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Gate Keeping Global Warming: The International Role of Environmental Assessments and Regulation in Controlling Choices for Future Power Development

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GATE KEEPING GLOBAL WARMING: THE INTERNATIONAL ROLE OF ENVIRONMENTAL ASSESSMENTS AND REGULATION IN CONTROLLING CHOICES FOR FUTURE POWER DEVELOPMENT

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I. INTRODUCTION: GATEKEEPING THE POWER FUTURE

Global warming is the consensus environmental challenge of the 21st century. The offending greenhouse gases (GHGs) are a function of the traditional practice of modern society using fire to manipulate the universe - particularly combusting fossil fuels for electric power production.[1] Invariably, power derived from burning gaseous, liquid

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1. About three-quarters of the anthropogenic sources of carbon in the atmosphere is the result of the combustion of fossil fuels, while 25 percent is the result of deforestation and resultant inability of the biosphere to assimilate and reprocess this chemical compound. Regarding global climate change, shifting land patterns are suspected by many researchers to be as significant as industrial emissions. Destruction of carbon dioxide sinks, such as forested areas, reduces the amount of carbon dioxide that can be stored, causing the remaining bare land to release less water into the atmosphere. This reduces annual rainfall, which increases local temperatures by a significant amount. In addition, stripped land releases back into the atmosphere more easily the heat that it would otherwise store. These factors upset climate balance. It is projected that the electric power sector will account for 35 percent of anthropogenic CO_2 emissions. RI/McGraw-Hill, World Energy Outlook, (1997).

and solid fossil fuels used to create electric power release copious quantities of CO2 to the environment.[2]

Yet despite the need to reduce the emission of greenhouse gases, power demand is exploding internationally. All forecasts of the U.S. Department of Energy, the International Energy Agency, and independent forecasters, agree that greenhouse gas (GHG) emissions, principally comprised in terms of volume of carbon dioxide and methane, will increase exponentially during the foreseeable future.[3] The construction of power generation facilities is increasing as populations and development continue, especially in developing nations.[4] Unabated, this exponential increase in power demands would tip the global environment into a run-away global warming risk.[5]

However, there are alternative technologies that can satisfy the power demand without emitting greenhouse gases. There are renewable power technologies that are well adapted for developing countries. Contrary to what one might assume, the decision to build conventional or renewable power technologies is not as simple as the preference of the utility or independent power producer who owns the facility. The capital intensity of power generation projects requires that large capital demands for construction be financed.[6] Financial markets are risk averse.[7] Capital is loaned only where due diligence by legal counsel and project loan officers conclude that a power project complies with all regulatory and environmental requirements.[8]

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2. 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* STEVEN FERREY, LAW OF INDEPENDENT POWER § 2.1 (21st ed. 2007).

3. International Energy Outlook 2007, Chapter 7: Energy Related Carbon Dioxide Emissions, *available at* http://www.eia.doe.gov/oiaf/ieo/emiaaions.html.

4. World Bank Statement, Ministerial Segment – COP11 – Montreal 4, *available at* http://siteresources.worldbank.org/ESSDNETWORK/Resources/MINISTERIALSEGMENTCOP11Montreal.pdf.

5. Intergovernmental Panel on Climate Change, United Nations Environment Programme, *Climate Change 2007: The Physical Science Basis, Summary for Policy Makers* 17 (2007), *available at* http://www.ipcc.ch/SPM2feb07.pdf.

7. International Energy Agency, World Energy Outlook 2004, 29-31, 34 (2004), *available at* http://www.iea.org/textbase/nppdf/free/2004/weo2004.pdf.

7. STEVEN FERREY, RISK, REWARD AND RETRENCHING CAPITAL FLOWS: GLOBAL WARMING REDUX (unpublished book, on file with author) [hereinafter, "Risk, Reward and Retrenching Capital Flows"].

8. *See* FERREY, *supra* note 3, §§ 3.55-3.98 for due diligence requirements.

This is particularly true in developing countries where a variety of risks are greater. In developing countries, power demand is increasing much faster than in developed countries. The majority of world power generation expansion will occur just in Asia over the next decades.[9] Because many developing countries must rely on power generation investment capital from either multilateral agencies[10] or U.S. or European lenders, the financial flow from a discrete number of lenders controls what is financed in the international power sector. Therefore, these international lenders control the financial spigot that facilitates power plant and transmission line construction. And these lenders are regulated institutions that function within environmental and other legal constraints. International finance is necessary for power capacity construction in developing countries, and that finance does not flow independent of certain environmental metrics.

There is an often overlooked, yet critical, "gate keeper" on what is built and where. The now mandatory preparation of Environmental Assessments prior to, and as a part of the pre-financial commitment due diligence of financing new power generation facilities, is that potential gatekeeper on what is built. Prior to financing, the multilateral international lenders require that an environmental assessment be performed to compare and validate the environmental attributes of the project, including alternative power generation technologies, locations and sizes of a project.[11] This opens the dialogue as to whether international money will finance conventional or alternative power generation: The link is direct: If there is no satisfactory Environmental Assessment, there will be no financing and thus no project.[12] The environmental assessment is the key "gate keeping" function for the architecture of the power future. Yet, it is largely invisible and has not received the scrutiny or analysis that normally would be devoted to such a key institutional "hold point" for the creation of our international infrastructure. This function is put in sharper relief now with the ratification by 168 nations of the Kyoto

9. *See generally* Intergovernmental Panel on Climate Change, *supra* note 6.

10. These include the World Bank and several regional investment banks. FERREY, *supra* note 3.

11. See Intergovernmental Panel on Climate Change, *supra* note 6 at §V.

12. *See infra* note discussion of the requirements of the Environmental Assessments prior to project financing.

Protocol and an urgent effort to reduce, let alone stabilize, the emission of greenhouse gases from the power sector.[13]

This article attempts to occupy analytically some of that regulatory gap. I will evaluate the critical "gate keeping" function of environmental assessments for the power future and global warming. I will also compare and contrast the key differences between five primary environmental assessment regulatory schemes that govern the flow of financing to future power plant construction throughout the world. I will the requirements of environmental assessments in the U.S. pursuant to the National Environmental Policy Act, several international requirements of different parts of the World Bank, and the Asian Development Bank. Environmental assessments are the institutional gatekeeper on power development choices. In these regulatory nuances are writ the blueprint for our collective energy future and the success of efforts to address global warming.

II. WARMING, GREENHOUSE GASES, AND INSTITUTIONAL RESPONSES

The true threat and ultimate impact of global warming will be unknowable until well into the 21st century when any warming repercussions are upon us, [and it takes decades to alter the well-entrenched world patters of combustion of fossil fuels in power plants and vehicles]. Under even the most optimistic scenarios to redirect the infrastructure of energy use to more sustainable technologies, if one does not begin such redirection now in earnest, our global "boat" can not be turned in time should global warming predictions prove true.[14] By the time the global warming predictions are confirmed empirically, it will effectively be too late to reverse embedded technologies to avert consequences. How should policy makers now factor in scientific uncertainty? Under the "precautionary principle," when long-term environmental impacts of anthropogenic sources of emissions are not knowable, policy makers err in favor of environmental protection: One minimizes the probability of

13. *See* Kyoto Protocol to the United Nations Framework Convention on Climate Change, U.N. DOC FCCC/CP1997/L.7/Add.1, 37 I.L.M. 22 (Dec. 10, 1997), *available at* http://unfccc.int/resource/docs/convkp/kpeng.pdf.

14. *See generally* Intergovernmental Panel on Climate Change, *supra* note 6.

the maximum negative outcome.[15] Since the ecology of the Earth is an extraordinarily complex living system that is not easily or cheaply – if at all – repaired after-the- fact, one might err in policy choices in favor of preserving the healthy balance of functioning natural systems.

A. The Phenomenon of Global Warming

Climate change is important. There is historical evidence that societal collapse has occurred from global climate change.[16] Climate change is attributed to global warming due to the greenhouse effect from anthropogenic emissions of carbon dioxide (CO2) and other greenhouse gases.[17] Like the greenhouse effect itself, climate change is a process that occurs naturally, but it has been intensified by human activities.[18] The risks of climate change include the potential for large-scale and possibly irreversible impacts on continental and global scales.[19]

1. The Science of Atmospheric Greenhouse Gases

Greenhouse gases are a direct byproduct of economic activity. GHGs occur naturally in the atmosphere, but since the Industrial Revolution, emissions resulting from combusting fossil fuels for mechanical and electrical energy have poured into the atmosphere.[20] GHGs trap sunlight in the earth's atmosphere, absorbing the longer

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15. David M. Driesen, *Free Lunch or Cheap Fix?: The Emission Trading Idea and The Climate Change Convention*, 26 B.C. ENVTL. AFF. L. REV. 1, 15-16 (1998).

16. *See* H. Weiss & R.S. Bradley, *What Drives Societal Collapse?*, SCIENCE, Jan. 26, 2001.

17. *See generally* Pew Center for Climate Change, *Global Warming Basics*, *available at* http://www.pewclimate.org/global-warming-basics/.

18. Intergovernmental Panel on Climate Change, *supra* note 6.

19. Intergovernmental Panel on Climate Change, United Nations Environment Programme, Working Group II (Impacts, Adaptation, and Vulnerability), *Summary for Policymakers 6* (2001) [hereinafter WG2 Summary], *available at* http://www.grida.no/climate/ipcc_tar/wg2/pdf/wg2TARspm.pdf (last visited Oct. 27, 2003) (describing possible risks of climate change impacts - The possible impacts are climate-dependent, and the Working Group has not evaluated the full range of scenarios. Climate change may be the most expensive disaster ever faced.); *See also* Andrew Simms, *International Federation of the Red Cross and Red Crescent*, World Disasters Report 98 (2002).

20. Intergovernmental Panel on Climate Change, *supra* note 6.

infrared radiation, and turn the sunlight into heat, a phenomenon known as the "greenhouse effect."[21]

Greenhouse gases include as those gases of most concern: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). All are measured in units that are multiples of the global warming impact of one molecule of CO_2 compared to one molecule of the subject GHG. This is referred to as CO_2 equivalents, CO_2e, where CO2 is assigned a value of 1, and for example, methane, which has twenty-one times more warming potential molecule-for-molecule, is assigned a value of 21.

In 2000, anthropogenic activities emitted 320 million tons of methane and 33 TgN of nitrogen[22] into the atmosphere per year.[23] It is estimated that about 26 million tons of CO2 is now expelled annually into the atmosphere. These levels are rising at a rate of about four percent per year.[24] The secondary greenhouse gases, resulting significantly from agriculture, electricity production, and transportation, all contribute to and intensify the greenhouse effect with varying amounts and levels of potency.[25] They are more highly reactive in the atmosphere, and while they have local environmental impact on air quality, their impact on the greenhouse effect is not completely understood.[26] .

The global warming impact molecule-by-molecule of many of these secondary, and less prevalent GHGs, is significantly greater than CO2.[27] However, because they are released in much lesser quantities and/or have shorter residence times in the atmosphere before they dissipate, CO2 is the most troubling GHG.[28] Assigning

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21. *Id.*

22. A TgN = 1 teragram of nitrogen, or 10 to the twelfth power grams, or a trillion grams.

23. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, United Nations Environment Programme, *Climate Change 2001: Working Group I: The Scientific Basis* § 4.2 (2001) [hereinafter WG1 FULL REPORT], *available at* http://www.grida.no/climate/ipcc_tar/wg1/index.htm.

