a responsibility to reduce their carbon output under Kyoto.

The U.S. and China emit 40% of the world's GHG emissions, yet neither is covered by limits under the Kyoto Protocol.⁴⁸ The United States, as a signatory party, would have been covered, but it never ratified the Protocol; China's developing status exempted it as an Annex I covered country. This more than 40% U.S. and China share of emissions dwarfs the cumulative 28% of world GHG emissions from all 40 Annex 1 Kyoto ratifying parties.⁴⁹ Just two countries amply exceed the emissions of the next 40 largest carbon emitting countries. Without active involvement of more than the existing 37 Annex I Kyoto countries, there is no way to stabilize—let alone decrease—atmospheric carbon concentrations.

Global CO₂ emissions are rising at the rate of approximately 10% per year.⁵⁰ If not addressed, the annual increase in GHG emissions from India, China, Brazil, Indonesia, or any one of several dozen fast-growing nations will cumulatively swamp all of the collective GHG reductions of the developed nations complying with the modest requirement of the Kyoto Protocol.⁵¹

46. *Alarming Growth in Expected Carbon Dioxide Emissions in China, Analysis Finds*, SCIENCE DAILY (Mar. 11, 2008), <http://www.sciencedaily.com/releases/2008/03/080310155857.htm>.

47. *India Rejects Mandatory GHG Cuts*, INSIDE EPA'S CLEAN ENERGY REP. (June 30, 2008), <http://cleanenergyreport.com/2008063099175/Clean-Energy-Report-Blog/Blogging-Clean-Energy/india-rejects-mandatory-ghg-cuts/menu-id-204.html>; see also Kirkup, *supra* note 29.

48. See *List of Annex I Parties to the Convention*, *supra* note 32; see also *Status of Ratification of the Kyoto Protocol*, *supra* note 34.

49. Jeffrey Ball, *Kyoto's Caps on Emissions Hit Snag in Marketplace*, WALL ST. J., Dec. 3, 2007, at A1.

50. See Ray Purdy, *The Legal Implications of Carbon Capture and Storage under the Sea*, 7 SUSTAINABLE DEV. L. & POL'Y 22, 23 tbl.1 (2006).

51. *The Relative Shares*: The Kyoto Protocol, as currently enacted, is not going to achieve a target of reducing GHG emission to 7% below composite 1990 levels a few months from now in time for its 2012 target. Making the comparison of the responsibility for increasing GHG emissions of developed and developing countries over time: Developed countries, representing about 20 of all countries, were responsible for 18.6 billion tons of GHGs emitted annually. U.N. Framework Convention on Climate Change, *National greenhouse gas inventory data for the period 1990–2004 and status of reporting*, Oct. 19, 2006, U.N. Doc. FCCC/SBI/2005/18, available at unfccc.int/resource/docs/sbi/eng/26.pdf. One hundred twenty-two developing na-

The balance is changing rapidly, in ways that disadvantage the effectiveness of the existing Kyoto Protocol. The thirty richest nations (members of the Organization for Economic Cooperation and Development, or “OECD”) produce a small majority of the world CO₂ emissions—currently estimated at about twenty-five gigatons (Gt) annually—compared to developing countries.⁵² The crossover point is projected to be no later than 2020, when OECD countries and developing countries each are projected to emit roughly comparable amounts of CO₂ into the atmosphere. By 2030, the position of developed and developing

tions of the approximately 160 developing countries (which reflect reporting from about three-quarters of developing countries) reported 11.7 billion tons of GHG emissions in 2004. U.N. Framework Convention on Climate Change, *Sixth Compilation and Synthesis of National Communications from Parties Not Included in Annex 1 to the Convention*, Oct. 25, 2005, U.N. Doc. FCCC/SBI/2005/18/Add.2.

The Impact of Developing Nation Growth: Somewhat more than half of GHGs emitted annually now are from developed countries. If the non-Annex 1 developing nations increase their electricity demand and utilize predominately fossil-fuels for this expansion, their GHG emissions will increase by a forecast 4% annually between 2007 and 2020 (2004 World Energy Assessment, at 31). This cumulative compounded increase of about 60% of power use in developing nations over 15 years, alone, will constitute an increase of 24% in carbon emissions worldwide. U.N. Dev. Programme, *WORLD ENERGY ASSESSMENT: OVERVIEW 2004*, at 31, U.N. Sales No. E.04.III.B.6 (2004).

Less Developed Nation Significance. Between 1990-2004, the 41 Annex 1 developed nations, excluding the countries with “economies in transition” (the failed former Soviet economies), increased GHG annual emissions by 12.1%. U.N. Framework Convention on Climate Change, *National greenhouse gas inventory data for the period 1990–2004 and status of reporting*, Oct. 19, 2006, U.N. Doc. FCCC/SBI/2005/18, available at unfccc.int/resource/docs/sbi/eng/26.pdf. If these 41 “developed” Annex 1 nations regulated by the Kyoto Protocol were to reduce their emissions by the Kyoto goal of approximately 20% from current levels, equivalent to 7% from 1990 levels. This would constitute an approximately 12% reduction in world carbon emissions (60% of total at 20% reduction = 12%). This reduction is only about half the increase from developing nations. U.N. Dev. Programme, *WORLD ENERGY ASSESSMENT: OVERVIEW 2004*, at 31, U.N. Sales No. E.04.III.B.6 (2004). Therefore, the increase in GHGs from developing countries is twice the reduction of developed nations, even assuming that the Kyoto targets are achieved by 2020. However, these targets only affect that 20% of world nations that are developed, and to date, these developed nations will not meet these reduction levels. Therefore, under the best of circumstances where everything works in developed nations as envisioned, the Kyoto Protocol will not sufficiently reduce world GHG emissions, which will dramatically increase instead of decrease. Under current reality, a world reduction in carbon is only possibly achieved if the developing nations of the world do not base their increasing electrification on carbon-based fuels. As the five-year period of the Kyoto Protocol ends, this has not occurred to any significant degree.

⁵² See Purdy, *supra* note 50, at 23 tbl.1. OECD and developing countries collectively constitute more than 90% of all CO emissions and are projected to continue this percentage over time. See OECD ECONOMIC OUTLOOK, ORG. ECON. COMM. DEV. 197 (1998), available at <http://www.oecd.org/dataoecd/58/50/29173911.pdf>

nations will have reversed, with developing countries providing the dominant share of CO₂ emissions, and increasing over time into the foreseeable future.⁵³

This trend is important in assessing the signature of the Kyoto Protocol as an effective or ineffective long-term international architecture for the reduction of emissions. The critical reality is that developing nations represent the geographic core of expected exponential increase in CO₂ emissions: it is there that new global warming architecture and law must focus. To bypass or ignore them, as the Kyoto Protocol entirely does,⁵⁴ is to invite broad policy failure.

The United States Energy Information Administration (EIA) forecasts a 50% worldwide increase of carbon emissions between 2005 and 2030 as the most likely scenario.⁵⁵ The International Energy Agency forecasts a 25-90% increase over the same period.⁵⁶ The International Energy Agency concluded that absent a major policy change, CO₂ emissions could increase 130% by 2050.⁵⁷ Most of the projected increase will occur in developing countries, whose emissions are projected to grow five times as fast as emissions from industrialized countries over the next twenty-five years.⁵⁸ Projections estimate that by 2030, China's GHG emissions will quadruple and Asia alone will emit 60% of the world's carbon emissions.⁵⁹

Therefore, the new international architecture to control warming must draw its legal authority around major developing nations. The Kyoto Protocol does not do this, and talks of inclusion

53. *Id.*

54. The Kyoto Protocol only regulates 34 of the 200 nations in the world. While these covered developed nations represent an important fraction of global carbon emissions, it is a significant minority of total carbon sources. See generally Kyoto Protocol, *supra* note 25.

55. ENERGY INFO. ADMIN., U.S. DEPT. OF ENERGY, DOE/EIA-0484(2008), INTERNATIONAL ENERGY OUTLOOK (Sept. 2008), available at [http://www.eia.doe.gov/oiaf/archive/ieo08/pdf/0484\(2008\).pdf](http://www.eia.doe.gov/oiaf/archive/ieo08/pdf/0484(2008).pdf)

56. U.N. INTERNATIONAL PANEL ON CLIMATE CHANGE, FOURTH ASSESSMENT REPORT: CLIMATE CHANGE 2007 (Rajendra K. Pachauri et al. eds., 2007).

57. *Energy Estimates Show rise in CO₂ Emissions, Offer Mitigation Options*, INSIDE EPA'S CLEAN ENERGY REP. (June 26, 2008), <http://cleanenergyreport.com/2008062699158/Carbon-Control-Daily-News/News/energy-estimates-show-rise-in-co2-emissions-offer-mitigation-options/menu-id-202.html>.

58. ENERGY INFO. ADMIN., *supra* note 55, at 89.

59. Deborah E. Cooper, Note, *The Kyoto Protocol and China: Global Warming's Sleeping Giant*, 11 GEO. INT'L ENVTL. L. REV. 401, 404 (1999); see also NICHOLAS STERN, CHINA'S GROWTH, CHINA'S CITIES, AND THE NEW GLOBAL LOW-CARBON INDUSTRIAL REVOLUTION 10 (2010), available at <http://www2.lse.ac.uk/GranthamInstitute/publications/Policy/docs/PPstern-china-industrial-revolution.pdf>.

into Kyoto have met resistance from developing nations at the Copenhagen round. A new legal architecture must include developing nations and appropriate architecture for them to deal with carbon emissions in a cost-effective manner.

B. *Reforming Forest Architecture—Now Ineligible under Kyoto*

Deforestation accounts for 18% of annual global warming, making it the second largest source of global warming.⁶⁰ The loss of rainforest not only lowers carbon absorption, but by removing cover, also increases local water vapor creation, which is a potent GHG.⁶¹ The Kyoto Protocol does not recognize the preservation of forest for creating creditable offsets that can be traded to those needing carbon emission allowances. The ramifications of this policy choice are critical: leading carbon scientists have submitted that the only way to reduce carbon concentrations to even 90% of current levels is to adopt “forestry practices that sequester carbon” or there will be “irreversible catastrophic effects.”⁶²

Forests store about 45% of terrestrial carbon, and remove from the atmosphere about one third of the anthropogenic carbon emitted annually.⁶³ Up to 20% of annual GHGs are linked to deforestation—emissions these forests would have scrubbed from the air.⁶⁴ Forests provide a better way to sequester atmospheric CO₂ than the proposed controversial sequestration experiments in underground mines or in the ocean, because forests are a self-sustaining system, while long-term underground or under-sea storage is not proven.⁶⁵ Forest ecosystems store an estimated

60. NICHOLAS STERN ET AL., THE STERN REVIEW OF THE ECONOMICS OF CLIMATE CHANGE 171 (2006), available at http://www.azclimatechange.gov/download/stern_review.pdf.