24. *Id.*

25. JEDEDIAH S. PURDY, *CLIMATE CHANGE AND THE LIMITS OF THE POSSIBLE*, 18 Duke Envtl. L. & Pol'y F. 28, (AUGUST 27, 2008).

26. *See generally* John M. Reilly, et. al., *Multi-gas Contributors to Global Climate Change: Climate Impacts and Mitigation Costs of Non-CO2 Gases*, PEW CENTER, (Feb. 2003), *available at* http://www.pewclimate.org/document.cfm?documentID=211 (last visited Sept. 4, 2004).

27. *See infra* p. 9 Table 1.

28. *Id.*

CO2 a global warming potential of 1 (as explained two paragraphs above), the relatively greater magnitude of the other GHGs and there residence time in the atmosphere is as provided in Table 1. The GHGs in Table 1 are displayed in descending order of their impacts on the environment, which is a function of their quantity released, their heat radiation properties, and their residence time in the atmosphere.

Table 1: Key Facts About Greenhouse Gases

GHG	**Global Warming Potential [CO2 = 1]**	**Residency Time [years]**	**Amount of U.S. Total GHG Release [%][29]**
CO2	1	100	85
Methane	21	12	11
Nitrous Oxides	310	120	2
Hydrochlorofluorocarbons	140-11,700	varies	< 1
Chlorofluorocarbons	6,500	varies	< 1
Hexafluoride (SF6)	23,900	varies	< 1

Whatever the impact of the secondary GHGs, carbon dioxide (CO2) is far and away the largest GHG by emitted volume. CO2 is the main byproduct of fossil fuel combustion, and therefore results from any energy production that uses oil, coal, natural gas or other solid waste fuels. Ninety-eight percent of anthropogenic CO2 emissions are from combustion of fossil fuels, and 83% of U.S. GHG emissions are attributed to CO2.[30]

29. U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-1993*, ES-4 (1994) (EPA 230-R-94-014).

30. U.S. Dep't of Energy, EIA, *Emission of Greenhouse Gases in the United States*, 1998.

Most of the world's carbon is collected in the deposits of oil, gas, and inorganic deposits of carbonates.[31] Carbon is also in plants in the ocean, and growing plants and trees on land.[32] Most organisms use organic molecules/carbon for the energy required for growth.[33] About fifteen billion tons of carbon, in the form of CO2, is turned into new wood growth each year.[34] Thus, healthy forests and their conservation are very important in the CO2 cycle, absorbing naturally and containing about two-thirds of atmospheric carbon, including much of what is emitted from anthropogenic sources.[35] Therefore, the gross amount of carbon emitted from burning fossil fuels does not become an environmental problem, to the extent that forests absorb about half of that emission and convert it into additional forest growth. However, there are limits on that absorption.

Until recently, the U.S. Environmental Protection Agency in the U.S. did not classify CO2 as a "pollutant."[36] But the sheer amount of CO2 emitted into the environment is enormous and persists for more than 100 years.[37] In 2000, the world emitted almost seven billion tons CO2 of into the atmosphere per year.[38] Global CO2 emissions are rising at the rate of approximately ten percent per year.[39] Atmospheric CO2 levels now are approximately 33% higher than in pre-industrial times.[40]

Almost three-quarters of anthropogenic CO2 emissions are generated in developed countries, although this balance is shifting towards

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31. *See* WG1 FULL REPORT, *supra* note 26.

32. EO Library: The Carbon Cycle, at 2, *available at* http://earthobservatory.nasa.gov/Library/CarbonCycle/carbon_cycle2.html.

33. *Id.*

34. Arnold W. Reitze, *Global Warming*, 31 ENVTL LAW REPORTER 10253, 10255 (2001).

35. Environmental Protection Agency, *The Terrestrial Carbon Cycle: Managing Forest Ecosystems*, *available at* http://www.epa.gov/wed/pages/projects/globalclimatechange/TerrestrialCarbonCycle.pdf.

36. Massachusetts v. EPA, 549 U.S. 497, 127 S.Ct. 1438 (2007).

37. Energy Info. Admin., US Dep't of Energy, International Energy Outlook 2003, 4-5 (2004), *available at* http://tonto.eia.doe.gov/FTPROOT/ forecasting/0484(2003).pdf [hereinafter International Outlook].

38. *Id.*

39. *Id.*

40. Reitze, *supra* note 35, at 10254 (CO2 levels have increased from 270-280 ppm in pre-industrial times to more than 360 ppm in 1999. Nitrous oxide levels increased from 270 ppm to 310 ppm and methane concentrations have increased from 700 ppb to 1,700 ppb over the same period).

developing countries.[41] Although emitting less than one-quarter of anthropogenic sources of CO2 now, developing nations are expected to emit a majority of CO2 emissions before 2035 and as early as 2020, while China is expected to surpass the U.S. as the largest CO2 emitter in the world within 10 years.[42] The sobering news in this is not only that emissions are increasing, but that developing countries have much higher GHG emissions per unit of gross national product.[43] China has the highest emissions in the world per unit of gross national product (GNP) by a factor more than double other nations.[44] As these nations industrialize, they increase GHG emissions, though CO2 intensities may decline as the economies grow more efficient, and economic activity shifts becomes less energy intensive, as has been observed in developed countries.

The two main sources of anthropogenic GHG emissions are motor vehicles and electricity generation plants.[45] Asia's economic growth, high population growth, and increased urbanization are increasing pressure on both transportation and electricity generation resources.[46] Implementing limits on personal transportation is a daunting challenge. Unlike electricity which is often centrally supplied from a few large plants, transportation decisions on vehicle purchase and use are made by billions of individual households in an atomized and disaggregated fashion. The extremely low capital in-

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41. *Id;* Almost exactly half of world CO2 emissions are deemed to emanate from activities in the OECD countries. As of 2020, developing nations are forecast to surpass the developed nations in the discharge of CO2. There are 30 countries that have signed the Convention on the Organization for Economic Cooperation and Development. This includes 30 of the 36 developed countries originally expected to sign the Kyoto Protocol (The U.S. and Australia did not sign). Purdy, supra note 26, at 23, Table 1.

42. Reitze, *supra* note 35; Purdy, *supra* note 26 (showing OECD CO2 output equaling developing nation CO2 output as early as 2020).

43. *Reitze, supra* note 35, at 10255.

44. *China Gas Emissions 'may pass U.S'* BBC NEWS, April 24, 2007, *available at* http://news.bbc.co.uk/2/hi/asia-pacific/6587493.stm.

45. *International Energy Outlook, SUPRA* NOTE 4, AT 7. (About 25% of CO2 emissions are from deforestation and natural processes).

46. One in Four Beijingers Now Owns a Car. South China Morning Post, August 6, 2003. In Beijing during 2003, vehicle ownership rose from 1 million in 1997 to 2 million, and new vehicles came onto Beijing's roads at a rate of 27,000 per month. In many cities in India, the dominant motor vehicles are "auto-rickshaws," vehicles with small two and four stroke engines that use a highly polluting home-brew of a kerosene-lubricant mix as fuel. *LPG Plan for Rickshaws Could Clear Air of Toxins*, The Times of India, August 23, 2003.

vestment needed to get a motor vehicle on the road is a serious obstacle to controlling emissions. To affect consumption decisions in the transportation sector requires motivating hundreds of millions of individual consumers. Similarly, the extremely low capital intensity of electricity using appliance is an obstacle to CO2 emissions reductions.[47]

Electricity generation is the other major producer of GHGs. Fossil-fuel fired power plants are responsible for 30% of anthropogenic CO2 emissions.[48] China currently meets 70 percent of its electricity demand through coal plants, the most prolific emitters among fossil fuel plants in terms of both CO2 and particulate matte.[49] Fifty-seven percent of India's electricity comes from coal.[50] To meet its growing energy needs, China is planning on rolling out 100 new large power plants by 2020, including nuclear, hydropower and coal plants.[51] China is rolling out 1 Gw[52] of new coal-fired electric capacity per year.[53] India has targeted 100,000 MW[54] in new capacity over the next ten years.[55] Vietnam is planning on adding scores of additional new hydroelectric and oil-fired plants by 2010.[56] The single-point nature of power plants' emissions, the centralized nature of most power plant decisions in developing nations, and the exploding demand for electricity, make electricity generating plants the logical choice for a frontal assault on GHG emissions.

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47. STEVEN FERREY, RENEWABLE POWER IN DEVELOPING COUNTRIES: WINNING THE WAR ON GLOBAL WARMING 10 (PennWell Books 2005).

48. Uranium Institute, Position Paper, *Responding to Global Climate Change: The Potential Contribution of Nuclear Power*, at http://www.world-nuclear.org/climate.htm (last visited Aug. 15, 2004).

49. Howard W. French, *China's Boom Brings Fear of an Electricity Breakdown*, N.Y. Times, Jul. 5, 2004, at A4.

50. *Id.*

51. *Id.*

52. One Gw = 1,000 Mw. *See* Unit Conversion.org, http://www.unitconversion.org/power/megawatts-to-kilowatts-conversion.

53. Purdy, *supra* note 26, at 23

54. One megawatt (Mw) = 1000 killowatts (Kw) = 1,000,000 watts. Unit Conversion.org, *supra note 53.* A large shopping mall might use about 1 Mw of electric capacity, while a large university with many research labs, such as M.I.T. uses about 25 peak Mw of capacity.

55. U.S. DEP'T OF ENERGY, *India Country Analysis Brief*, (January 2007) *available at* http://www.eia.doe.gov/cabs/india.html.

56. U.S. DEP'T OF ENERGY, *Vietnam Country Analysis Brief*, (January 2007) *available at* http://www.eia.doe.gov/cabs/vietnam.html.

2. Long-Term Climate Change Risk

The Intergovernmental Panel on Climate Change (IPCC) is a United Nations agency created during the 1990 Rio de Janeiro Earth Summit to serve as a non-politicized source of information about climate change for policy makers.[57] The IPCC has three working groups and in 2001, they published their most recent major reports, along with Summaries for Policy Makers, which contain the distilled findings of the working groups.[58]

The nearly seven billion tons of CO2 emitted by the U.S., or 26 billion tons emitted by the world, into the atmosphere annually stays in the atmosphere for extremely long periods - 100 years - and accumulates over time.[59] The IPCC estimates that the present atmospheric concentration of CO_2 is at its highest level in the past 420,000 years, and the current rate of increase is unprecedented over the past 20,000 years.[60] The result of this massive influx of carbon into the atmosphere is a rapidly warming climate.[61] During the 20th century, the global average surface temperature increased 0.6 degrees Celsius, and the 20th century was likely the northern hemisphere's warmest in a thousand years. By 2100, IPCC models project the average global surface temperature to warm anywhere from 1.4 to 5.8 degrees Celsius.[62] This is a rate of warming higher than has occurred over the past 10,000 years. The IPCC concluded that it is very unlikely that such warming is natural in origin or because of internal variability alone.[63]

The IPCC used global mean annual temperature as a proxy for the magnitude of climate change.[64] The actual impact depends on multiple interrelated factors, such as the magnitude and rate of global and regional variation in mean climate, extreme climate phenomena,

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57. Intergovernmental Panel on Climate Change, About IPCC, http://www.ipcc.ch/about/index.htm (last visited Oct. 11, 2006).

58. *Id.*

59. *See infra*, p.9, Table 1.

60. Intergovernmental Panel on Climate Change, United Nations Environment Programme, Working Group I (Science), *Summary for Policymakers 7* (2001) [hereinafter WG1 Summary] *available at* http://www.grida.no/climate/ipcc_tar/wg1/pdf/WG1_TAR-FRONT.PDF (last visited Oct. 26, 2003).

61. *Id.* at 2.

62. *Id.* at 14.

63. Intergovernmental Panel on Climate Change, *supra* note 6.

64. WG2 Summary, *supra* note 20, at 5.

socio-economic conditions, and adaptation responses to warming.[65] Flooding and sea level rise resulting from climate change pose the most direct risk to human settlement.[66] In developing nations, the impacts of climate change are expected to be far reaching, adversely affecting virtually all aspects of social and economic life, threatening agriculture and water supply, and displacing millions of people living in low lying areas.[67]

In some of the IPCC's projections, the global average sea level will rise anywhere from 0.09 to 0.88 meters causing tens of billions of dollars of damage to coastal-area infrastructure and displacing 200 million people by 2080.[68]

> "Continued global warming is in nobody's interest, but the simple facts of the matter are that developing countries will suffer the most damage, and their poor will be at an even greater disadvantage."[69]

Human systems are also vulnerable to extreme climatic events, which will increase in severity with continued global warming. The economic loss from ordinary and extreme weather events has soared in recent decades. Global economic losses from extreme weather events rose by a factor of 10.3 from $3.9 billion per year in the 1950s to $40 billion per year in the 1990s.[70] The costs of such events have increased rapidly despite significant efforts to fortify infrastructure and enhance disaster preparedness.[71] Finally, the impacts of climate change may not have a linear relationship to in-

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65. WG2 Summary, *supra* note 20 at 5.

66. *Id.*

67. *Id.*

68. WG2 Summary, *supra* note 20, at 13 (assessing risks to human systems from flooding resulting from climate change); *Id.* at 5; *See also* Paul Kirshen & Matthias Ruth, *Dynamic Investigation into Climate Change Impacts on Urban Infrastructure* 2 (paper presented at Western Regional Science Association Annual Meeting, Feb. 18-20, 2002) (discussing interrelationships between climate change and urban infrastructure and assessing possible impacts) *available at* http://www.puaf.umd.edu/faculty/papers/ruth/ClimateChangeConf.pdf (last visited Jan. 22, 2004).

69. James Wolfensohn, President, World Bank, Speech at United Nations General Assembly Special Session (UNGASS) (June 1997).

70. WG2 Summary, *supra* note 20, at 10 (discussing climate change impacts on insurance and financial services industries).

71. *Id.*

creased temperature or GHG concentrations.[72] As a complex biological system, the climate exhibits complex, non-linear behavior, which may resemble cumulative chaotic scenarios.[73] In other words, there may be a "tipping point" or precipice at which naturally balanced systems spiral rapidly into disarray. Since we have never advanced to such a precipice, there is no empirical demonstration of where or whether it exists.

The real danger lies in the small, but serious potential for a catastrophic event with unpredictable consequences. Examples of such extreme impacts include the slowing of the Gulf Stream current and large reductions in the Greenland and West Antarctic Ice Sheets.[74] If such changes do occur, their impact could be widespread, sustained, and irreversible in any discreet time frame in which human political institutions can negotiate and respond.

Though the IPCC acts as the voice of scientific consensus, there are scientists who dissent from the IPCC's conclusions. The dissent proceeds on several grounds:

- It contests the scientific data and its interpretation,
- It argues that additional CO2 emissions will lead to additional plant carbon sink development in the tree canopy and oceans, or other natural balancing factors, which will absorb or neutralize the additional CO2,
- It submits that future technological innovation will mitigate any global warming impacts,
- It attacks the phrasing of the IPCC conclusions.[75]

The dissent in the scientific community submits that given the natural variability of the climate and of the IPCC's own scenarios, there is no compelling evidence that global warming is anthropo-

72. Intergovernmental Panel on Climate Change, United Nations Environment Programme, Working Group 3 (Mitigation), *Summary for Policymakers 3* (2001) [hereinafter WG3 Summary] *available at* http://www.grida.no/climate/ipcc_tar/wg3/pdf/WG3_SPM.pdf (last visited Oct. 28, 2003).

73. GRÉGOIRE NICOLIS & ILYA PRIGOGINE, EXPLORING COMPLEXITY, 36-40 (W.H. Freeman and Co. 1989) (discussing non-linear behavior of climate system and possible amplifying mechanisms).

74. WG3 Summary, *supra* note 72, at 3.

75. *See* Senator James M. Inhofe, Chairman, Comm. On Env't And Pub. Works, Floor Statement regarding The Science Of Climate Change, (July 28, 2003) *available at* http://epw.senate.gov/pressitem.cfm?party=rep&id=212247 (last visited October, 11, 2007).

genic.[76] For example, Dr. James Lindzen, a MIT meteorologist, has attacked the methodology of the IPCC's historic temperature analysis.[77] Attacking the claim that the last century was the warmest in 1,000 years, Dr. Lindzen argues that the IPCC researchers used tree rings alone to gauge temperature for the first 600 years of the study, and only those from four separate locations.[78] Lindzen calls the method to turn tree-ring width into temperature "hopelessly flawed."[79] Lindzen also claims that the IPCC seriously overstates the correlation between temperature and the amount of CO2 in the atmosphere. Additionally, critics of the IPCC point to a 1,000 year climate study by Drs. Sallie Baliunas and Willie Soon of the Harvard-Smithsonian Center for Astrophysics.[80] Soon and Baliunas take issue with the IPCC by contending that the 20th century saw no unique patterns; they found few climatic anomalies in the proxy records.[81]

Lack of certainty surrounding the possible effects of climate change is not a good rationale for inaction. Estimates of the benefits of reducing GHGs range from U.S. $5-125/ton, with an additional benefit of up to $20/ton for diminution of criteria pollutants.[82] The enormity and complexity of climate change means that the policy-making time frame is very long, and policy makers will be unable to affect a quick fix.[83]

The international legal doctrine known as the "precautionary principle" advances the concept of policy risk hedging to respond to eco-

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76. Iain Murray, *An Improved Climate*, WASHINGTON TIMES, Dec. 26, 2003, *available at* http://www.washingtontimes.com/news/2003/dec/26/20031226-114728-6336r/.

77. Daniel Grossman, *Dissent In The Maelstrom*, SCIENTIFIC AMERICAN, Nov. 2001, *available at* http://www.sciam.com/article.cfm?id=dissent-in-the-maelstrom.

78. *Id.*

79. *Id.*

80. David Appell, *Hot Words: A Claim Of Nonhuman-Induced Global Warming Sparks Debate*, SCIENTIFIC AMERICAN, June 24, 2003, *available at* http://www.sciam.com/article.cfm?id=hot-words-2003-06-24.

81. *Id.*

82. J.P. BRUCE, ET AL., CLIMATE CHANGE 1995: ECONOMIC AND SOCIAL DIMENSIONS OF CLIMATE CHANGE, 183 (1996).

83. James K. Sebenius, *Designing Negotiations Toward a New Regime: The Case of Global Warming*, 15 INT'L SECURITY 110, 111 (1991). (Climate change involves interplay between the planet's ecosystem and the human socioeconomic system, two vast and complex systems).

logical uncertainties; it works to keep options open for the future.[84] The precautionary principle militates in favor of limiting GHGs to a level that eliminates any foreseeable plausible threat of catastrophic environmental scenarios. The United Nations Framework Convention on Climate Change (UNFCCC), still the only international accord on climate change in force, makes the precautionary principle a core tenet in Article 3:

> The Parties should take precautionary measures to anticipate, prevent, or minimize the causes of climate change and mitigate its adverse effects. *Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures*, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost.[85]

B. Institutional Action and Inaction on Greenhouse Gases

1. Sustainable Energy Paths

Whether conventional fossil-fuel-fired power plants are (1) permanently torquing the global thermostat beyond natural limits of sustainability, or (2) merely expelling copious quantities of GHGs and other criteria pollutants into the atmosphere, the prudent policy response for developed and developing nations may be the same. There is a logical policy choice:

- When sustainable power generation technologies are available which do not cause significant GHC emissions

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84. The precautionary principle also is articulated as "that if it is known that an action may cause profound and irreversible environmental damage which permanently reduces the welfare of future generations, but the probability of such damage is not known, thin it is inequitable to act as if the probability is known." Charles Perrings, as quoted in D. Kysar, *Climate Change, Cultural Transformation, Comprehensive Rationality*, 31 B.C. ENVTL. AFF. L. REV. 555, 565 (2004).

85. United Nations Conference on Environment and Development: Framework Convention on Climate Change, May 9, 1992, art. 3, S. Treaty Doc. No. 102-38, U.N. Doc. A/AC.237/18 (Part II) Add.1, 81 I.L.M 849 [hereinafter UNFCCC] *available at* http://unfccc.int/resource/docs/convkp/conveng.pdf. (last visited Jan. 22, 2004) (emphasis added).

- at an appropriate scale and application to the demands of developing nations
- which nations have a flexible and developing power infrastructure that can accommodate "greenfield" renewable energy projects
- where developed nations and international organizations are prepared to provide substantial financial and technical assistance with alternative energy development for developing countries and
- deployment of renewable resources buffers developing countries particularly, and all nations generally, against the volatile financial and supply vicissitudes of importing fossil fuels for their power sectors,

More than 30 years ago, the U.S. Council on Environmental Quality, issued this call for an intergenerational approach to the possibility of global warming:

> One imperative we share is to protect the integrity of our fragile craft and the security of its passengers for the duration of our voyage. With our limited knowledge of its workings, we should not experiment with its great systems in a way that imposes unknown and potentially large risks on future generations. In particular, we cannot presume that, in order to decide whether to proceed with the carbon dioxide experiment, we can accurately assess the long-term costs and benefits of unprecedented changes in global climate.....Although our domination over the earth may be nearly absolute, our right to exercise it is not.[86]

Under any global warming scenario, it makes logical institutional and national sense to deploy renewable resources to a significant degree. Many renewable technologies make economic sense now in terms of economics and buffering users from fossil fuel price fluctuations, even without taking account of GHG issues.[87] Renewable energy technologies in many instances – particularly where new

86. U.S. Council on Envtl. Quality, Global Energy Futures and the Carbon Dioxide Problem, at viii (1981).

87. American Wind Energy Association, *The Economics of Wind Energy,* http://www.awea.org/pubs/factsheets/EconomicsOfWind-Feb2005.pdf (last visited October 11, 2006).

electric supply infrastructure is being created or extended – are justified without regard to their GHG benefits in developing nations.