61. *Stratospheric Water Vapor Is a Global Warming Wild Card*, SCIENCE DAILY (Feb. 1, 2010), <http://www.sciencedaily.com/releases/2010/01/100131145840.htm>; see also FERREY, *supra* note 12.

62. James Hansen et al., *supra* note 27.

63. Gordon Bonan, *Forests and Climate Change: Forcings, Feedbacks, and the Climate Benefits of Forests*, 320 SCIENCE 1444, 1444–49 (2008); PERVAZE A. SHEIKH & ROSS W. GORTE, CONG. RESEARCH SERV., RL34634, CLIMATE CHANGE AND INTERNATIONAL DEFORESTATION: LEGISLATIVE ANALYSIS 1 (2008).

64. Dean Scott & Eric Lyman, *Negotiators Finalize Measure on Forests, Fund for Adapting to Global Warming Effects*, 38 ENV'T REP. (BNA) 2699, 2700 (2007).

65. Steven Ferrey, *The Failure of International Global Warming Regulation to Promote Needed Renewable Energy*, 37 B.C. ENV'T. AFF. L. REV. 67, 100 (2010).

50% more carbon than the entire amount contained in the earth's atmosphere.⁶⁶

Tropical forests are responsible for about a quarter of this absorption, yet deforestation occurs most rapidly in tropical forests in South America and Africa.⁶⁷ Rain forests in the Brazilian Amazon, Madagascar and the Philippine archipelago are seeing soaring rates of deforestation.⁶⁸ In 2007, Amazon rainforest deforestation rates quadrupled in the last months of the year,⁶⁹ while Indonesian tropical deforestation exceeds one million hectares of forest annually.⁷⁰ About half of the mature tropical forests, between 750 to 800 million hectares of the original 1.5 to 1.6 billion hectares that once covered the planet, have already fallen.⁷¹ Deforestation is rapidly increasing, with deforestation in Brazil and Indonesia exceeding one million hectares per year.⁷² Deforestation continues at a rate of one acre per second.⁷³

Each year, forests equal to the size of Portugal, or half the size of England, are depleted.⁷⁴ Half of this destruction is from illegal logging that is not effectively policed,⁷⁵ estimated to be a \$10 billion annual black market industry.⁷⁶ Logs are fungible commodities, and once cut, it is difficult to determine whether the

66. Michael L. Brown, *Limiting Corrupt Incentives in a Global REDD Regime*, 37 *ECOLOGY L.Q.* 237, 238 (2010).

67. PERVAZE A. SHEIKH & ROSS W. GORTE, *supra* note 63, at 1.

68. See *Brazil Amazon Deforestation Soars*, BBC NEWS, Jan. 24, 2008, available at <http://news.bbc.co.uk/2/hi/americas/7206165.stm>; see also Lorraine A. Remer; see also *NASA Tropical Deforestation Research*, *Earth Observatory*, NASA EARTH OBSERVATORY, http://earthobservatory.nasa.gov/Library/Deforestation/deforestation_update4.html (last visited Feb. 27, 2011) (describing methods of reliably assessing deforestation).

69. Michael Kepp, *Recent Jump in Amazon Deforestation Rates Prompts Brazil to Adopt Emergency Measures*, 31 *INT'L ENV'T REP.* 113, 113 (2008).

70. FOREST INVENTORY AND MAPPING CTR., MINISTRY OF FORESTRY OF REPUBLIC OF INDONESIA, FRMA 08, FOREST RESOURCES MONITORING IN INDONESIA, http://www.dephut.go.id/informasi/unff/COP%2013/FRM_in_Indonesia.pdf.

71. Ron Nielsen, *THE LITTLE GREEN HANDBOOK: SEVEN TRENDS SHAPING THE FUTURE OF OUR PLANET*, PICADOR 34 (2006).

72. FOREST INVENTORY AND MAPPING CTR., MINISTRY OF FORESTRY OF REPUBLIC OF INDONESIA, *supra* note 70.

73. Daniel Watts, *Capping Deforestation Emissions in Developing Countries Equitably and Effectively*, 8 *SEATTLE J. FOR SOC. JUST.* 819, 820 (2010).

74. See *Global Problem*, CARBON PEOPLE, http://www.carbonpeople.com.au/global_problem.html (last visited Mar. 12, 2011).

75. ANDREW W. MITCHELL ET AL., GLOBAL CANOPY PROGRAMME, FORESTS FIRST IN THE FIGHT AGAINST GLOBAL CLIMATE CHANGE 9 (2007), available at <http://www.globalcanopy.org/themedia/file/PDFs/Forests%20First%20June%202007.pdf>.

76. Brown, *supra* note 66, at 253.

timber is illegal or not, where simply crossing the border from the harvesting country to the processing country is enough to “launder” the commodity.⁷⁷

The global demand for wood products is a trillion dollar industry, creating a relentless demand to harvest beyond designated areas.⁷⁸ A World Bank report found that 83% of Indonesia’s annual GHG emissions, as well as 60% of Brazil’s GHG emissions, come from the destruction of their forests.⁷⁹ Collectively, these emissions from two countries account for almost 10% of the world’s total emissions of greenhouse gases.⁸⁰

Under the Kyoto Protocol, offset carbon credits can be obtained for planting trees but not for preserving existing forests.⁸¹ It is estimated that purchasing and policing existing forest preservation could be accomplished at a price of approximately \$4 per ton of carbon saved—much cheaper than the cost of European Union Emission Reduction Unit (“EU-ERU”) carbon credits. No credit of any kind either under the Kyoto Protocol or under the parallel European Union Emissions Trading Scheme (“EU-ETS”) is given to any country for preserving forest resources.⁸² Leading up to the Kyoto Protocol, developed nations objected to such credit, arguing that it would be difficult to monitor and measure the amount actually preserved, as well as to ensure that preservation would endure over time.⁸³ Some modest demonstration programs on preserving forests were finally launched in 2008.⁸⁴

The Kyoto signatories expressly limited land use and forestry projects that can earn credits to those involving afforestation (tree planting on non-forested land) and reforestation (tree planting on previously forested land).⁸⁵ The European Union’s emissions trading scheme, which provides the chief Kyoto compliance mechanism for the Union’s members, goes even further

77. *Id.*

78. *Id.* at 255.

79. Thomas Lovejoy, *The Threat From Trees, Global Warming Isn't Just A Problem of Cars and Smokestacks But of the Chain Saw, Too*, NEWSWEEK, June 28, 2008, <http://www.newsweek.com/id/143691>.

80. MITCHELL ET AL., *supra* note 75, at 11.

81. Jeffrey Ball, *Kyoto's Caps on Emissions Hit Snag in Marketplace*, WALL ST. J., Dec. 3, 2007, at 1.

82. *Id.*

83. Dean Scott & Eric Lyman, *supra* note 64, at 2699–2700.

84. *Id.*

85. Kyoto Protocol, *supra* note 26, at Art. 3.

by excluding all forestry credits and including those from afforestation and reforestation projects.⁸⁶

Furthermore, there is new evidence that afforestation (eligible for offset credits under Kyoto) may not be as beneficial as forest preservation (not eligible).⁸⁷ Apparently, not all forest resources are created equal. A new Australian study claims that natural forests are 60% more efficient than created forests in sequestering carbon.⁸⁸ Natural forests, untouched, stored the carbon for longer than plantation forests, which were cut down on a rotation basis, while commercial logging changes the age structure of forests so that the average age of trees is much younger.⁸⁹

In addition, there is a significant carbon sequestration loss once original natural forest is destroyed, even if replaced with new afforestation acreage.⁹⁰ So perhaps preservation of existing forests is more critical than afforestation of new areas.⁹¹ Forest preservation, however, remains ineligible for credits under the Kyoto Protocol, the EU-ETS, and the Regional Greenhouse Gas Initiative program in ten U.S. states.⁹²

Efforts of some developing countries to change the Protocol to include credit for avoiding deforestation in a Clean Development Mechanism project was tabled in 2005 meetings and was not resolved at the Bali climate meetings in late 2007 or in the Copenhagen round of talks in 2009.⁹³ At the December 2009 COP-15 meeting in Copenhagen, Denmark, the "crucial role of reducing emissions from deforestation and forest degradation," was expressly recognized, and it called for the "immediate establishment of a mechanism" to mobilize financial resources from developed countries for capacity building and other Reducing Emissions and Deforestation in Developing Countries

86. Stuart E. Eizenstat, *Seeing the Climate Policy for the Trees*, N.Y. TIMES, Nov. 4, 2006, <http://www.nytimes.com/2006/11/04/opinion/04eizenstat.html>.

87. See Michael Perry, *Untouched Forests Store 3 Times More Carbon – Study*, REUTERS, Aug. 4, 2008, <http://www.reuters.com/article/latestCrisis/idUSSP255954>.

88. *Id.*

89. *Id.*

90. *Id.*

91. *Growing Forestry Offsets*, 2 CARBON CONTROL NEWS 32, (2008); see also Perry, *supra* note 87.

92. See Ball, *supra* note 81.

93. Kenneth Richards et al., *Agriculture and Forestlands: U.S. Carbon Policy Strategies*, PEW CENTER ON GLOBAL CLIMATE CHANGE 13 (2006), available at <http://www.pewclimate.org/docUploads/Agricultural%20and%20Forestlands-U.S.%20Carbon%20Policy%20Strategies.pdf>.

(“REDD”) related activities.⁹⁴ The Copenhagen accord recognized that a financing mechanism was required for REDD.⁹⁵ A pilot project in five selected countries was announced in 2009.

There were first steps at COP-16 in Cancun in December 2010, which concluding text of two pages shows some progress with calls for developing nations to craft national “action plans” and other policies on forest protections.⁹⁶ Brazil, one of the key voices on REDD, expressed specific concern with the REDD scheme infringing on sovereignty.⁹⁷ Very few developing countries can monitor their deforestation via satellite, thus “leakage” to deforestation to other areas is a risk, as is the permanence of preserved areas. Under REDD, credit accounting baselines are established based on historic deforestation rates, which have always fluctuated, and therefore, there is no way to determine required “additionality” for CDM or monitor real achieved progress. No long-term plan for financing for REDD is in place.⁹⁸

New international architecture can create an opportunity to radically alter forest management and improve livelihoods in rural areas of developing countries.⁹⁹ Many indigenous populations live off existing forests, and forest preservation, species protection, ecotourism, and sustainable harvesting can be a source of local employment. Currently, the most affordable, cost-effective solution for carbon concentration mitigation in developing countries still is off the Kyoto table and needs to be resurrected as part of creating a new architectural line of cost-effective activities.

94. William Boyd, *Ways of Seeing in Environmental: How Deforestation Became an Object of Climate Governance*, 37 *ECOLOGY L.Q.* 843, 843 (2010).