If dire forecasted global warming impacts are correct, nations and the international community will wish it had done *more, earlier* than current efforts to deploy renewable power technologies. If to the contrary, the dire GHG predictions are not borne out over time, the worst-case scenario is that developing and other nations, for some part of their power mix, would have to elect proven renewable energy technologies in lieu of some conventional technologies. The International Energy Agency in Paris forecasts that by 2030, world demand for energy will grow by 59% and fossil fuel sources will still supply 82% of the total, with non-carbon renewable energy sources supplying only 6%.[88]

The sheer dollar cost of fossil fuels will rise as demand for electricity grows and fossil fuel becomes more scarce and harder to obtain.[89] A supply-side increase in the rate of extraction of fossil fuels will not indefinitely solve the fossil energy supply problem. Fossil fuels are created over hundreds of millions of years, and thus in modern institutional terms, are finite and not renewable.[90] Doubling the size of world oil reserves will add, at most, fourteen years to the life expectancy of the reserves if use continues to climb at the currently increasing rate.[91] It is generally acknowledged that because of reasons of dwindling accessible supply and price, the voracious energy appetites of humankind will cause a shift to alternative energy sources. This inevitability presents a technological and economic advantage for whichever nations build power infrastructure now, at least in part, around non-carbon fuels.

2. The Kyoto Protocol and Future Power Resources

By 1991, 13 developed nations, not including the U.S., had agreed to reduce or stabilize their CO2 emissions by 2005.[92] These pledges

88. International Energy Agency, *World Energy Outlook 2004*, *available at* http://www.iea.org/textbase/nppdf/free/2004/weo2004.pdf.

89. *See* Evar D. Nering, *The Mirage of a Growing Fuel Supply*, N.Y. TIMES, Jun. 4, 2001, at A17.

90. *See* SCIENCE ONLINE, *Non-renewable energy resources*, *available at* http://www.scienceonline.co.uk/energy/nonrenewable.html

91. International Energy Agency, *supra* note 88.

92. United Nations Framework on Climate Change (May 9, 1992).

have not been realized.[93] The Framework Convention on Climate Change treaty was agreed to at the Rio de Janeiro U.N. Conference on Environment and Development in 1992 and the Kyoto convention in 1997.[94] The "Kyoto Protocol," ratified by 36 industrialized nations excluding prominently the United States and Australia, requires those 36 developed nations by 2012 to reduce CO2 emissions 7% below 1990 baseline levels.[95] The other GHGs must be reduced to 5 to 7% below either their 1990 or 1995 baseline levels by 2008 to 2012.[96] Emissions may be reduced or forest canopy expanded to absorb CO2. [97]

The U.S. has withdrawn from the Protocol, while most European Union countries, including Russia, have ratified it.[98] The European Union ("EU") has already established an internal EU target of 22% renewable energy for the generation of electricity, and 12% of all energy from renewable resources by 2010, although it may not be realized.[99]

Only 34 (36 if the United States and Australia had ratified the Protocol) of the 200 world nations are covered in the Protocol by mandatory obligations.[100] Because of the short-term needs of developing countries to provide food, energy, and other services to their poor, they are not required by the Kyoto Protocol to invest in GHG reductions.[101] There is no mechanism in the Kyoto Protocol to ensure

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93. The GHG emissions of the major E.U. countries and the U.S. had not peaked by 2005. Emissions continued to increase between 1990 and 2005, and had not stabilized by that time. For example, U.S. emissions continued to increase by about 17% over this period. The U.S. Department of Energy Information Administration expects carbon emissions to continue to increase over the forecast period which extends to 2030. See, International Energy Outlook 2007, Ch. 7 – Energy-Related Carbon Dioxide Emissions, *available at* http://www.eia.doe.gov/oiaf/ieo/emissions.html.

94. UNFCC, *A Summary of the Kyoto Protocols,* http://unfccc.int/kyoto_ protocol/background/items/2879.php (last visited October 11, 2007).

95. *Id.*

96. *Id.*

97. *Id.*

98. The U.S. voted 95-0 for the Byrd-Hagel Resolution, which opposed Kyoto and any climate change treaty that did not include binding GHG emission targets for developing nations on the same schedule as developed nations. S. Rep. No. 105-54, at 4 (1997).

99. EEI ENERGY NEWS, Sept. 26, 2002 at p. 9.

100. International Energy Outlook 2007, *supra* note 7,

101. *Id.*

compliance of any nation.[102] It is expected that developed nations will engage in concessional technology transfer and assistance with renewable energy technologies in developing nations.[103] This increases the importance of environmental assessments in regulating what types of power generation are "green lighted" for construction.

The UNFCCC uses the principle of "common but differentiated responsibility" with regard to climate change. The approach of much of the international community is to look at GHG as a common but differentiated responsibility of both developed and developing nations.[104]

The developed nations have much larger absolute and per capita energy consumption, but in some instances lower energy consumption per unit of gross domestic product.[105] With population more stable in many developed nations, it is developing nations where population and development pressures will lead to dramatic increases in electric generation in the next two decades.

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102. *Id.*

103. UNFCCC, *Joint Implementation*, *available at* http://unfccc.int/kyoto_protocol/background/items/2882.php

104. "Common but Differentiated Responsibility articulated as Principle 7 of the Rio Declaration, this principle requires states to cooperate in a spirit of global partnership to protect the environment. Yet, because states have contributed differently to global environmental problems, the principle recognizes that they should have common, but differentiated, responsibilities. A good example is Article 4 of the 1992 UNFCCC, which places an obligation on developed countries to take the lead in meeting the required reductions in greenhouse gas emissions. Developing country parties, however, are only obliged to implement these commitments to the extent that developed countries have met their commitments to provide financial resources and to transfer technology. As a general principle, sure to govern further negotiations on the UNFCCC, the principle of common but differentiated responsibility is highly significant. The structure of the 1997 UNFCCC Kyoto Protocol mirrors the philosophy of common but differentiated responsibility. Developed countries are committed to reducing their overall emissions of greenhouse gases by at least 5 percent below 1990 levels between 2008 and 2012. Developing nations have no such commitments. Although every nation state has the responsibility to reduce global greenhouse gas emissions, only Organization for Economic Co-Operation and Development (OECD) and economies-in-transition countries are required to make specific, quantified emission limitations. The limitations, even among these countries, vary to take into account differing domestic circumstances. Developing countries are provided with an opportunity to participate through the Clean Development Mechanism, which allows countries to cooperate on specific projects to reduce greenhouse gas emissions." *See* The World Bank, Projects and Operations, http://www4.worldbank.org/legal/legen/legen_iel.html (last visited Oct, 11, 2007).

105. UNFCCC, *supra* note 103.

These targets for GHG reduction will not be achieved in the specified time frames. All forecasts of the U.S. Department of Energy, the International Energy Agency, and independent forecasters, agree that GHG emissions will increase exponentially, not decrease, during the foreseeable future.[106] The U.S. Department of Energy forecast that a worldwide increase of 54% over 1990 levels could occur by 2015.[107] While greenhouse gases in the U.S. since 1990 have increased more slowly than population growth or electric power production, in the one dozen years after 1990, U.S. greenhouse gas emissions increased 10.9%.[108]

III. GLOBAL ENVIRONMENT AS A FUNCTION OF ENERGY TECHNOLOGY CHOICES

> "Energy flows underlie all human activity and substantially influence both the economic and the ecological systems locally and regionally, as well as globally."[109]

A. Regulatory Options For Warming Mitigation: The Reality Principles

The emission of greenhouse gases is driven by a fairly simple relationship where GHGs are a function of:

- population
- degree of development and electrification
- choice of technology.

Affecting any of the three elements in this equation changes the emission of atmospheric gases that drive the models of global warming. If we must mitigate global warming, we must immediately in-

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106. International Energy Outlook 2007, *supra* note 7.

107. Reitze, *supra* at note 37, at 248.

108. U.S. Dep't of Energy, EIA, *Emissions of Greenhouse Gases in the United States 2002* (2003). This is because of increased deployment of renewable resources and cogeneration during this period and greater energy efficiency in U.S. manufacturing, production and delivery of services.

109. Uwe Fritsche and Felix C. Matthes, *Changing Course: A Contribution to a Global Energy Strategy*, Heinrich Boll Foundation, Paper No. 22, at 13 (2003) [hereinafter *Changing Course*] (2002 World Summit, Johannesburg).

fluence some or all of these three variables. Which of these three variables can we influence by policy changes?

1. Variable 1: Population

While population control has its proponents, there is little doubt that world population will increase significantly during the next 50 years, especially in less industrialized, poorer, developing nations. World population could reach 8 billion people by 2020 and 9 to 10 billion by 2050.[110] East Asia (including China) and South Asia now contain more than three billion of the world's six billion population.[111] Urbanization and population growth in India have driven a 208 percent growth in India's energy consumption in the last twenty years.[112] By 2025, one quarter of the world's population will be living in Asian cities.[113]

Over the last twenty-five years, more than one billion people in developing nations have gained access to modern energy fuels, including electricity, coal, kerosene, natural gas, and liquefied natural gas.[114] There are, however, still between 1.6 billion to 2 billion people[115] worldwide with no access to modern energy services or electricity and 56 percent of the world's rural population lacks access to energy services.[116] Due to population growth, the number of people

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110. *Id.* at 15.

111. *Id.* (utilizing IEA 2002 data).

112. *India Country Analysis Brief*, *supra* note 59.

113. Susan Sim, *Overtaking the West: Asia's Teeming Urbanites*, THE STRAITS TIMES (Singapore), Dec. 9, 1996, at 41.

114. DOUGLAS F. BARNES & JONATHAN HALPERN, *THE ROLE OF ENERGY SUBSIDIES*, ENERGY SERVICES FOR THE WORLD'S POOR: ENERGY AND DEVELOPMENT REPORT 2000, at 60 (The World Bank & Energy Sector Management Assistance Programme eds.) (2000) [hereinafter Barnes, Role of Energy Subsidies].

115. 2004 World Energy Assessment, at 33 (estimating 2 billion people); PENELOPE J. BROOK AND JOHN BESANT-JONES, "REACHING THE POOR IN THE AGE OF ENERGY REFORM," *ENERGY SERVICES FOR THE WORLD'S POOR: ENERGY AND DEVELOPMENT REPORT 2000*, at 2 (The World Bank & Energy Sector Management Assistance Programme eds.) (2000) [hereinafter Brook, Reaching the Poor] (estimating 2 billion); WORLD RESOURCES INSTITUTE, POWER POLITICS: EQUITY AND ENVIRONMENT IN ELECTRICITY REFORM, 2 (Navroz K. Dubash, ed.) (2002) (1.7 billion); Energy and Mining Sector Board: The World Bank Group, *The World Bank Group's Energy Program: Poverty Alleviation, Sustainability, and Selectivity*, 7 (2001) (1.6 billion).

116. World Resources Institute, POWER POLITICS: EQUITY AND ENVIRONMENT IN ELECTRICITY REFORM, 1 (Navroz K. Dubash, ed.) (2002).

without access to modern energy services is increasing at approximately 30 million people per year.[117] Population is not a variable that is controllable with the governmental systems employed in most of the countries of the world.