95. PETER AKONG MINANG & DEBORAH MURPHY, INT’L INSTITUTE FOR SUSTAINABLE DEVELOPMENT, *REDD AFTER COPENHAGEN: THE WAY FORWARD 20* (2010), available at http://www.asb.cgiar.org/PDFwebdocs/REDD_After_Copenhagen-EN.pdf.

96. United Nations Framework Convention on Climate Change Conference of the Parties, Cancun, Mex., Nov. 29–Dec. 10, 2010, Decision, U.N. Doc. FCCC/CP/2010/7/Add.1 at 13 ¶72 (Mar. 15, 2011), <http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf#page=2>.

97. Dean Scott & Eric J. Lyman, *Cancun Talks End With Agreement to Push For Greater Emissions Cuts, Verify Actions*, 41 *ENV’T REP. (BNA)* 2793 (2010).

98. Robin Chase, *Get Real on Global Warming Goals*, *BOSTON GLOBE*, Apr. 22, 2008, at A15.

99. Mohamed T. El-Ashry, *An Overview of This Issue: Framework for a Post-Kyoto Climate Change Agreement*, 8 *AM. U. SUSTAINABLE DEV. L. & POL’Y* 2, 3 (2008).

Forest preservation is an important element for inclusion of a new post-Kyoto carbon architecture that seeks to include developing countries. It provides the means for the inclusion of more countries in Kyoto.

C. *Black Carbon*

Black carbon, commonly known as soot, is an unaddressed and significant GHG emission of concern, especially in the Himalayas and the Polar Regions, including Greenland and the West Antarctic ice sheets. Black carbon particulate emissions were recently identified as the second most important climate change agent. Because black carbon is an aerosol, it is responsible for trapping heat and changing the albedo of snow and ice.¹⁰⁰ Simultaneously, reducing black carbon emissions would save up to three million lives a year that otherwise are lost due to the health effects of air pollution.¹⁰¹

Black carbon is not covered in any way under the Kyoto Protocol, nor did it appear on the late 2007 Bali agenda for consideration. Black carbon “particularly from fossil-fuel sources, is very likely to be the fastest method of slowing global warming” in the immediate future, according to Dr. Mark Jacobson at Stanford University, who notes that major cuts in soot emissions could slow the effects of climate change for a decade or two,¹⁰² giving policymakers more time to address CO₂ emissions.¹⁰³

100. James Hansen & Larissa Nazarenko, *Soot Climate Forcing Via Snow and Ice Albedos*, 101 PROC. NAT'L ACAD. OF SCI., 423, 427 (2004).

101. Mark Jacobson, *Control of Fossil-Fuel Particulate Black Carbon and Organic Matter, Possibly the Most Effective Method of Slowing Global Warming*, 107 J. GEOPHYSICAL RES. 16-1 (2002) (citing C. A. Pope III & D. W. Dockery, *Epidemiology of particle effects*, AIR POLLUTION AND HEALTH, 673-705 (1999) and statistics from the World Health Organization).

102. *EPA Black Carbon and Global Warming: Hearing Before the H. Comm. on Oversight & Government Reform*, 110th Cong. 12 (2007) (statement of V. Ramanathan), available at http://house.resource.org/110/gov.house.ogr.20071018_hrs11RFM2154.pdf (“[t]hus a drastic reduction in BC has the potential of offsetting the CO₂ induced warming for a decade or two . . .”).

103. *EPA Black Carbon and Global Warming: Hearing Before the H. Comm. on Oversight & Government Reform*, 110th Cong. 12 (2007) (statement of M. Jacobson), available at house.resource.org/110/gov.house.ogr.20071018_hrs11RFM2154.pdf [hereinafter Jacobson Testimony]; see also *Climate Briefing Note: Reducing Black Carbon, or Soot, May Be Fastest Strategy for Slowing Climate Change*, INSTITUTE FOR GOVERNANCE & SUSTAINABLE DEVELOPMENT (Apr. 22, 2008), <http://www.igsd.org/docs/BC%20Briefing%20Note%2027Mar08.pdf>; Veerabhadran Ramanathan & Gregory R. Carmichael, *Global and Regional Climate Changes Due to Black Carbon*, 1 NAT. GEOSCIENCE 221, 226 (2008) (black carbon “offers an opportunity to mitigate the effects of global warming trends in the short term”).

There is an important location-based aspect of black carbon: today, unlike CO₂, the overwhelming majority of black carbon emissions are from developing countries.¹⁰⁴ Emissions are only expected to increase.¹⁰⁵ The largest sources of ambient black carbon emissions are in Asia, Latin America, and Africa.¹⁰⁶ China and India alone account for 25-35% of total worldwide global black carbon emissions,¹⁰⁷ with emissions from China doubling from 2000 to 2006.¹⁰⁸

III.

THE SECOND DIMENSION: REENGINEERING THE POWER BASE IN NON-ANNEX 1 DEVELOPING COUNTRIES

A. *The Architecture of the Power Generating Base*

More than one-third of CO₂ emissions are attributable to the electric power sector.¹⁰⁹ Energy use, and the construction of fossil fuel fired power generation facilities, is increasing as population growth and development continue, especially in developing nations.¹¹⁰ There is no concerted government effort to control either population itself, or consumption by the population.¹¹¹ The majority of energy and power generation expansion will occur just in Asia over the next decades.¹¹² Unabated, this exponential increase in power demand in developing nations will tip the global environment thermostat to run-away global warming

104. EPA Black Carbon and Global Warming: Hearing Before the H. Comm. on Oversight & Government Reform, 110th Cong. 12 (2007) (statement of Tami Bond), available at house.resource.org/110/gov.house.ogr.20071018_hrs11RFM2154.pdf.

105. Jacobson Testimony, *supra* note 103, at 5.

106. Tami Bond, *Air Pollution as a Climate Forcing: A Workshop*, NAT'L AERONAUTICS & SPACE ADMIN., <http://www.giss.nasa.gov/meetings/pollution2002/summary.html> (last viewed Mar. 28, 2011).

107. Ramanathan & Carmichael, *supra* 103, at 226.

108. *Id.*

109. *See Emission of Greenhouse Gases in the United States 2005*, U.S. ENERGY INFO. ADMIN. (Feb. 2007), available at <http://www.eia.doe.gov/oiaf/1605/ggprt/summary/carbon.html>.

110. *World Bank Statement*, U.N. COP11, available at <http://siteresources.worldbank.org/ESSDNETWORK/Resources/MINISTERIALSEGMENTCOP11Montreal.pdf>; INT'L ENERGY AGENCY, *supra* note 11.

111. Arnold Reitze, *Electric Power in a Carbon-Constrained World*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 821, 928-929 (2010).

112. INT'L ENERGY AGENCY, *supra* note 11.

risk, regardless of what the U.S. and other developed nations do to rein in their carbon emissions.¹¹³

Ninety eight percent of anthropogenic CO₂ emissions are from combustion of fossil fuels.¹¹⁴ A fossil fuel generation result in 64% of the total atmospheric carbon dioxide, and this amount has increased significantly since 1990.¹¹⁵ Power derived from burning gaseous, liquid and solid fossil fuels release copious quantities of CO₂ into the environment.¹¹⁶ Most countries are using fossil fuels, not renewable power resources, to satisfy their exponential increase in demand.¹¹⁷

GHG emissions increased about 70% between 1970 and 2004, with combustion of fossil fuels accounting for 70% of GHG emissions and electric power generation responsible for 40% of those emissions—particularly with coal-fired electric power generation accounting for about 70% of the emissions in this sector.¹¹⁸ Global energy-related emissions are expected to increase 57% from 2005 to 2030.¹¹⁹ From any perspective, there is a fast-growing problem with coal resources at the center.¹²⁰ Seventy three

113. RICHARD B. ALLEY ET AL., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, U.N. ENV'T PROGRAMME, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, SUMMARY FOR POLICY MAKERS 17 (2007), available at <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf>.

114. *Emission of Greenhouse Gases in the United States 2005*, *supra* note 109.

115. *Id.*; *Frequently Asked Global Change Questions*, CARBON DIOXIDE INFO. ANALYSIS CENTER, <http://cdiac.ornl.gov/faq.html> (last visited Apr. 30, 2008).

116. The amount of carbon released per unit of usable energy decreased each time as human populations moved from wood to coal as the dominant CO₂-releasing fuel in the late 19th century, and again moved from coal to oil in the mid-20th century, and will move toward natural gas in the future. See Steve Ferrey, *When 1 + 1 No Longer Equals 2: The New Math of Legal "Additionality" Controlling World and U.S. Global Warming Regulation*, 10 MINN. J.L. SCI. & TECH 591, 599 (2009) (citing STEVEN FERREY, *THE LAW OF INDEPENDENT POWER* § 2.1 (West 26th ed. 2008)).

117. See *Electricity Emissions in the United States*, PEW CENTER, at fig.12 (May 2009), available at <http://www.pewclimate.org/technology/overview/electricity>. 41% of world electric production, and 49% U.S. electric production, is from coal. *Id.* at figs.2 & 12.

118. Joëlle de Sépibus, *The Liberalisation of the Power Industry in the European Union and its Impact on Climate Change 2-4* (Swiss Nat'l Ctr. Of Competence in Research, Working Paper No. 10, 2008), available at http://phase1.nccr-trade.org/images/stories/publications/IP6/de_Sepibus_EU_libCC_final.pdf.

119. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-09-151, INTERNATIONAL CLIMATE CHANGE PROGRAMS: LESSONS LEARNED FROM THE EUROPEAN UNION'S EMISSIONS TRADING SCHEME AND THE KYOTO PROTOCOL'S CLEAN DEVELOPMENT MECHANISM (Nov. 2008), available at <http://www.gao.gov/new.items/d09151.pdf>.

120. *Coal and Climate Change Facts*, PEW CENTER, <http://www.pewclimate.org/global-warming-basics/coalfacts.cfm> (last visited Feb. 27, 2011). It is estimated that 86% of incremental world coal demand between now and 2030 will come from China and India. *Id.* China's coal output increased from 1.3 billion tons in 2000 to

percent of U.S. electricity and 67% of world electricity production is from fossil fuels.¹²¹ Electric power demand is continuing to increase.¹²² At current rates of energy development, energy-related CO₂ emissions in 2050 would be 250% of their current levels.¹²³

Unprecedented deployment of renewable energy generation alternatives will be required to alter this trend.¹²⁴ The technology exists to accomplish this. Renewable power is the long-term win-win scenario for developing nations. Renewable energy can provide opportunities for poverty alleviation, supply energy, and enhance energy security by relying on domestic resources.¹²⁵ Unlike fossil fuels, renewable resources are widely disseminated across the globe. While many nations—particularly developing nations—have no significant fossil fuel reserves of oil, coal or natural gas, every nation has significant renewable energy in some form, such as hydropower, sunlight, wind, agricultural biomass waste, wood, and ocean wave power.