2. Variable 2: Electrification For Development

With development, per capita electric consumption will increase dramatically in developing nations. Patterns of electric intensity are changing quickly in the 21st century. Forecasts suggest a very strong demand growth for electric energy over the next 50 years in developing countries. The average annual growth rate in primary energy use in developing countries from 1990 to 2001 grew by 3.2 percent per year, compared in industrialized countries to 1.5 percent over the same period.[118] As much as a 4 percent per year increase in demand by developing countries over the next 20 years is predicted by the International Energy Agency.[119] Energy demand in developing Asia will double over the next twenty five years.[120] The majority of this demand stems from economic and population growth in developing countries and transitional countries.[121]

Access to modern electric energy is a fundamental component of human development and an important catalyst for economic growth, especially in developing nations. Ultimately, increased access results in access to necessities and an improved standard of living. Direct benefits from electric energy access include reliable lighting, heat, and refrigeration, health benefits due to enhanced indoor air quality from the cessation of use of polluting fuel sources, reduced fire hazards, higher quality health services equipment, greater business productivity, and increased opportunities for education.[122]

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117. UNITED NATIONS DEVELOPMENT PROGRAMME ET. AL., WORLD ENERGY ASSESSMENT: OVERVIEW 2004 UPDATE, at 65 (Jose Goldemberg & Thomas B. Johansson eds.) (2004) [hereinafter 2004 World Energy Assessment].

118. *Id.*

119. International Energy Agency, World Energy Outlook 2002 (Paris, 2002).

120. International Outlook 2003, *supra* note 38.

121. Renewables 2004: International Conference for Renewable Energies, Conference Issue Paper, (June 1-4, 2004), Bonn, Germany, at 7 [hereinafter Renewable 2004 Conference Paper].

122. CATHERINE W. PRICE, BETTER ENERGY SERVICES, BETTER ENERGY SECTORS – AND LINKS WITH THE POOR, ENERGY SERVICES FOR THE WORLD'S POOR: ENERGY AND DEVELOPMENT REPORT 2000, 26-27 (The World Bank & Energy Sector Management Assistance Programme eds.) (2000) [hereinafter Price, Better Energy Services, Better Energy Sectors].

To illustrate the discrepancy in energy use and standard of living, the United Nations Development Programme (UNDP) developed a human development index (HDI) for comparing social and economic well-being in relation to per capita energy use.[123] The HDI values, shown below in Table 2, illustrate a strong correlation between social and economic well-being and per capita energy consumption levels. Countries with high HDI values have high per capita energy consumption values. Conversely, countries with low HDI values, typically developing countries, have low per capita energy consumption values.

Table 2: Per Capita Energy Use By Region, 2000[124]

Asia	China	Former USSR	OECD Europe	OECD North America	OECD Pacific	Latin America/ Caribbean	Sub-Saharan Africa
25	38	133	142	281	180	48	25

The HDI values for a majority of the population in developing countries is distorted or inflated because of the misdistribution of modern energy services in developing countries. In fact, there is a significant energy consumption dichotomy within developing countries when contrasting the energy services consumed by affluent subgroups of the population with those available to low-income households. The affluent portion of the population generally represents a small subsection of the overall country population but disproportionately consumes energy.[125] This dichotomy reflects the significant stratification of incomes in developing nations.

The U.S. Department of Energy projects that energy demand in developing Asia will double over the next twenty five years.[126] The International Energy Agency in Paris forecasts that two-thirds of all future energy demand will emanate from just China and India.[127] Some projections estimate that by 2030, China's GHG emissions will quadruple and Asia alone will emit 60% of the world's carbon

123. United Nations Development Program, HDI. a*vailable at* UNDP.org.

124. United Nations Development Programme [UNDP], United Nations Department for Economic and Social Affairs *2004 World Energy Assessment,* 27 (2004) (*prepared by* José Goldemberg and Thomas B. Johansson).

125. *Id.* at 26.

126. International Outlook 2003, *supra* note 38.

127. *Id.*

emissions.[128] The needs of countries outside the OECD will require an investment of some U.S. $2 trillion to install approximately 1,900 gigawatts of new electric generating capacity by 2025.[129] The International Energy Agency projected that it will require an investment of $16 trillion by 2030 to meet the world's energy requirements, with $5 trillion of that amount allocated to electric power production, primarily in Asia and Africa.[130]

It is expected that global energy use will double by 2040 and triple by 2060, creating a tremendous demand on existing fuel sources.[131] To cope with the increased electrification that accompanies the substantial increase in per capita energy use which will occur in developing nations in the next decades, the world may have to achieve a reduction of CO_2 of up to 50% during the 21st century.[132] This future is directly dependent on whether fossil fuels or renewable technologies are chosen now to generate electricity. This is no small choice: There is a policy choice involved between conventional and alternative resources.

3. Variable 3: Power Technologies

The only one of these three variables in the global warming equation that can be influenced dramatically by policy makers is the choice of technology for development. The fundamental touch-stone technology for development in all nations is electricity. Electricity has been described as an "agent of technological progress."[133] As electricity is used in place of fossil fuels and human labor, less overall energy is used and more productive and efficient operations occur in certain segments of society.[134] Yet, electricity is so indispensable

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128. Deborah E. Cooper, *The Kyoto Protocol and China: Global Warming's Sleeping Giant*, 11 GEO. INT'L ENVTL. L. REV. 401, 405 (1999).

129. Fritsche, *supra* note 109 at 28, (utilizing IEA data from *World Energy Outlook 2000*).

130. International Energy Agency, *World Energy Investment Outlook 2003*, (Nov. 2003).

131. International Energy Agency, *World Energy Outlook* 2004, *available at* www.worldenergyoutlook.org.

132. *Id.* at 18.

133. SCHURR, ET AL., ELECTRICITY IN THE AMERICAN ECONOMY: AGENT OF TECHNOLOGICAL PROGRESS (Greenwood Press 1990).

134. Clark Gellings and Richard Lordan, *The Power Delivery System of the Future*, ELECTRICITY DAILY, Jan.-Feb. 2004.

that it has become "transparent to most users, at least until there is an outage."[135]

The choices for many developing countries are challenging. We stand at a cross-road in time because in the next two decades, there will be a massive electrification of developing nations. During this period, developing nations will choose whether to deploy conventional fossil-fired or sustainable renewable options to generate electricity. Once installed, those facilities will remain in place, contributing to global warming or not, often for 40 years and in many cases longer.

These are "hard" infrastructure choices. Experience in the U.S. demonstrates that older fossil-fired power plants, at the conclusion of their originally scheduled lives, typically are refitted with new burners, boilers, and fuel-handling equipment and extended for additional decades.[136] Moreover, once the transmission infrastructure is established to carry power out of a large fossil-fired plant to load centers, it will create a transmission and distribution (T&D) corridor, system hardware and distribution patterns that require a centralized large power generation facility at that terminus of the transmission grid.[137]

Electric transmission and distribution facilities, telecommunications equipment, and oil and gas pipelines have long lives.[138] Once a T&D system is created to link centralized generation with distribution, it becomes an embedded "hard" infrastructure. This is where distributed generation and renewable technologies may offer some

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135. *Id.*

136. For the past decade in the U.S., there has brewed a pitched battle between environmentalists and utilities over the life-extension of fossil-fired power plants. As these plants have reached their scheduled life, they often have been refitted with new equipment and kept in service. A battle still bounces from the regulators to the courts about whether this is allowed without meeting more stringent Clean Air Act requirements for New Source Review. For more on this topic, see STEVEN FERREY, THE LAW OF INDEPENDENT POWER , ch. 5 (West Publishers, 22nd ed. 2005) [hereinafter THE LAW OF INDEPENDENT POWER].

137. Transmission corridors are the rights of way, established at law by regulatory agencies, within which power generated at centralized power plants is distributed to substations and load centers (demands for power). Transmission occurs physically by the movement of electrons in copper or aluminum wire from the sources of generation to the users of power. Once established, it is hard for these patterns of transmission to be easily rerouted. In the author's experience, in many parts of the world, the legal time required to permit and site a new transmission corridor takes longer than the time required to permit and site a new generation facility.

138. Fritsche, *supra* note 109, at Fig. 8 (utilizing IEA data from 2002).

accommodation: They either can be placed on-site at existing centralized generation locations or distributed solar technologies can be sited at many dispersed locations.

Like a highway grid, once configured, locational and use patterns that grow up around that grid make it more difficult later to reroute those electric highways. "Hard" infrastructure choices of any kind, once embedded in the physical and distributional fabric of a country, are not easily removed or altered. This is not to say that one can not later substitute in place a fossil-fired unit which has reached the end of its useful life with a renewable unit, but it is often practically impossible. Conventional fossil-fired projects typically have been sited either (1) where fuel supply, transmission off-take capacity and cooling water resources coincide, or (2) in transmission proximity to population and load centers.[139]

Renewable technologies must go to the place where they can be exploited. Only in certain locations is the wind regime sufficient to turn large wind turbines and hydro power is limited to moving water courses. In addition solar photovoltaic power, while ubiquitous, requires a large land/surface area to produce the equivalent amount of power as a large fossil-fuel-fired facility (solar power is much less dense than fossil fuels - though solar collectors can be mounted on roofs or walls, or have dual uses, e.g., functioning as both a roof and electricity generator).[140] Thus, it does not follow that older fossil-fired facilities can or will be replaced at their sites with renewable power technologies. With a mature transmission and distribution system in place, the total system economics and technical considerations may militate in favor of continuing the existing fossil-fuel facilities.

The current critical challenge concerns what is being deployed in developing nations to meet rising demand and extension of service to previously unserved areas. This is where there is population growth, pressure for rapid electrification, and a developing infrastructure that can accommodate either renewable or conventional technologies:

> "Developing countries offer unique opportunities for cultivating sustainable energy in large part because the bulk

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139. The Law of Independent Power, *supra* note 136, § 6:136.

140. *Id.* (Photovoltaic power is the generation of direct current electricity using by capturing the photon excitation of solar-reactive media, often silicon or gallium arsenide, which have been used to power satellites and roof-top solar PV electric panels).

> of their energy demand and investments still lie before them...The World Bank Group is committed to nothing less than a evolution in the rate and scale with which sustainable clean energy services are expanded to those who lack them, and the new dimension in global partnerships that is needed to bridge the modern energy divide."[141]

There is no expectation that any nation will deploy exclusively fossil-fuel or only renewable electric generation technologies. It is not an "either/or" choice. However, the balance chosen between conventional and alternative electric resources has immense implications for the emission of greenhouse gases. The critical path timing of these decisions is now.

On choice of technology, there is good news, and bad news. The good news, is that there is available today a variety of proven and reliable renewable energy technologies to supply electric power, that do not contribute significantly to global warming.[142] Many developing nations have a single, centralized state-owned utility that is the monopoly supplier of electricity to the nation.[143] In this framework, a single decision about the electric power development path could be implemented nationwide.

In 1999, all nations on earth consumed 26.7 billion barrels of oil, 81.1 trillion cubic feet of natural gas, and 2.1 billion tons of coal (oil equivalent) -- all of which are decayed organic matter previously brought to life by the sun.[144] Energy used by humankind on the earth equals only about 0.01% of the total solar energy reaching the earth.[145] Total installed capacity of renewable energy, excluding large hydropower, for electricity generation was 142 GW worldwide, of which 58 GW was in developing countries (see Table 3). While

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141. The World Bank Group, *Renewable Energy for Development*, 2 (2004), http://go.worldbank.org/45L6F8ZI30.

142. The Law of Independent Power, *supra* note 3, § 2:11.

143. For example, EVN in Vietnam, EGAT in Thailand, Ceylon Electricity Board in Sri Lanka, PLN in Indonesia, Uganda Electricity Board in Uganda, TANESCO in Tanzania, and various state utility boards in the 32 states of India. These are government-associated entities. While there are efforts in all of these nations to privatize, through the restructuring and equalization of these state entities, their history and current status is not as totally independent private companies.