However, unless the post-Kyoto architecture segregates and promotes these technologies, developing nations will not deploy them sufficiently, instead opting to burn coal and other traditional fossil fuels. For instance, developers of Kyoto CDM projects in developing nations are trapping methane and flaring it, without turning its combustion and heat in an engine into free electricity in the process.¹²⁶ Since natural gas, a by-product where oil is located, is composed principally of methane, lighting it for purposes of destruction without utilizing the heat or light produced converts the methane to CO₂, which is a less potent

2.23 billion tons in 2005 making China by far the world's largest coal producer; the next largest is the U.S. with 1.13 billion tons produced in 2005. *Id.* About half of China's coal use is for electricity; and 80% of electricity generation is fueled by coal. *Id.*

121. *Id.*

122. See INT'L ENERGY AGENCY, *supra* note 11.

123. ENERGY-TECHNOLOGY PERSPECTIVES-SCENARIOS AND STRATEGIES TO 2050, INT'L ENERGY AGENCY 16 (2006), available at http://www.unece.lsu.edu/biofuels/documents/2007July/SRN_020.pdf.

124. Neal J. Cabral, *The Role of Renewable Portfolio Standards in the Context of a National Carbon Cap-and-Trade Program*, 8 AM. U. SUSTAINABLE DEV. L. & POL'Y 13, 14-15 (2007).

125. El-Ashry, *supra* note 99, at 3.

126. Steven Ferrey, *The Failure of International Global Warming Regulation to Promote Needed Renewable Energy*, 37 B.C. ENVTL. AFF. L. REV. 67, 92-93 (2010).

GHG.¹²⁷ These easy solutions reduce GHGs, but perpetuate the need for electricity to be produced from fossil fuels.

Industrial emitters in each country are able to trade emission allowances or create new additional offset credits through specific mechanisms. The Clean Development Mechanism (CDM) allows projects in non-Annex 1 countries that reduce greenhouse gases in developing nations to create and earn Certified Emission Reductions (CERs) for each ton of CO₂-equivalent of GHGs reduced.¹²⁸ Those CERs are then traded or sold to owners of regulated activities in Annex I developed countries, which increases that country's emission cap allocated in the Protocol.¹²⁹ Emission trading can serve as a means to transfer funds to developing countries, as well as fostering least-cost emission mitigation internationally. Renewable energy projects account for 28% of CDM CERs; methane capture and flaring projects producing no electricity, mostly located at large landfills, coal mines, and Concentrated Animal Feeding Operations, account for 19% of CERs.¹³⁰

Therefore, while the Kyoto Protocol CDM process encourages carbon reduction in developing countries, it does not always result in a substitution of renewable power for conventional fossil-fuel power.¹³¹ For instance, developers of Kyoto CDM projects in developing nations are trapping methane and flaring it in a flame to destroy its methane content, without turning the resultant heat into free electricity by igniting it in an engine in the process.¹³² The world stands at a crossroads in time because in

127. See SCI. AND TECH. COMM., MEETING UK ENERGY AND CLIMATE NEEDS: ROLE OF CARBON CAPTURE AND STORAGE: GOVERNMENT RESPONSE TO THE COMMITTEE'S FIRST REPORT OF SESSION 2005-06, 2006, H.C. 578-1, at 2 (U.K.), available at <http://www.publications.parliament.uk/pa/cm200506/cmselect/cmsctech/1036/1036.pdf>; FERREY, *supra* note 12, at 236 tbl.5.1.

128. See Kyoto Protocol, *supra* note 25, art. 12.

129. Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol, Nov. 28-Dec. 10, 2005, *Report of the Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol on its First Session, Held at Montreal from 28 November to 10 December 2005*, at 27, U.N. Doc. FCCC/KP/CMP/2005/8/Add.2 (Mar. 3, 2006), available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf>. Credits earned after 2000 can be used to achieve compliance during first commitment period, which begins in 2008. 2.5% of ERUs and CERs may be carried over to the second phase of implementation after 2012. *Id.*

130. Michael Wara, *Measuring the Clean Development Mechanism's Performance and Potential*, 55 UCLA L. REV. 1759, 1779 (2008).

131. *Id.*

132. Observation of the author, in his work for the World Bank and U.N. Development Program as Legal Advisor on power development in developing countries since 1993 to the present. See also Kris Christen, *Environmental Impacts of Gas*

the next decade, there will be a massive investment in electrification of developing nations.¹³³ Once installed, those facilities will remain in place, often for forty years and in many cases longer.¹³⁴ According to Rajendra Pachauri, International Panel on Climate Change Chairman, “What we do in the next two to three years will determine our future.”¹³⁵ The choices in energy technology made now certainly will be the signature of the world carbon footprint for the remainder of this century, during which we may pass the point of no return in terms of global warming.¹³⁶

But under the current Kyoto Protocol, proper incentives are not present: “The CDM has, for a variety of reasons, been largely unsuccessful in encouraging real and significant changes in developing countries,” according to the June 2008 report of an independent task force of the Council on Foreign Relations.¹³⁷ CDM “has been disappointingly ineffective at achieving its goal of effecting fundamental shifts toward cleaner energy production”¹³⁸ CDM architecture must be modified to effect fundamental shifts in energy production. That architecture must target renewable energy projects and forest preservation as priority targets. There will need to be a link between national cred-

Flaring, Venting Add Up, ENVTL. SCI. & TECH, Dec. 15, 2004, available at <http://pubs.acs.org/doi/pdf/10.1021/es0406886>; Charles Peterson et al, *Waste and the World Bank*, WASTE MGMT. WORLD (Aug. 1, 2010), http://www.waste-management-world.com/wmw/en-us/index/display/article-display.articles_waste-management-world.volume-11.Issue-4.Features.Waste-and-the-world-bank.html; U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-04-809, NATURAL GAS FLARING AND VENTING: OPPORTUNITIES TO IMPROVE DATA AND REDUCE EMISSIONS (2004), available at <http://www.gao.gov/cgi-bin/getrpt?GAO-04-809>. CDM projects are credited by capturing or destroying carbon gases, rather than maximizing efficiency. Because one receives greater credit by 2100% from destroying methane than CO₂, many CDM projects capture rural or agricultural methane and flare it (converting it to CO₂). But in that flaring process, it is not used to produce electricity, which is otherwise locally supplied by traditional sources. Rather than make the lifecycle cost-effective investment in electric generation technology, CDM investors often minimize capital investments by flaring methane and ignoring essentially free-at-the-margin electric generation. The source of this is observation of the author in his extensive work around the world advising international organizations and private entities on carbon policy.

133. See Wara, *supra* note 130, at 1790–91.

134. See SCI. AND TECH. COMM., *supra* note 127.

135. See *2020 Climate Leadership Campaign*, STATE OF THE WORLD F., <http://www.worldforum.org/climate-change.htm> (last visited Mar. 8, 2011).

136. See Bill McKibben, *How Close to Catastrophe?*, N.Y. REV. BOOKS (Nov. 16, 2006), <http://www.nybooks.com/articles/19596> (quoting NASA's James Hansen on the necessity of a radical carbon transformation by 2015).

137. GEORGE E. PATAKI ET AL., *CONFRONTING CLIMATE CHANGE: A STRATEGY FOR U.S. FOREIGN POLICY* 5 (2008).

138. *Id.* at 49.

its and offset trading markets for there to be meaningful international interchange between these markets.

China and India are building a significant amount of new coal powered plants.¹³⁹ China and India have around one quarter of the world's coal reserves, and are deploying them rapidly to fire electric power plants.¹⁴⁰ India has targeted 100,000 megawatts (MW) in new capacity over the next ten years.¹⁴¹ China is currently installing 1,000 MW of coal power generation each week and predictions are that by the year 2030, coal-fired power in India and China will add three *billion* extra tons of CO₂ to the atmosphere every year.¹⁴² Therefore, just these additional CO₂ emissions from China and India's electric power sectors will constitute approximately 10% of all world CO₂ emissions from all sources.¹⁴³

China currently meets 71% of its electricity demand through coal plants, the most prolific emitters among fossil fuel plants in terms of both CO₂ and particulate matter; 70% of India's electricity comes from coal.¹⁴⁴ None of the countries with the largest coal reserves—United States, China, India, and Indonesia—has a carbon policy to regulate the release of CO₂ from the deployment of such coal reserves.

The immediate funding of renewable energy projects worldwide, and especially in Asia given its growth, is necessary to prevent these nations from becoming even more reliant on an expanding fossil fuel-based generation infrastructure in the long term. There needs to be a proven format that developing nations can deploy to achieve the right kind of renewable energy power projects. Fortunately, the proven model for the new post-Kyoto architecture exists.

139. See Ray Purdy, *The Legal Implications of Carbon Capture and Storage under the Sea*, 7 SUSTAINABLE DEV. L. & POL'Y 22, 23 (2006).

140. Steven Ferrey, *The Missing International Link for Carbon Control*, ELEC. J., Apr. 2009, at 17, 19.

141. *Power*, PUB. PRIVATE PARTNERSHIPS IN INDIA, <http://www.pppinindia.com/sector-power.php> (last visited Mar. 8, 2011).

142. Purdy, *supra* note 139, at 23.

143. *Id.* at 23 tbl.1.

144. See U.S. Dep't of Energy, *Country Analysis Briefs: China*, ENERGY INFO. ADMIN. (Nov. 2010), <http://www.eia.doe.gov/cabs/China/pdf.pdf>; U.S. Dep't of Energy, *Country Analysis Briefs: India*, ENERGY INFO. ADMIN. (Aug. 2010), <http://www.eia.doe.gov/cabs/india/pdf>.

B. *The Demonstrated New Architecture: The Successful Power Sector Model in Developing Nations*

There is hard evidence that the model for success in developing nations is to deploy renewable power.¹⁴⁵ For the past decade, since the original decision to implement international carbon controls, five nations in Asia were among the first to develop small power producer (SPP) programs to promote renewable energy development in their countries.¹⁴⁶ These programs create an important model of best practices for the new architecture of post-Kyoto investment.

In just a few years, new renewable small power projects have created a substantial contribution to growing national energy supplies: Almost 4% of the power supply in Sri Lanka, India and Thailand are from SPP independent renewable energy initiatives.¹⁴⁷ This is the appropriate laboratory, as approximately 60% of all new power generation capacity financed in developing countries is in Asia.¹⁴⁸ These five Asian nations feature different forms of government and have different predominant fuel sources in their power generation bases (hydro, coal, gas, and oil).¹⁴⁹ Some of the national electric systems have an integrated high-voltage transmission system, whereas others have a dis-integrated or island system.¹⁵⁰ These successes in the face of very disparate starting points are the architecture for developing countries' participation in the post-Kyoto scheme.

Table One displays key comparative elements of program design and implementation in these five non-Annex I Asian programs.¹⁵¹ The middle column illustrates that two of the five profiled programs subsidize renewable energy SPPs. Thailand does so by providing a project-specific subsidy through a competitive solicitation process.¹⁵² Andhra Pradesh state in India does

145. See STEVEN FERREY, *RENEWABLE POWER IN DEVELOPING COUNTRIES: WINNING THE WAR ON GLOBAL WARMING 185–201* (2006).

146. *Id.* at 67.