144. National Energy Foundation, *Fuel Consumption Statistics, available at* http://www.nefl.org/ea/eastats.html.

145. The Law of Independent Power, *supra* note 3, § 2:11.

this installed capacity is but a tiny fraction of the 3700 GW of total electricity generation capacity, installations of some technologies such as wind and solar photovoltaics are growing at over 25 percent per year, albeit from a small base.

TABLE 3: Grid-based renewable power capacity as of 2003

Generation type	Capacity in all countries (GW)	Capacity in developing countries (GW)
Small hydro power[b]	56	33
Wind power	40	3
Biomass power[c]	35	18
Geothermal power	9	4
Solar photovoltaic power (grid-connected)	1.1	< 0.1
Solar thermal power	0.4	0
Total renewable power capacity	**142**	**58**
For comparison - large hydro power[d]	730	340
- total electric power capacity	3700	1300

[a] Developing countries are non-OECD countries plus Mexico, South Korea and Turkey, excluding countries with economies in transition. Martinot et al. (2002) included economies in transition in these totals, reflecting all countries eligible for World Bank development assistance.
[b] Definitions of small hydro vary by country. They usually cover hydro up to 10 MW, although this figure is up to 25 MW in India and up to 30 MW in China - thus global totals can differ greatly depending on what is counted.
[c] Biomass power figures exclude municipal solid waste combustion and landfill gas.
[d] Published hydro power figures assumed to include both large and small hydro, except in China, where these are reported separately. Total hydro is the sum of small and large hydro.
Source:
http://www.jxj.com/magsandj/rew/2004_05/indicators_of_investment.html

Hydro power is currently the world's largest renewable source of electricity, accounting for 6% of worldwide energy supply or about 15% of the world's electricity. Hydro power supplies more than 90% of total national electric central supply in two dozen countries in more than half of centralized electric supply in 63 countries.[146] The theoretical size of worldwide hydro power capacity is about four times greater than that which has been exploited at this time.[147]

Globally, installed wind generation capacity has increased by an average 25% annually since 1990. The current cost of wind generated electricity is approximately 3 to 7 cents per kilowatt-hour (kWh).[148] This is similar to the costs of generating electricity from fossil fuels and is cheaper than the cost of electricity from most recent nuclear power plants. The cents-per-kilowatt cost of wind energy production has fallen dramatically in recent years as countries around the world have added wind power to their energy portfolios.[149]

The amount of solar energy reaching the earth each year is many times greater than worldwide energy demand, although it varies with location, time of day and the season. Electricity produced by photovoltaics for electrical grids currently costs about 30 cents per kWh.[150] While electricity from traditional coal fired power plants costs about 6 cents per kWh.[151]

Still, solar and wind energy are intermittent resources, and as such can not be used reliably to meet base load electricity requirements without integration with electric energy storage.[152] More traditional renewable generation resources such as hydroelectric or geothermal power generation and biomass fuels are round-the-clock dispatchable resources that and can supply base load power resources.[153]

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146. World Commission on Dams, Dams and Development, 10 (2000) *available at* http://www.dams.org/report/. During the twentieth century, more than $2 trillion (USD) was invested in the construction of large dams. *Id.* at 12.

147. World Commission on Dams, *supra* at note 147, at 12.

148. American Wind Energy Association, *FAQ Cost,* available at http://www.awea.org/faq/cost.html.

149. *Id.*

150. National Resource Defense Council, *NRDC: Solar Power, available at* http://www.nrdc.org/air/energy/renewables/solar.asp.

151. Energy Information Agency, *Electric Power Annual – Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, available at* http://www.eia.doe.gov/cneaf/electricity/epa/epat7p4.html.

152. The Law of Independent Power, *supra* note 3, § 2:11 (wind subsection).

153. *Id.*

While many nations -- particularly developing nations -- have no significant reserves of oil, coal or natural gas, every nation has solar energy in some form -- sunlight, wind, ocean wave power, etc. Every nation has some indigenous renewable energy resource, allowing for energy independence and providing a source for domestic economic development.[154] While the commercial and national interests involved in fossil fuel extremely concentrated, solar energy interests and flows are much more decentralized and diverse.

The bad news is that not all renewable technologies are yet cost-competitive in many applications. However, in many rural applications off the existing transmission grid, it is more cost-effective to install a dispersed renewable energy technology to provide electricity than it is to extend the transmission grid to the region so as to supply centrally generated electricity.[155] But in other situations, not accounting for the environmental benefits of renewable electricity, these technologies can be more expensive. Their costs typically are incurred up-front, as opposed to incurred over the life of the electric generating unit, as is common with fossil-fuel-fired facilities which must purchase fossil fuels over their operating lifetime.[156]

In addition, many developing nations have large supplies of coal; the temptation to burn cheap coal in conventional electric power production first, as was done in the U.S., the U.K. and elsewhere during their industrial revolutions, is palpable.[157] The environmental assessment, prerequisite to financing any of these coal or other conventional power technologies, is the critical point of evaluation of the acceptability of these technologies. It can result in the permitting or rejection of specific power plant proposals.

With renewable resources, putting aside the currently greater cost associated with their use, the environmental issue typically is one of land use. To produce a large amount of power from wind or solar energy, a significant area must be devoted to installation of equip-

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154. The Law of Independent Power, *supra* note 3, § 2:11.

155. World Bank, *Technical and Economic Assessment: Off Grid, Mini-Grid and Grid Electrification Technologies* chapter 1, page 9, *available at* http://go.worldbank.org/45L6F8ZI30.

156. The Law of Independent Power, *supra* note 3, § 2:11.

157. It is of note that during the industrial revolutions in the U.S. and U.K in the 18th and 19th centuries, coal was the only energy technology available at a scale to fuel manufacturing industry, with mechanical power from hydro facilities available in certain places. Oil, natural gas, and other renewable technologies were not then available as they are today.

ment.[158] The area covered by wind turbines or solar collectors is greater than the area covered by a fossil-fuel-fired power plant that would produce an equivalent amount of power.

IV. ENVIRONMENTAL CLEARANCES FOR NEW POWER DEVELOPMENT

A. The "Gatekeeper" Role on Alternatives For New Power Projects

What power gets built in developing nations is a function of what power technologies can gain approval and financing. What are the environmental clearance and permitting process in various nations of the world?

Much of the financing for power projects in developing countries depends on loans and/or loan guarantees from, or supported by, multilateral lending agencies.[159] These loans and loan guarantees are only made if the project satisfies certain criteria such as, environmental assessments which are now a universal prerequisite to international lending.[160]

Each of the international and regional lending agencies requires an independent environmental assessment and review prior to extending credit or credit guarantees for a power project. Therefore, the environmental assessment required by international agencies is the key requirement to open the tap to international lending necessary to finance power projects in developing nations. Thus, this environmental assessment is the key "gatekeeper" for what types of power projects – fossil or renewable – are constructed many developing countries.

These required environmental assessments are different depending on which agency is involved in extending credit or support. National Environmental Policy Act (NEPA) applies to U.S. agency involvement.[161] Each international agency has its own individual requirements. One must comply with the environmental assessment requirements of the agency from whom the SPP project obtains credit or support. The differences are important. There are critical differ-

158. The Law of Independent Power, *supra* note 3, § 2:11.
159. Risk, Reward and Retrenching Capital Flows, *supra* note 8.
160. *Id.*
161. 42 U.S.C. § 4332 (Supp. 1 1975).

ences in the environmental assessment requirements of different multilateral lenders as to:

- Types of power projects covered
- Screening of projects for environmental assessment -- different types of projects face different environmental assessment rigor
- Responsibility for environmental assessment -- when independent experts and advisory panels must be utilized
- Initiation of the environmental assessment process -- at what point in the process of project development the environmental assessment is required to be completed
- Project scoping -- what environmental issues must be evaluated over what time period and what geographic area
- Types of environmental impacts considered -- whether both positive and negative impacts must be evaluated, as well as indirect and cumulative impacts of a project
- Consideration of project alternatives -- assessment of smaller scale or less environmentally damaging feasible alternatives
- Mitigation discussion or adoption -- whether environmental mitigation measures for the power project must be considered or adopted
- Timing of EIA document preparation -- timing and deadlines
- Environmental assessment review and public participation -- how the environmental assessment is linked to loan approval and opportunities for public comment and input.
- Final decisions to proceed with energy projects -- how final decisions are made

Post-approval monitoring and auditing -- whether the agency employs mechanisms to ensure environmental compliance.

These international environmental requirements that are a prerequisite to new power development in developing nations grew out of the NEPA experience in the U.S.[162] But it is here where the similarity ends.

The United States enacted NEPA in 1970.[163] NEPA requires that a federal agency perform an environmental assessment for federal actions proposed, regulated, or funded by the agency. Section 102 of

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162. *Id.*
163. *Id.*

NEPA mandates that as part of environmental assessment, the lead federal agency must prepare an environmental impact statement for all major federal actions that significantly affect the quality of the human environment.[164] This assessment must occur prior to any agency action, decision or commitment.[165] This innovative requirement of an agency prior to agency action performing environmental assessment has worked its way into other countries' legal systems and multinational development agencies.

Throughout the 1970s and 1980s, negative environmental consequences attributed to World Bank-funded projects prompted concern about the lack of environmental review at the Bank.[166] Under pressure from non-governmental organizations (NGOs) and other international organizations, the World Bank issued a directive in 1989 that mandated "an environmental assessment for all projects that may have a significant negative impact on the environment."[167] Since then, other multinational development banks (MDBs), such as the Asian Development Bank (ADB), the African Development Bank (AfDB), and the European Development Bank (EBRD) have instituted environmental assessment policies and procedures for proposed projects.[168] Many of the current MDB polices and procedures include the preparation of an environmental assessment (EA) report for projects that meet certain criteria.[169]

Depending on the funding source for power projects, NEPA (U.S.), ADB, or IBRD requirements apply. Between 1989-1998, each of these international lenders adopted environmental assessment requirements. This section catalogues the environmental assessment requirements instituted by NEPA, the International Bank for Reconstruction and Development (IBRD or World Bank), the International Finance Corporation (IFC), the Multilateral Investment Guarantee Agency (MIGA) and the Asian Development Bank (ADB).

Although IBRD initiated its policy (at the end of the 1980s) two decades after NEPA's enactment in 1970, it didn't achieve effective

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164. *Id.*

165. Kleppe, v. Siera Club, 427 U.S. 390, 96 S.Ct. 2718, 8 ERC 2169, 49 L.Ed.2d 576, 6 ENVTL. L. REP. 20, 532 (1976).

166. Robert Wade, *The World Bank's Struggle to Integrate the Environment*, GLOBAL ECONOMIC INSTITUTION NEWSLETTER, Issue 5, *available at* http://www.cepr.org/gei/5rep2.htm (last visited October 5, 2008).

167. *Id.*

168. *Id.*

169. An environmental assessment report is also referred to as "an environmental impact assessment report" or an "environmental impact statement."

status until the end of the century. While IBRD issued its first environmental directive in 1989, it published its operational policies and bank procedures for environmental assessment in January 1999.[170] Of note, IBRD's policies are not international law; rather they are a set of guidelines and standards that IBRD requires project sponsors to follow in order to receive loans for public sector projects.