147. See Steven Ferrey, *The Failure of International Global Warming Regulation to Promote Needed Renewable Energy*, 37 B.C. ENVTL. AFF. L. REV. 67, 121 (2010), available at <http://lawdigitalcommons.bc.edu/ealr/vol37/iss1/4>.

148. Ada Karina Izaguirre, *Private Participation in the Electricity Sector—Recent Trends*, 154 PUB. POL'Y FOR THE PRIVATE SECTOR 1, 7 (1998), available at <http://rru.worldbank.org/Documents/PublicPolicyJournal/154izagu.pdf>.

149. Ferrey, *supra* note 145, at 68–84.

150. *Id.* at 68, 185.

151. *Id.* at 70.

152. *Id.* at 85–86.

so by providing a feed-in tariff in excess of true avoided cost for renewable energy SPPs power sales.¹⁵³

TABLE ONE: COMPARATIVE DEVELOPING NATION
RENEWABLE PROGRAM OVERVIEW

| Country Program | Year begun | Maximum size (MW) | Premium for renewable energy | Primary fuel | Eligible PPA solicitation |
|-----------------------|------------|------------------------------------|------------------------------|------------------|---------------------------|
| Thailand | 1992 | <60 or <90 | Yes, competitive bid | Gas | Controlled period |
| Indonesia | 1993 | <30 Java <15 other island grids | No | Renewable Energy | Controlled period |
| Sri Lanka | 1998 | <10 <20 | No | Hydro | Open offer |
| India: Andhra Pradesh | 1995 | Prior <50 | Yes, in tariff | Wind | Open offer |
| India: Tamil Nadu | 1995 | < 50 | No | Wind | Open offer |

Analyzing these programs in detail reveals several important lessons for small renewable program design and policy in developing nations.¹⁵⁴ A national or international framework for structured SPP project development is necessary: SPPs will not spring full-borne from the existing electric sector environments in developing countries. A system of law, regulation, and utility interface that facilitates orderly SPP renewable power development must exist.¹⁵⁵ Many of the programs were implemented prior to the Kyoto CDM program, but CDM monetization provides even greater incentives. There is a model for successfully shifting to a renewable power base in fast-electrifying developing nations.

IV.

THE THIRD DIMENSION: SHIFTING POWER TECHNOLOGY IN ANNEX 1 COUNTRIES

Only Annex 1 developed nations are covered by Kyoto. The Protocol requires forty developed nations to reduce CO₂ emissions an average of 7% below 1990 baseline levels by 2012.¹⁵⁶

153. *Id.* at 132-33.

154. *Id.* at 72.

155. *Id.*

156. See Kyoto Protocol, *supra* note 25, art. 3, para. 1. See also *List of Annex I Parties to the Convention*, *supra* note 32 for a listing of current Annex I members. The Kyoto Protocol received subsequent national ratification and adoption by 55%

The other GHGs must be reduced to 5-7% below either their 1990 or 1995 baseline levels by 2012.¹⁵⁷

A. *Shortcomings of the Current Architecture*

There is an obvious connection between renewable power options and carbon reduction strategies, according to both Australian data and testimony to the U.S. Congress.¹⁵⁸ Annex 1 countries were anticipated to shift a significant percentage of their power generation bases to renewable energy. Instead, the Kyoto Protocol CDM process encourages carbon reduction in developing countries, rather than the substitution of renewable power for conventional fossil-fuel power.

CDM projects to date have been located in a limited number of countries and only a few gases, with “little contribution to sustainable development.”¹⁵⁹ One country generated more CERs than all other countries cumulatively in the world.¹⁶⁰ As of the end of 2006, the World Bank reports 61% of CDM projects were located in China, 12% in India, 7% in other Asian countries, 10% in Latin America (most significantly Brazil), and 3% in Africa.¹⁶¹ Carbon finance through the CDM process has significantly bypassed Africa and the poorest countries.¹⁶²

of Annex I party signatories, notably excluding the U.S., by February 2005 and then entered into effect. Currently, 192 countries have ratified, accepted, acceded, or approved the Protocol. See *Status of the Ratification of the Kyoto Protocol*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php (last visited Mar. 8, 2011) [hereinafter *Kyoto Status*]. While most countries have committed to achieve an 8% reduction below 1990 levels for CO₂, there has been a reallocation among European Union countries so that some countries are allowed to emit more than these baseline levels while others are required to reduce up to 28%, with the weighted average for the European Union overall being 8% reduction. See Ferrey, *supra* note 147, at 81.

157. See Kyoto Protocol, *supra* note 25, art. 3, para. 1, 8. For six greenhouse gases (GHGs) that are suspected of causing global warming, principally including CO₂ and methane (CH₄), major developed countries (called the Annex I parties) have targets for reduction of these GHGs in the period 2008-2012. One hundred ninety-two countries either ratified, accepted, acceded, or approved the Protocol. See *Kyoto Status*, *supra* note 156.

158. Neal J. Cabral, *The Role of Renewable Portfolio Standards in the Context of a National Carbon Cap-and-Trade Program*, 8 SUSTAINABLE DEV. L. & POL'Y 13, 14-15 (Fall 2007).

159. El-Ashry, *supra* note 99, at 2, 5.

160. U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 119, at 35 fig.5.

161. Lauren Etter, *In China, a Plan to Turn Rice into Carbon Credits*, WALL ST. J., Oct. 9, 2007, at A1, A15.

162. Rasmus Heltberg et al., CLIMATE CHANGE: CHALLENGES FOR SOCIAL PROTECTION IN AFRICA 2, 10 (2008), available at <http://www.africathinktank.org/wp-con>

These CDM programs were originally a late addition to the Kyoto Protocol, a minor afterthought.¹⁶³ The current Kyoto Protocol architecture does not require the installation of renewable technologies anywhere; it only requires the reduction of carbon emissions, which may or may not involve the installation of renewable generation.¹⁶⁴ The impact of CDM projects has not been to promote appropriate renewable investments in developing countries. Rather it has only served to create additional credits for traditional regulated emitters in Annex 1 countries.¹⁶⁵

A report by the World Wildlife Fund found that many CDM programs fail to support sustainable development in host CDM countries.¹⁶⁶ The WWF report found that one third of projects in India failed to demonstrate their “additionality” from what would have been otherwise implemented, and an OECD study found that 20% of the CDM projects would have occurred notwithstanding CDM qualification.¹⁶⁷ The World Wildlife Fund claimed that one out of every five certified CDM projects actu-

tent/uploads/2010/09/Climate-Change-Challenges-for-Social-Protection-in-Africa-Heltberg-Jorgensen-and-Siegel.pdf.

163. Jeffrey Ball, *Kyoto's Caps on Emissions Hit Snag in Marketplace*, WALL ST. J., Dec. 3, 2007, at A1, A19.

164. Renewable Portfolio Requirements, as employed in about half of the U.S. states, actually reward the installation of renewable electric generation technologies. See Steven Ferrey, *Sustainable Energy, Environmental Policy, and States' Rights*, N.Y.U. ENVTL. L.J. 507, 646–47 (2004). They typically require the distributing retailer of power to satisfy a retail portfolio standard, and with deregulation of power resources in many states, many utilities no longer own generation resources to satisfy these standards as the distributing retailer.

165. Christine Voigt, *Is the Clean Development Mechanism Sustainable?*, 8 SUSTAINABLE DEV. L. & POL'Y 15, 18 (Winter 2008).

166. See LAMBERT SCHNEIDER, *IS THE CDM FULFILLING ITS ENVIRONMENTAL and Sustainable Development Objectives? An Evaluation of the CDM and Options for Improvement 72* (2007), available at <http://www.oeko.de/oekodoc/622/2007-162-en.pdf>.

167. *Id.* at 40; JANE ELLIS & SAM KAMEL, *OVERCOMING BARRIERS TO CLEAN DEVELOPMENT MECHANISM PROJECTS 41* (2007), available at <http://www.cd4cdm.org/Publications/OvercomingBarriersCDMprojects.pdf>. To receive approval, CDM projects must meet three requirements: (1) voluntary participation by the parties involved; (2) real and measurable mitigation of emissions; and (3); reductions that are additional to any that would have occurred in the absence of the project (referred to as “additionality”). See Kyoto Protocol, *supra* note 25, art. 12, para. 5. CDM “creates perverse incentives to manipulate baselines,” undercutting the intention of the additionality requirement. See Michael L. Brown, *Limiting Corrupt Incentives in a Global REDD Regime*, 37 *ECOLOGY L.Q.* 237, 244 (2010). This can motivate CDM project hosts to strategically increase environmental emissions leading up to a project so they can show a greater reduction when the project is completed, thus undercutting the ultimate purpose of the CDM process. *Id.* at 246.

ally increases carbon, instead of reducing it.¹⁶⁸ The report charges that this will result in the production of a large quantity of cheap carbon credits that allow businesses and developed countries to avoid a fast shift to renewable resources and/or to keep polluting.¹⁶⁹

The CDM process has been transfigured into a transactional problem, according to some critics. Three to eight percent of the value of the credit is taken by brokers facilitating processing of the transactions.¹⁷⁰ With 945 CDM projects creating 1.2 billion CERs in 2008, plus 2,900 additional projects in 2009 producing 2.6 billion CERs, the trader and broker transaction commissions will produce more than \$1 billion over a five-year period.¹⁷¹ In addition to trading the CERs created, there are consultant costs associated with the certification of credits.

CDM also potentially creates government revenue from taxes on Certified Emission Reduction (CER) revenue.¹⁷² For example, China levied a 65% tax on the revenue from CERs, generating over \$2 billion.¹⁷³ The limited oversight capacity of the CDM Executive Board and the lack of real enforcement through third-party checks raise doubts as to CDM emissions reductions.¹⁷⁴ The Executive Board of the U.N.F.C.C.C. is thought to be overwhelmed by the amount of CDM projects in the pipeline to be certified as to their baseline, allocation, monitoring and compliance. A survey found widespread fraud and incompetence in the certification of a large number of CDM projects in China and India, where the majority of CDM projects are located.¹⁷⁵ Up to 40-75% of surveyed projects were found in two studies to be improperly certified by the U.N.F.C.C.¹⁷⁶ In certain countries, lobbying by regulated firms has resulted in allocation of extra

168. Michael Szabo, *A Fifth of U.N. Carbon Credits May Be Bogus*, REUTERS, Nov. 29, 2007, available at www.reuters.com/article/EnvironmentNews/idUSL2926519020071129?pageNumber=2&virtualBrandChannel=O&sp=true.

169. See SCHNEIDER, *supra* note 166, at 10–11.

170. Benjamin J. Sovacool, *Building Umbrellas or Arks? Three Alternatives to Carbon Credits and Offsets*, 23 ELECTRICITY J. 29, 31 (2010).