Once the IBRD policies were in place, other international lenders followed suit. IFC published its environmental assessment operational procedures in October 1998, and its Environmental and Social Review Procedure (ESRP) in December 1998.[171] IFC's environmental assessment procedures are based on the IBRD procedures, but are not identical. Indeed, IFC's 1998 Environmental and Social Review Procedure states, "IFC's environmental and social policies, while harmonized with World Bank policies, are adapted to the private sector nature of IFC's business."[172]

MIGA's current environmental assessment policy, which is similar to IFC's policy, became effective on July 1, 1999.[173] ADB on February 28, 2003 issued its Operations Manual Section 20, "Environmental Considerations in ADB Operations," which includes Bank Procedures and Operational Procedures.[174] Therefore, for all of these international agencies, the current environmental requirements were issued between December 1998 and 2003. Thus, the first truly international regime is quite recent. They are millennial policies that are just now starting to effectively screen proposed power development projects.

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170. Wade, *supra* note 166.

171. International Finance Corporation, *Environmental & Social Review Procedure*, Annexes A-H and Guidance Notes A, B, C, D (December 1998) *archived at* http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/pol_ESRP/$FILE/ESRP.pdf

172. *Id.* ¶ 2. (The most recent draft, International Finance Corporation, *E&S Review Procedures, version 2.0*, was published July 31, 2007 *available at* http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/pol_ESRP2007/$FILE/ESRP2007.pdf [hereinafter "IFC ESRP"].

173. Multilateral Investment Guarantee Agency, *Operational Regulations*, Annex B (Aug. 27, 2002) *available at* http://www.miga.org/index.cfm?aid=18 [hereinafter "MIGA Operational Regulations"].

174. Asian Development Bank, *Operations Manual Section 20, Environmental Considerations in ADB Operations* (Feb. 28, 2003) *archived at* http://www.adb.org/Documents/Manuals/Operations/om20.asp?p=aadb. This section has since been superseded by *Operations Manual, Section F1* (Oct. 29, 2003) *available at* http://www.adb.org/Documents/Manuals/Operations/OMF01_29oct03.pdf [hereinafter "ADB OM Sec. F1"].

B. *Comparative Distinctions Among Environmental Assessment Policies*

1. Types of Projects Covered

Project developers prefer to avoid the delay and cost of environmental reviews, and thus would prefer that a project not be covered. If a project is not covered by environmental impact assessment requirements, it can proceed directly to obtaining required contracts, permits, and financing. If subject to environmental assessment, in come cases permits are held up while the assessment proceeds and financing can similarly be delayed. Which international projects must undergo environmental assessment and review as a prerequisite to project financing?

NEPA NEPA requires an environmental assessment for all federal project and policy proposals and also requires the preparation of an environmental impact statement (EIS) for any proposals for legislation or other major federal action that significantly affects the quality of the human environment. While these requirements would appear to apply only to public projects, a federal action includes projects that are assisted, partially funded, or regulated by federal agencies, and thus many projects that are privately financed fall under the purview of NEPA.[175] So there must be a major federal connection and in must result in a significant impact on the natural environment.

IBRD IBRD screens every project proposed for IBRD financing to determine the appropriate extent and type of environmental assessment.[176] IBRD funds public sector projects only.

IFC IFC is a member of the World Bank Group, but unlike IBRD, IFC funds private projects. IFC requires an environmental assessment of all projects proposed for IFC financing.[177]

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175. 40 C.F.R. § 1508.18.

176. International Bank for Reconstruction and Development, *Operational Procedures*, ¶ 8 (1998) [hereinafter "IBRD, Operational Procedures"].

177. See International Finance Corporation *Operational Policies at 4.01*, "Environmental Assessment", October 1998 [hereinafter "IFC OP"] *archived at* http://www.ifc.org/ifcext/enviro.nsf/Content/Policies_Archived. This policy has been superseded by IFC's *Policy on Social and Environmental Sustainability*, April 30, 2006 hereinafter ["IFC PSES"] and IFC's *Performance Standards, 1 through 8, on Social and Environmental Sustainability* [hereinafter "IFC PS"] *available at* http://www.ifc.org/ifcext/enviro.nsf/Content/SustainabilityPolicy and http://www.ifc.org/ifcext/enviro.nsf/Content/PerformanceStandards, respectively.

MIGA MIGA is also a member of the World Bank Group and provides political risk guarantees to investors in projects. MIGA requires an environmental assessment of proposed projects before providing guarantees.[178]

ADB ADB supports both public sector and private sector projects. ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, financial intermediation loans, and private sector investment operations. The environmental assessment process covers all project components whether financed by ADB, cofinanciers, or the government.[179] ADB treats public sector entities slightly differently than private sector entities.[180]

2. Project Screening

Which power projects require what types of environmental assessments? Do only *adverse* or negative environmental impacts matter, or will significant *beneficial* impacts also require review? Do more sensitive environments, irreversible impacts, or novel impacts deserve special consideration?

NEPA An agency considering a project uses an EA to determine whether the preparation of an environmental impact statement is required. An EIS is necessary for major federal actions that significantly affect the quality of the human environment. The meanings of the various terms in this statement are given more precision by Council for Environmental Quality regulations and case law. Both *adverse* and *beneficial* impacts are relevant and trigger the requirement to prepare an EIS if the impacts are significant. This differs from many of the international agency assessments, which focus only on adverse impacts.

The first step is to place the proposed project into one of three categories as to the preparation of an EIS: (1) categorically ex-

178. MIGA, Operational Regulations, ¶ 1 (2006).

179. ADP OM, *supra* note 174, § F1 ¶ 22.

180. "Private sector entities and implementing institutions are a diverse group with varying environmental awareness and capabilities, and ADB generally adopts a flexible procedure in dealing with private sector loans and investments, to tailor environmental requirements to the investment vehicle, project and expected subprojects. Nevertheless, the substance of ADB's environmental assessment requirements for private sector
investments is the same as the requirements that apply to the public sector." *Id.* ¶ 21.

cluded, (2) categorically included, or (3) EIS in dispute. Categorically excluded projects are projects that have been predetermined to have no significant environmental impact, and therefore do not require an EIS.[181] Categorically included projects are projects that always require an EIS.[182] For the category of EIS in dispute, the agency performs an environmental assessment to decide whether an EIS is necessary.[183]

IBRD, IFC, and MIGA. IBRD, IFC and MIGA have very similar policies for environmental screening of proposed projects. The entity classifies the proposed project into one of the following categories A, B, C, or FI.[184] The project is classified based on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

Category A includes projects that are likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented.[185] Category B is defined relative to Category A as a project that has potential adverse environmental impacts on human populations or environmentally important areas – including wetlands, forest, grasslands, and other natural habitats – that are less adverse than those of Category A projects.[186] Category B projects have site-specific impacts, with few of them being irreversible.[187] Category C includes projects that are likely to have minimal or no adverse environmental impacts.[188] Category FI includes subprojects where the investment of World Bank or IFC funds is through a financial intermediary and there may be adverse environmental impacts.[189]

Category A projects require an environmental assessment including a report. Category B projects require an environmental assessment that is narrower in scope than a Category A environmental assessment, and the findings and results are described in project documentation, rather than a separate environmental assessment report.

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181. NEPA, the Environmental Quality Improvement Act of 1970 (current version at 40 C.F.R § 1501.4 (2008)).

182. 40 C.F.R § 1501.4.

183. *Id.*

184. MIGA does not have an FI category.

185. *See* IBRD, Operational Procedures, *supra* note 176, ¶ 8(a); MIGA Operational Regulations, *supra* note 173.

186. *Id.*

187. IBRD, Operational Procedures, *supra* note 176, ¶ 8(b).

188. *Id.* ¶ 8(c)

189. *Id.* ¶ 8(d)

ADB ADB also screens projects and assigns them to one of Categories A, B, C or FI. Proposed projects, similar to IBRD, IFC and MIGA, are screened based on type, location, sensitivity, scale, nature, and magnitude of potential environmental impacts. ADB, however, also screens based on the availability of cost-effective mitigation measures.[190] ADB's policies provide less of a description for the categories than the World Bank members' policies. Category A include projects with potential to have significant adverse environmental impacts. An environmental impact assessment is required to address significant impacts. Category B includes projects judged to have some adverse environmental impacts, but of lesser degree or significance than those of category A projects. Similar to NEPA's EIS in dispute category, an ADB Category B project requires an initial environmental examination to decide whether an environmental impact assessment is needed. Category C projects are projects that are unlikely to have adverse environmental impacts. For Category C projects, no environmental impact assessment or initial environmental examination is needed. For these Category C projects, the financial intermediary must apply an environmental management system, unless there are only insignificant environmental impacts. Category FI is for projects that involve a credit line through a financial intermediary or an equity investment in a financial intermediary.

3. Responsibility For Environmental Assessment

Oftentimes, multiple government agencies can be involved in a project. For example, in the U.S., a project could involve the Department of Interior and the Department of Energy. In a developing country, a power project could involve the Ministry of Mines and Energy, the Ministry of Finance, the Ministry of Environment, and/or the Ministry of Industry.[191] One of these agencies will have to be the lead agency in the country concerned about the environmental assessment. Some agencies are more sympathetic to environmental protection, while other may be more sympathetic to power development. Who takes the lead on environmental assessments, and when must independent environmental assessors or an advisory panel be engaged for the assessment? Each agency differs.

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190. ADB OM, *supra* note 179, § F1, ¶ 6.

191. The author has offered typical names of relevant ministries in developing countries. The actual name and responsibility of government ministries in developing countries will vary slightly in different countries.

NEPA Under NEPA, the lead federal agency is responsible for the environmental impact statement.[192] The federal government pays the EIS preparation costs for all government-sponsored projects, and for most other projects the agency shifts responsibility and financial obligations for the Environmental Assessment to the private project sponsor. Federal agencies are authorized under NEPA to have regulations to recover the EIS costs of private projects, but only a minority of federal agencies have such regulations.[193]

IBRD After the Bank performs the initial screening, which is, putting the project in category A, B, C or FI, the borrower is responsible for carrying out the environmental assessment.[194] For a Category A project, the borrower must retain independent environmental assessment experts who are not affiliated with the project. If a Category A project is "highly risky or contentious or [involves] serious and multidimensional environmental concerns," the Bank recommends that the borrower should "engage an advisory panel of independent, internationally recognized environmental specialists to advise on all aspects of the project relevant to the environmental assessment."[195] Project preparation facility advances and trust funds may be available to potential borrowers that request Bank assistance for financing the environmental assessment of a proposed project.[196]

IFC The project sponsor is responsible for carrying out the environmental assessment.[197] For Category A projects, similar to IBRD, IFC recommends, but does not require, that the project sponsor retain independent environmental assessment experts who are not affiliated with the project to prepare the environmental assessment. Also similar to IBRD, for Category A projects that are "highly risky or contentious or that involve serious and multidimensional environmental concerns," IFC recommends, but does not require, that the project sponsor engage an advisory panel.[198]

MIGA The applicant is responsible for carrying out the environmental assessment, unless the applicant is a lender or minority partner. In the case of a lender or minority partner, the applicant has to

192. 42 U.S.C.A. § 4332(C) (2004).
193. *Id.*
194. International Bank on Reconstruction and Development, *supra* note 185, at 4.01, ¶ 4.
195. *Id.*
196. *Id.* ¶ 25.
197. IFC, Operational Procedures, *supra* note 177, at 4.01, ¶ 4.
198. *Id.*

submit copies of the project sponsor's environmental assessment to MIGA.[199] Regarding Category A projects, MIGA has virtually identical requirements as IBRD and IFC in terms of hiring independent experts and engaging an advisory panel.