171. *Id.*

172. Brown, *supra* note 167, at 237.

173. *Id.* at 247.

174. *Id.* at 251.

175. *Id.* at 249.

176. Sovacool, *supra* note 170, at 32.

credits, resulting in inequality.¹⁷⁷ Revenues have been consolidated in a select number of dominant companies.¹⁷⁸

The offsetting of HFC-23, produced in the manufacturing of Teflon in plastic processes, resulted in certain carbon investors produced HFC-23, just so they could offset it for market revenues. "Strategic gaming" resulted in achieving forty-seven times the cost of carbon reduction in tradable credits, as well reducing nitrous oxide in south Korea to earn credits would sixty times the cost of reduction.¹⁷⁹ This caused the company affected to make thirty-five times more revenue from selling carbon credits than manufacturing its products. Capturing methane from oil drilling in Vietnam and coal mines in China have resulted in the revenues being plowed back into fossil fuel production that produces more carbon than switching to a renewable resource alternative.¹⁸⁰ Another evaluation of projects in developing countries concluded that 25% of them offered little or no environmental benefit at all.¹⁸¹ With this record, it is clear that carbon markets to date, and particularly CDM tradable offsets created under the Kyoto Protocol and the EU-ETS, have not worked as commonly assumed, to solve environmental or energy challenges.

B. *Preference for CDM Offset Trades Rather Than GHG Reduction in Annex 1 Countries*

The participating Annex I E.U. countries differ significantly in their responsibilities to reduce carbon emissions, ranging from a 28% carbon reduction (Luxembourg) to an allowed 27% carbon increase (Portugal).¹⁸² Australia is allowed to increase emissions up to 8%, while Russia, Ukraine, and New Zealand have no reduction requirements.¹⁸³ Central and Eastern European states have launched legal proceedings against the European Commission, alleging their AAU allocations are now too low.¹⁸⁴

177. *Id.*

178. *Id.*

179. *Id.* at 32, 33.

180. *Id.* at 33.

181. *Id.*

182. ANTHONY HOBBLEY, *Creating a Global Carbon Market*, in CLIMATE CHANGE: A GUIDE TO CARBON LAW AND PRACTICE 127, 129 (Paul Q. Watchman ed., 2008).

183. *Id.* at 129. The Russian Federation and Ukraine joined the Protocol with given commitments of a 0% reduction below their 1990 levels, although their actual emissions were below the 1990 baseline because of the Soviet economic collapse. *Id.*

184. *Id.* at 135.

Have significant GHG reductions been facilitated in Annex 1 countries by the Kyoto architecture? E.U. carbon emissions are continuing to rise despite the E.U. carbon-trading program.¹⁸⁵ In 2005, U.S.-monitored carbon emissions rose 0.6% while EU (Annex 1) emissions fell 0.4%, while in 2006 U.S.-monitored carbon emissions fell 1.3% and EU emissions fell 0.3%.¹⁸⁶ On balance, both the U.S. and the Annex 1 EU countries that are part of the Kyoto Protocol and the EU-ETS experienced the same 0.7% net carbon emissions change during 2005-2006. Emissions of carbon dioxide in the E.U. actually rose 1.1% in 2007 compared to 2006.¹⁸⁷

The data on most leading E.U. countries does not show the trend line that one might have anticipated since the 1992 Rio Declaration commenced attack on GHGs emissions.¹⁸⁸ Compared to 1990 baseline emissions,¹⁸⁹ E.U. countries were up about 25% on CO₂ emissions by 2006.¹⁹⁰ CO₂ emissions have particularly increased in cement production, petroleum refining, electricity and heat production, and transportation.¹⁹¹

Romania and Bulgaria demanded larger CO₂ emission allocations than the European Commission gave them, and thereafter judicially appealed this allocation to the European Court of First Instance.¹⁹² Poland, the Czech Republic, Hungary, Romania, and Slovakia launched legal actions against the E.U. Commission, asserting that even their relatively modest future carbon

185. See Keith Johnson, *Carbon Copy: Europe's Still Not Cutting Emissions*, WALL ST. J. BLOG (Apr. 2, 2008, 4:00PM), <http://blogs.wsj.com/environmental-capital/2008/04/02/carbon-copy-europes-still-not-cutting-emissions/>.

186. *EU and US Greenhouse Gas Emissions Fell in 2006*, REUTERS, Apr. 18, 2008, <http://uk.reuters.com/article/2008/04/18/us-climate-emissions-idUKL1877759520080418>.

187. *Analysis Shows Increase in EU Carbon Emissions*, 39 Env't Rep. (BNA) 706 (Apr. 11, 2008); see also Angelique van Engelen, *European CO₂ Emissions Rise 1.1% During 2007, Carbon Trading Market Rallies*, BLOGGER NEWS NETWORK (Apr. 3, 2008), <http://www.bloggernews.net/114927>.

188. See FERREY, *supra* note 12, at 633.

189. UNFCCC Secretariat, "Annual European Community Greenhouse Gas Inventory 1990-2006 and Inventory Report 2008," Technical Report No. 6/2008, May 2008, at 175 tbl.3.61. http://www.eea.europa.eu/publications/technical_report_2008_6/Summary_Annual_EC_GHG_inventory_19902006_and_inventory_report_2008.

190. *Id.*

191. *Id.* at 89 fig.2.4.

192. FRANK CONVERY ET AL., MIT JOINT PROGRAM ON THE SCI. AND POLICY OF GLOBAL CHANGE, THE EUROPEAN CARBON MARKET IN ACTION: LESSONS FROM THE FIRST TRADING PERIOD: INTERIM REPORT 22 (2008), available at http://globalchange.mit.edu/files/document/MITJPSPGC_Rpt162.pdf.

limits are too strict for the countries' economic growth.¹⁹³ Political concessions were made in Poznan, Poland meetings in December 2008, where the former Eastern-bloc E.U. states were given 12% of future auction revenues from GHG allowance auctions in order to subsidize their continuation of their existing high-carbon industries.¹⁹⁴ Several EU countries reallocated and transferred a portion of their emissions allowances to recalcitrant countries such as Spain, Ireland, Portugal, and others, to provide generous increases, rather than reductions from 1990 levels.¹⁹⁵

Each CDM CER generated in a developing country increases the GHG emissions allowed in an Annex I country to which it is exported through the Kyoto registration process. Non-renewable CDM projects dominate the roster.¹⁹⁶ "It is difficult to conclude that the EU-ETS carbon system that parallels the Kyoto Protocol resulted in any carbon reductions that would not have occurred in the absence of the cap-and-trade system, according to Rachel Miller, Director of Federal Affairs for British Petroleum."¹⁹⁷

V.

THE FOURTH DIMENSION ARCHITECTURE: CREATING NEW INTERNATIONAL ENFORCEMENT MECHANISMS

Enforceability is a key element for a successful GHG reduction regime. A significant problem with Kyoto, as with many international mechanisms, is that it is a wholly voluntary agreement.¹⁹⁸ There is no provision in the Kyoto Protocol to en-

193. Erica Herrero-Martinez, *States Study Carbon Trading*, WALL ST. J., Aug. 1, 2007, at B5A.

194. Pete Harrison & Huw Jones, *EU Finalizes Deal to Fight Climate Change*, REUTERS, Dec. 16, 2008, <http://www.reuters.com/article/2008/12/17/us-eu-climate-parliament-idUSTRE4BG2SH20081217?pageNumber=2>.

195. See generally EUROPEAN UNION EMISSIONS TRADING SCHEME (EU ETS), THE ENCYCLOPEDIA OF EARTH, [http://www.eoearth.org/article/European_Union_Emissions_Trading_Scheme_\(EU_ETS\)](http://www.eoearth.org/article/European_Union_Emissions_Trading_Scheme_(EU_ETS)) (last updated Aug. 29, 2009).

196. JONATHAN RAMSEUR, CONG. RESEARCH SERV., RL 34436, THE ROLE OF OFFSETS IN THE GREENHOUSE GAS EMISSIONS CAP-AND-TRADE PROGRAM: POTENTIAL BENEFITS AND CONCERNS 11 (2008), available at www.ncseonline.org/nle/crsreports/08July/RL34436.pdf.

197. *Cracking Down on Offset Projects*, CARBON CONTROL NEWS (Aug. 6, 2008), <http://www.carboncontrolnews.com>.

198. SCOTT BARRETT, ENVIRONMENT AND STATECRAFT 360 (2003) ("The main strike against Kyoto is the most crucial of all: the agreement fails to solve the enforcement problem."); see also Chris Peloso, *Crafting an International Climate Change Protocol: Applying the Lessons Learned from the Success of the Montreal Protocol and the Ozone Depletion Problem*, 25 J. LAND USE & ENVTL. L. 305, 320 (2010) ("Another shortcoming of the Kyoto Protocol is the lack of effective enforcement mechanisms.").

sure compliance of any nation that fails to achieve its reductions or violates any provision.¹⁹⁹ There is no effective international organization with any effective power over carbon-emitting nations. At the end of the day, achievement is voluntary and unenforceable.²⁰⁰ Given the time pressure to achieve GHG reductions,²⁰¹ there needs to be a significant architectural fix.

With most countries slated to miss their Kyoto goals, there is no sanction, no penalty, and no accountability in the international architecture. Unlike some international legal disputes, there is not even an international court to which to take Kyoto disputes; violation of the Kyoto carbon pollutant targets carries no penalty.

The 15th Conference of the Parties in 2009 in Copenhagen and the 16th COP in Cancun in 2010 made minimal progress. Developing nations are resistant to any international monitoring or verification requirements, conducted at the national rather than international level, and do not apply unless developing countries take international financial aid for such measures.²⁰² This lack of international enforcement was a major shortcoming in Copenhagen, and seen by China, India and other developing countries as a major victory for their position supporting a continuing a lack of international compliance mechanisms.²⁰³ It is of note that U.S. courts do not recognize COP decisions as part of U.S. law nor anything that must be followed by U.S. environmental agencies.²⁰⁴

This lack of an enforcement mechanism has repercussions even in more formal EU obligations on member countries. Because of inconsistencies and controversies in individual European countries, the plan for post-2012 is centralized E.U. allocation of carbon emissions rights, eliminates current national allocation.²⁰⁵ Yet, some of the Eastern European countries (Poland, Czechoslovakia, and Hungary) are expected to continue challenge of

199. IPCC, *Third Assessment Report: Climate Change 2001* (2001), http://www.grida.no/publications/other/ipcc_tar/.

200. The Kyoto Protocol has no compulsory mechanism to enforce any restriction or penalty against any signatory country that fails to achieve its carbon quota. See generally Kyoto Protocol, *supra* note 25 (lacking enforcement mechanisms).

201. *Threat to the Planet*, *supra* note 7, at 16.

202. David Hunter, *Implications of the Copenhagen Accord for Global Climate Governance*, 10 SUSTAINABLE DEV. LAW & POL'Y 2, 8 (Winter 2010).

203. *Id.* at 15.

204. *Id.* at 6 n.21.

205. Gardner, *supra* note 41, at 1417.

their future allocations.²⁰⁶ Central and Eastern E.U. states have launched legal proceedings against the European Commission, alleging their allocations are already too low.²⁰⁷ Poland and Bulgaria, both recently admitted to the E.U., and former Eastern bloc countries argue that more advanced Western E.U. countries should do more carbon reduction, while the poorer Eastern European countries should do less.²⁰⁸

Exceptions and delays have since been made for certain less affluent EU countries. The member states that have deployed high-carbon power are phased in from 30% utility sector allowance auction in 2013 until full auction in 2020.²⁰⁹ As well, less affluent countries will receive 12% more of allowance revenues and/or the allowances that they require, permitting them to realize significant income transfers by selling this surplus to the rest of the European industry—which will receive fewer allowances than required.²¹⁰

This experience in the EU, at the forefront of regional carbon regulation²¹¹—as well as significant resistance of certain states in the U.S. to climate change regulation,²¹² which has resulted in abandonment of efforts to enact federal statute,²¹³ and controversy within those U.S. states that have led in regulating carbon²¹⁴—illustrate the difficulty in enforcing climate regulation.

206. See, e.g., Herrero-Martinez, *supra* note 193; see also see also EUROPEAN ENVTL. AGENCY, *Tracking Progress Towards Kyoto and 2020 Targets in Europe*, at 19, EEA Rep. No. 7/2010 (2010), available at <http://www.eea.europa.eu/publications/progress-towards-kyoto>.

207. See HOBBLEY, *supra* note 182, at 135.

208. Stephen Castle, *European Nations, Fearing Downturn, Seek to Revise Agreement on Emissions Cuts*, N.Y. TIMES, Oct. 17, 2008, at A6, available at <http://www.nytimes.com/2008/10/17/world/europe/17union.html>.

209. See CMS Cameron McKenna LLP, *Phase III of the Emissions Trading Scheme: Your Q&A Guide*, 8–9 (2009), LAW-NOW, <http://www.law-now.com/cmck/pdfs/nonsecured/phase3.pdf>.

210. Harrison & Jones, *supra* note 194.

211. See *supra* notes 190–193 & accompanying text.

212. Jeff Ryser, *Duke's Rogers Fears CO₂ Legislation will be 'California-centric' and Driven by Ideology*, ELECTRIC UTIL. WK., Feb. 16, 2009, at 22.

213. Cathy Cash, *Uncertainty to Reign No Matter What Congress Does on GHGs, ICF says; Debate Still Forming*, ELECTRIC UTIL. WK., Jan. 17, 2011, at 1, 34.

214. Three of the 10 RGGI states, regulating carbon in the Northeast U.S. since 2009, have raided millions of dollars each from the RGGI revenue raised from auctioning carbon emission allowances. See *States Raid RGGI Funds to Fill Budget Gap*, THE ENVTL. LEADER (Dec. 21, 2010), <http://www.environmentalleader.com/2010/12/21/states-raid-rggi-funds-to-fill-budget-gaps/>; Lisa Wood, *Green Advocates in Maine Fear RGGI Funds May be Used to Close Budget Gap*, ELECTRIC UTIL. WK., Jan. 24, 2011, at 8–9.

CO₂ previously was not considered a pollutant,²¹⁵ and it functions as a warming molecule rather than a direct chemical impairing health when breathed. Consequently, in terms of enforcement mechanisms, it has no direct or geographically specific local impact; it changes global mean temperature over time, but its immediate presence does not directly contaminate the proximate environment. It affects a global, but not local, “tragedy of the commons.”²¹⁶ In this regard, global warming emissions are different from conventional pollutants,²¹⁷ and their regulation poses both policy and legal barriers to enforce limitations affecting the global commons.

With more than 200 diverse world nations all contributing to emissions that cause climate change, new global enforcement mechanisms are a critical challenge. The United Nations does not have permanent mechanisms in place to enforce environmental goals. There are economic cash flows and trade practices, including the direct aid afforded by multilateral international agencies such as the World Bank and regional development banks.²¹⁸ Both of these economic avenues are likely elements through which to impose some requirements as part of an enforcement mechanism.

As a “carrot,” there is the commitment in the Copenhagen and Cancun COP meetings to \$100 billion in annual additional funding aid to developing countries to address climate change,²¹⁹ which could impose requirements on the use of these funds and recipient national policy.²²⁰ The European experience is critical

215. *Massachusetts v. EPA*, 549 U.S. 497, 528–29 (2007).

216. Garrett Hardin, *The Tragedy of the Commons*, 162 *SCIENCE* 1243, 1245 (1968), available at <http://www.cs.wright.edu/~swang/cs409/Hardin.pdf>.

217. See FERREY, *supra* note 12, at 178–181 & tbl.5.1 (discussing the conventional criteria air pollutants).

218. See *Countries and Regions*, WORLD BANK, <http://go.worldbank.org/FFZ0CTE2V0> (last visited Mar. 9, 2011) for a list of countries involved with the World Bank. There has been a dispute regarding whether the World Bank, the United Nations, or a new third-party organization should administer climate change funding from developed to developing nations for climate change response and adaptation. The World Bank was selected as the interim trustee of these funds. See *Cancun Climate Conference Delivers Action—and Hope*, WORLD BANK, <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSDNET/0,,contentMDK:22790662~menuPK:64885113~pagePK:7278667~piPK:64911824~theSitePK:5929282,00.html> (last visited Mar. 9, 2010).

219. James Kanter, *Copenhagen's One Real Accomplishment: Getting Some Money Flowing*, N.Y. TIMES (Dec. 20, 2009), <http://www.nytimes.com/2009/12/21/business/energy-environment/21iht-green21.html>.

220. See *supra* notes 4–5 for discussion of the administration of these additional funds.

as a harbinger of Kyoto enforcement, given that almost 90% of the regulated Kyoto Annex I countries are in Europe, and most of those are members of the EU and subject to the EU-ETS carbon regulatory system.²²¹ To date, though, even these most ambitious countries are underachieving goals,²²² which are themselves lesser goals than necessary to arrest climate change.²²³ In this atmosphere, there will be significant tendency for individual countries to impose trade sanctions as a climate enforcement mechanism. As a “stick,” such sanctions found their way into almost-passed U.S. climate change legislation, discussed in the next section.²²⁴ While trade sanctions can be imposed unilaterally by a nation, such sanctions could impair free international trade and invoke sanctions pursuant to World Trade Organization agreements, international rules of trade, and GATT agreements.²²⁵

VI.

CAN U.S. REGULATION REFORM THE KYOTO PROTOCOL?

Could U.S. carbon control legislation aid or remedy these Kyoto deficiencies? The U.S. is a major player in climate change, alone approaching the carbon emissions of the twenty seven European Union members regulated by the Kyoto Protocol.²²⁶ U.S. decisions on carbon are significant. Major developed nations in the world are watching each other on climate control initiatives.

The version of climate control legislation which came relatively close to enactment, the Waxman-Markey bill, which narrowly

221. See *List of Annex I Parties to the Convention*, *supra* note 32.

222. See *supra* text accompanying notes 190–193.

223. See *supra* text accompanying notes 7–10, 13.

224. See *infra* notes 233–34.

225. See General Agreement on Tariffs and Trade, art. XX(b), Oct. 30, 1947, 61 Stat. A-11, 55 U.N.T.S. 194. See generally *The WTO in Brief: Part 3: The WTO Agreements*, WORLD TRADE ORG., http://www.wto.org/english/thewto_e/whatis_e/inbrief_e/inbr03_e.htm (last visited Mar. 9, 2011) (describing agreements under GATT); Steve Charnovitz, *Environmental Trade Sanctions and the GATT: An Analysis of the Pelly Amendment on Foreign Environmental Practices*, HIGH NORTH ALLIANCE (1995), http://www.highnorth.no/library/Trade/GATT_WTO/en-tr-sa.htm (describing the conflict between unilateral sanctions and international rules of trade).

226. Greenhouse Gas Inventory Data—Detailed by Party, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, <http://unfccc.int/di/DetailedByParty/Event.do?event=go> (for information on the European Union, select “European Union (27),” “All Years,” “Totals,” “Aggregate GHGs, then press “Go.” For information on the United States, select “United States of America” instead of “European Union (27)”).

passed the House of Representatives by a vote of 219-212, in 2009, and is the closest that the U.S. has come to national climate change legislation. The subsequent 2010 Kerry-Boxer bill,²²⁷ was similar, if less successful, legislatively.²²⁸ The Waxman-Markey bill addressed from a unilateral U.S. perspective several of the significant shortfalls of the Kyoto Protocol:

- (1) It puts pressure on developing countries that trade with the U.S. to regulate their carbon emissions by 2018 or face possible trade sanctions discretionarily imposed by the President²²⁹
- (2) It demands a change in the power generating base to include an ambitious increase in the numeric percentage of renewable energy in the U.S.²³⁰
- (3) It provides allowance-offset credits for arresting deforestation in both a domestic and international context.²³¹
- (4) It conducts studies of black carbon contribution to climate change and ways to address its emission.²³²

Had it been enacted, each of these components would be more assertive of a mechanism to address climate change than the elements of the Kyoto Protocol to date. However, there is recent experience of the actions of the U.S. affecting changes in the EU climate regulatory system, such as E.U. Parliament and Council actions in April 2009 adopting certain elements pioneered in the U.S. Regional Greenhouse Gas Initiative.²³³ First, legislative action embodying trade sanctions as the Waxman-Markey bill would build pressure on developing countries that also export goods to the United States to regulate their carbon emissions at a level similar to that regulation of the United States. It does this

227. Clean Energy Jobs and American Power Act, S. 1733, 111th Cong. (2009), available at <http://www.gpo.gov/fdsys/pkg/BILLS-111s1733is/pdf/BILLS-111s1733is.pdf>.

228. Ryan Lizza, *As the World Burns; How the Senate and White House Missed Their Best Chance to Deal with Climate Change*, NEW YORKER, Oct. 11, 2010, at 70, available at http://www.newyorker.com/reporting/2010/10/11/101011fa_fact_lizza.

229. American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 401 (2009) (proposed §§ 765-67 of the Clean Air Act), available at <http://www.opencongress.org/bill/111-h2454/text>.

230. *Id.* § 101 (proposed § 610 of the Public Utility Regulatory Policies Act of 1978).

231. *Id.* §§ 311, 501-511 (respectively, proposed § 751 of the Clean Air Act and proposed domestic offset program).

232. *Id.* § 333 (proposed black carbon regulation).

233. Council Directive 2009/29/EC, 2009 O.J. (L140) 63 (amending Council Directive 2003/87/EC, 2003 O.J. (L275) 32), available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0063:0087:en:PDF>.

in two ways. First, it gives free allowances, in declining percentages until 2035, to trade-sensitive U.S. industries which could otherwise lose market share by having to purchase auctioned carbon emission allowances.²³⁴ It allocates 15% of all carbon emission allowances to free to trade-sensitive industries until 2026, and then phases down such allowance distribution, in favor of auction of allowances to these companies, from 2026 to 2035.²³⁵

Second, the Waxman-Markey legislation included possible trade sanctions beginning in 2018 against importers of goods into the U.S. from countries that do not include similar carbon regulation.²³⁶ The President could impose this trade sanction in 2018 or after.²³⁷ Therefore, such mechanisms would give these developing trading countries less than a decade to regulate carbon in a manner similar to the U.S., or face trade discrimination. Note however, that this second provision would only limit certain foreign nation industrial imports of trade-sensitive goods into the U.S.; it would not provide protection from carbon-associated costs to U.S. industries trying to export goods elsewhere in the world, as the first provision would do. This trade sanction “hammer” is a blunt and difficult tool to utilize. Trade sanctions can result in retaliation from the affected countries or others. Under the General Agreements on Tariffs and Trade (GATT) provisions, such barriers to protect in-country environment are allowed if carefully crafted, but would also likely be challenged.²³⁸

In a third vein that may be resurrected in separate legislation,²³⁹ the Waxman-Markey bill took a proactive approach to shift the U.S. economy to a quantitative deployment of renewable resources. In addition to regulating carbon emissions, with its other regulatory “hand,” it would create a mandatory require-

234. H.R. 2454 § 401 (proposed §§ 763–64 of the Clean Air Act).

235. *Id.*

236. *Id.* §§ 767–68 (proposed multilateral agreement goals and presidential discretion).

237. *Id.* § 767.

238. See General Agreement on Tariffs and Trade, *supra* note 225, art. XX(b) (excepting measures meant to protect human, animal, or plant life from the prohibition on trade discrimination between countries).

239. See Lou Grinzo, *A National RPS for the US?*, THE ENERGY COLLECTIVE (Sep 28, 2010), <http://theenergycollective.com/lougrinzo/44270/national-rps-us>. For example, in 2010, Senators Jeff Bingaman (D-N.M.), Sam Brownback (R-Kan.), Byron Dorgan (D-N.D.), Susan Collins (R-Maine), Tom Udall (D-N.M.), and Mark Udall (D-Colo.) introduced the Renewable Electricity Promotion Act to require as a matter of federal law a requirement to use a percentage of renewable energy for the production of electricity. *Id.*

ment for the deployment of renewable power generation in the U.S.²⁴⁰ Utilizing a renewable portfolio requirement, this bill would require that U.S. retail power entities have 6% new renewable power (constructed after passage of the bill) by 2012, and 20% by 2020.²⁴¹ Combined heat and power production facilities (commonly known as “cogeneration” facilities) would qualify as energy conservation, which in turn could qualify as a share of new renewable power. Therefore, by using this other prong to deliberately require significantly greater renewables in the generation mix, and including energy efficiency measures to qualify for a significant portion of this, this U.S. initiative would significantly address the failure of the Kyoto Protocol by pushing developed countries to shift their generating bases to a greater share of renewable power.

Fourth, the U.S. Waxman-Markey legislation would do a better job of talking the language of developing countries than does the Kyoto Protocol, and in this sense is serving as a model for reform as countries discussed in Cancun at COP-16 how to extend the Kyoto Protocol. Both black carbon and forests were included in Waxman-Markey,²⁴² and the Cancun discussions moved in those directions. This U.S. legislation would have included seven families of global warming chemicals for restriction in their emissions, compared to Kyoto’s six,²⁴³ and—while not yet included for regulation—there was to be a study of black carbon with possible further action to reduce its emission.²⁴⁴ This study of black carbon particularly would target its role in developing countries’ warming emissions. Black carbon is moving onto the table for discussion and possible action at Copenhagen and Cancun.

In addition, the Waxman-Markey bill would take a step forward on forest preservation. It would recognize forest preservation as an important value. International forests would be eligible to create carbon offsets, which in turn, expand the supply of allowances.²⁴⁵ This would also substantially change the dy-

240. American Clean Energy and Security Act of 2009, H.R. 2454 § 101 (proposed § 610 of the Public Utility Regulatory Policies Act of 1978).

241. *Id.*

242. *Id.* §§ 331, 332, 501–553 (respectively, proposed §§ 751–56 to the Clean Air Act, proposed § 851 to the Clean Air Act, and proposed domestic offset program).

243. *Compare id.* § 501 (setting forth proposed U.S. regulated greenhouse gases) with Kyoto Protocol, *supra* note 25, Annex A (setting forth Kyoto regulated greenhouses gases).

244. American Clean Energy and Security Act of 2009, H.R. 2454 § 332 (proposed § 851 to the Clean Air Act).

245. *Id.* § 311 (proposed §§ 743, 754 to the Clean Air Act).

namics of international carbon control. Some U.S. states have unilaterally imposed carbon control requirements on approvals of new fossil fuel-fired power plants.²⁴⁶ The avenue of compliance with carbon emissions from new power plants, in many instances in the U.S., has been the planting of new forests in foreign lands. To some degree, the Waxman-Markey legislation in the U.S. would address four areas of shortfall in the Kyoto Protocol.

What the U.S. ultimately decides to do will influence the E.U., and European countries, comprising thirty-five of those forth Kyoto Protocol-regulated nations. In April 2009, the European Union Council adopted legislative amendments to the Directive of the European Parliament and EU Council in 2003, to extend the GHG allowance-trading scheme of the EU-ETS.²⁴⁷ Many of these provisions adopt similar provisions that the RGGI Program in the U.S. adopted and implemented in 2009 for the EU-ETS Phase III period, beginning in 2013. These include the auction of carbon emission allowances, increasing from 20% auction-allocated in 2013 to 70% auction-allocated in 2020, and total auction-allocated by 2027.²⁴⁸ RGGI is the first system in the world to auction all carbon emissions.²⁴⁹ Starting in 2013 in the E.U., a renewable energy portfolio requirement will mandate each country to achieve a certain percentage of renewable power production and use in years going forward. However, the EU-ETS provides different target percentages for different countries, placing less pressure on those countries that had not previously promoted renewable power measures.²⁵⁰

246. Massachusetts has, for example, as a condition of approval of a siting approval for a new power project of 100 Mw or larger, required that there be carbon emission abatement or offset projects to abate a percentage of potential carbon emissions. This policy was not included in statute or regulation, but adopted as a prudential unilateral requirement for approval. See MASS. GEN. LAWS ch. 164, § 69J1/4 (2008), available at <http://www.malegislature.gov/Laws/GeneralLaws/PartI/TitleXXII/Chapter164/Section69J1~4>.

247. Council Directive 2009/29/EC, 2009 O.J. (L140) 63 (amending Council Directive 2003/87/EC, 2003 OJ (L275) 32), available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0063:0087:en:PDF>.

248. *Id.* ¶¶ 11, 21.

249. See Steven Ferrey, *Goblets of Fire: Potential Constitutional Impediments to the Regulation of Global Warming*, 35 *ECOLOGY L.Q.* 835, 844 (2009); Steven Ferrey, *Carbon and the Constitution*, *PUB. UTIL. FORT.*, Apr. 2009, at 40, for a discussion of RGGI.

250. Council Directive 2009/29/EC ¶¶ 18, 28; see also *EU Emissions Trading Scheme Undermined by Excess Allowances to Industry*, *WORLD WILDLIFE FUND*

VII.

CONCLUSION

The G8 industrial nations failed in mid-2008, and later at the Copenhagen discussions at the end of 2009, to agree on common worldwide emission reduction targets, let alone requirements. Nations could not even manage strict definition of operative terms, as there was confusion about whether future emission reductions would be measured against the now-specified 1990 carbon baseline, or the current baseline reflecting higher 2010 atmospheric carbon levels.²⁵¹

Recent progress has not met earlier expectations. The Bali Action Plan in 2007 established a binding commitment framework on all parties to negotiate a post-Kyoto (post 2012) extension of the Protocol.²⁵² The Bali Action Plan committed all parties to negotiate incentives for reducing emissions from deforestation and forest degradation in developing countries,²⁵³ which has not yet transpired. The April 2008 Bangkok talks following the December 2007 Bali conference, concluded that a post-2012 international carbon scheme should look much like the pre-2012 Kyoto regime, including trading of cap-and-trade allowances and the creation of additional credits or 'offsets' through the Joint Initiative and CDM mechanisms.²⁵⁴

An impasse to change occurred during the Copenhagen round of talks at the end of 2009 and the Cancun talks at the end of 2010. Thus, the movement to date is to cling to the existing architecture of the Protocol. This is not as much a statement of success of such programs as a statement of hoped-for continuation of existing international carbon reduction methodologies and methods. Indeed, the Kyoto Protocol does not show signifi-

(Dec. 23, 2004), <http://www.wwf.eu/news.cfm?17470/EU-emissions-trading-scheme-undermined-by-excess-allowances-to-industry>.

251. Steven Cook & Toshio Aritake, *Leaders of Major Economies Fail to Agree on Greenhouse Gas Emissions Targets*, 39 ENV'T REP. (BNA) 1380, 1381 (July 11, 2008).

252. Conference of the Parties to the United Nations Framework Convention on Climate Change, Bali, Indon., Dec. 3-15, 2007, *Report of the Conference of the Parties on its Thirteenth Session, Held in Bali from 3 to 15 December*, 3, U.N. Doc. FCCC/CP/2007/6/Add.1 (Mar. 14, 2008), available at <http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf>.

253. *Id.*

254. Lyman, *supra* note 1, at 704.

cant signs of being a technical success within the necessary time frames given the immense tasks at hand.²⁵⁵

A developed-country Annex I approach, as embodied in the Kyoto Protocol, will not succeed because it is contradictory to the scientific and political reality of the world. The necessary solution is a new international carbon architecture—cubed. Developed countries cannot solve the global warming challenge without vigorous developing nation participation, which is not regulated now by the Protocol. Even if all developed countries could achieve a Herculean reduction of 80% of their GHGs by 2050, this would not achieve Kyoto goals without vigorous participation by developing countries.²⁵⁶ The new architecture must expand the now-limited line of country inclusion, shift and expand the area and scope of renewable power resource deployment in developing countries, provide greater depth of Annex 1 country compliance in-country, and control the dimension of time to ensure enforcement of the necessary carbon commitments in the little time left under the scientific consensus. These changes in international climate change mechanisms are achievable—but only through a new regulatory and legal architecture—“cubed” in the dimensions described herein.

255. See *CO₂ Emissions Booming, Shifting East, Researchers Report*, OAK RIDGE NAT'L LAB. (Sept. 24, 2008), http://www.ornl.gov/info/press_releases/get_press_release.cfm?ReleaseNumber=mr20080924-00.

256. El-Ashry, *supra* note 99, at 2.