ADB The borrower is responsible for performing the environmental assessment in accordance with both the borrower's environmental assessment requirements and ADB's environmental assessment requirements.[200]

4. Initiation of the Process

When must assessments start and how integrated must they be with agency decision making? Generally, the applicable regulations state that environmental assessment should start as early as possible. There are, however, subtle differences

NEPA NEPA states that agencies must integrate the NEPA process *with other planning* to ensure that *planning and decisions* reflect environmental values. There is a focus on integrating environmental assessment with planning and decision making.[201]

IBRD IBRD screens proposed projects *at the earliest stage of the project cycle* – IBRD's project cycle. This screening may occur after the bulk of project planning has been performed by the project sponsor. The IBRD Task Team, at the earliest stage of the project cycle, screens the proposed project and assigns it to one of the four categories (A, B, C, or FI).[202] For projects that require an environmental assessment report, the Task Team advises the borrower that before the Bank proceeds to project appraisal, the environmental assessment report must be officially submitted to the Bank.

IFC IFC's policies contain language that may indicate a slightly more upstream integration of environmental assessment with other aspects of *project preparation* to help ensure that environmental social considerations are considered in project selection, sitting, and design decisions.[203]

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199. MIGA, Operational Regulations, *supra* note 173, at Annex B.

200. ADP OM, *supra* note 179, § F1, ¶ 5.

201. 40 C.F.R. § 1501.2. "Agencies shall integrate the NEPA process with other planning at the earliest possible time to insure that planning and decisions reflect environmental values, to avoid delays later in the process, and to head off potential conflicts."

202. IBRD OP, *supra* note 176, at 4.01, ¶ 2.

203. International Finance Corporation, *Policy on Social and Environmental Sustainability*, April 30, 2006, ¶ 16 [hereinafter "IFC PSES"] *available at*

MIGA MIGA's policies do not give recommendations or requirements for an environmental assessment start time.[204]

ADB Similar to IBRD, ADB's environmental assessment process is supposed to start as soon as potential projects for financing are identified. ADB's operational procedures state that environmental assessment is ideally carried out simultaneously with the prefeasibility and feasibility studies of the project. No deadline for completion of an environmental assessment report is given in the operational procedures; some flexibility is provided.[205]

5. Project Scoping

Scoping is the process of identifying issues, impacts and alternatives for consideration during, and inclusion in, the environmental assessment.[206] Project developers want the scope of adverse environmental impacts that they must review to be as narrow as possible with regard to environmental media affected, impacts attributed to the project, geographic scope of area affected, the period into the future that must be evaluated, and whether the project must take account of its own impacts added cumulatively to those of other projects or emission sources in the area. There can be public input of other agencies and concerned members of the public in such determinations. The public may want the scope widened to account for a more robust assessment of impacts on an area or neighborhood.

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http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/pol_SocEnvSustainability2006/$FILE/SustainabilityPolicy.pdf. "When a project is proposed for financing, IFC conducts a social and environmental review of the project as part of its overall due diligence. This review is appropriate to the nature and scale of the project, and commensurate with the level of social and environmental risks and impacts. IFC reviews any new business activity that is being considered for IFC financing, whether in the pre-construction, construction, or operational stage. The scope of the review may be expanded to other business activities of the client as part of IFC's risk management considerations.." *Id.* ¶ 13.

204. MIGA, Environmental Assessment Policy, *supra* note 173, ¶ 5. "MIGA will review the findings and recommendations of the environmental assessment to determine whether they provide an adequate basis for a decision to offer a guarantee."

205. ADB, OM § F1, *supra* note 174, ¶ 4. "Environmental assessment, however, is a process rather than a one-time report, and includes necessary environmental analyses and environmental management planning that take place throughout the project cycle.." *Id.*

206. *See generally*, State of Connecticut, Council on Environmental Quality - What is Scoping?, *available at* http://www.ct.gov/ceq/cwp/view.asp?a=987&Q=249036&ceqNav=%7C.

NEPA The lead agency determines the scope and the significant issues to be analyzed in depth in the EIS.[207] Before starting the scoping process, the lead agency must publish a notice of intent to prepare an EIS. As part of the scoping process, the agency must invite the participation of federal, state, and local agencies, any affected Indian tribe, the proponent of the action, and other interested persons, including those who might not agree with the action on environmental grounds.

IBRD The IBRD Task Team discusses the scope of the environmental assessment with the borrower, along with the procedures, schedule, and outline for any environmental assessment report that is required. According to Bank Procedures 4.01, this discussion occurs during the preparation of the Project Concept Document.[208] To prepare the Project Concept Document, the Task Team first examines the type, location, sensitivity, and scale of the proposed project, as well as the nature and magnitude of its potential impacts, in consultation with the Regional Environment Sector Unit.

Public input to the scoping process therefore appears limited, although IBRD does state that the borrower should initiate consultations with project-affected groups and local NGOs about the project's environmental aspects as early as possible. For Category A projects, the borrower must consult these groups shortly after environmental screening but before the terms of reference for the environmental assessment are finalized.

IFC For all project, IFC has text in its Policy on Social and Environmental Sustainability ("PSES") requiring participants to engage project-affected groups in "free, prior, and informed consultation and enables the informed participation of the affected communities."[209] Additionally, IFC's Environmental and Social Review Procedure states that for Category A projects, the project sponsor consults relevant stakeholders at least twice: (1) during scoping but before the terms of reference for the environmental assessment are finalized, and (2) after a draft environmental assessment report has been prepared. IFC has no corresponding published "Bank Procedures," and therefore no language explicitly describing the scoping process

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207. 40 C.F.R. §1501.7(a)(2). (A detailed description of the term "scope" is provided in 40 C.F.R. §1508.25, including the statement that "[s]cope consists of the range of actions, alternatives, and impacts to be considered in an environmental impact statement.").

208. IBRD BP, *supra* note 176, at 4.01, ¶ 6.

209. IFC PSES, *supra* note 177, ¶ 20.

within IFC. IFC's Environmental and Social Review Procedure states that a site visit is required for direct investment projects where the early review data sheets are insufficient and the Lead Specialist considers the particular project contains complexities or specific issues.[210]

MIGA MIGA has language similar to IBRD and IFC in its Environmental and Social Review Procedures regarding consultation with locally affected parties and local interest groups. MIGA's Procedures state that the project sponsor should consult with local stakeholders before the terms of reference for the environmental assessment are finalized.[211] For Category A projects, MIGA has policy similar to IFC wherein MIGA performs a site visit to determine the issues that must be addressed in the Environmental Assessment.[212]

ADB ADB employs an environmental screening categorization scheme similar to IBRD, IFC and MIGA, but ADB's Operations Manual does not explicitly describe how scoping is to occur. In general, the borrower is responsible for doing the environmental assessment and, within ADB, the project team is responsible for ADB's environmental assessment process.[213] For Category A and B projects, one of the two required public consultations is to take place during the early stages of EIA fieldwork, though no explicit mention of scoping is present in the Operations Manual.[214]

6. Types of Relevant Environmental Impacts Evaluated

Do impacts only include conventional pollutions or land-use impacts on the natural environment, or do they include socio-economic and human welfare impacts related to project development? Must indirect, cumulative, and international trans-boundary impacts of power projects be assessed?

NEPA NEPA regulations require that the EIS include impacts that are *direct, indirect, or cumulative.*[215] The regulations also require the EIS have a discussion section that includes:

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210. IFC ESRP, *supra* note 203, ¶ 2.2.4.

211. MIGA ESRP, *supra* note 173, ¶ 8(a).

212. *Id.* ¶ 33.

213. ADB OM, *supra* note 174, § F1, ¶ 5.

214. *Id.* § F1, ¶ 9.

215. 40 C.F.R. § 1508.25(c). (Section 1508.8 of the NEPA regulations defines "effects" as including ecological, aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those

"the environmental impacts of the alternatives including the proposed action, any adverse environmental effects which cannot be avoided should the proposal be implemented, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented."[216]

The NEPA regulations provide eight elements that are to be included in the discussion of environmental consequences:

- direct effects and their significance
- indirect effects and their significance
- possible conflicts between the proposed action and the objectives of federal, regional, state, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned
- the environmental effects of alternatives including the proposed action
- energy requirement and conservation potential of various alternatives and mitigation measures
- natural or depletable resource requirements and conservation potential of various alternatives and mitigation measures
- urban quality, historic and cultural resources, and the design of the built environment, including the reuse and conservation potential of various alternatives and mitigation measures
- means to mitigate adverse environmental impacts.[217]

IBRD The Environmental Assessment report should include an "Environmental Impacts" section that predicts and assesses the pro-

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resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial. Direct effects are defined as including effects which are caused by the action and occur at the same time and place. Indirect effects include effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems).

216. 40 C.F.R. § 1502.16.

217. 40 C.F.R. §1502.16.

ject's likely positive and negative impacts.[218] There also should be an identification of mitigation measures and residual negative impacts that cannot be mitigated. Additionally, there should be an exploration of opportunities for environmental enhancement.[219]

In the general discussion of environmental assessment, the operational policies state that the natural environment (air, water, and land), human health and safety, social aspects (involuntary resettlement, indigenous peoples, and cultural property), and trans-boundary and global environmental aspects are taken into account.[220] IBRD Operational Procedure 4.01 provides that, a sectoral or a regional environmental assessment is required when a project is likely to have sectoral or regional impacts. Both regional and sectoral environmental assessments require an assessment of *cumulative and indirect impacts*.[221]

IFC The IFC operational procedures include language regarding the types of impacts to be discussed in the Environmental Assessment report, including "all relevant social and environmental risks and impacts of the project, including the issues identified in Performance Standards 2 through 8, and those who will be affected by such risks and impacts.".[222] It does require, "as appropriate," an assessment of indirect or cumulative impacts, including impacts at "different locations."[223]

MIGA The MIGA operational regulations include virtually identical language to that of the IBRD operational policies regarding the general discussion of items to be taken into account during Envi-

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218. International Bank for Recconstruction and Development, Banking Products 4.01, ¶ 8(b) [hereinafter, IBRD BP].

219. IBRD OP 4.01, *supra* note 176 at Annex A, § (2)(e).

220. However, no specific instructions are given in Annex B ("Contents of Environmental Assessment Report") for discussion of transboundary and global environmental aspects. *Id.*

221. Environmental Assessment Sourcebook Update Number 4, at p.5; Update Number 15, at p. 9. A footnote to this statement references EA Sourcebook Updates 4 and 15 for guidance on the use of sectoral and regional environmental assessment.

222. IFC PS 1, *supra* note 177, ¶ 4.

223. *Id.* ¶ 5. IFC's *Performance Standard 1* requires the assessment to include "(iii) areas potentially impacted by cumulative impacts from further planned development of the project, any existing project or condition, and other project-related developments that are realistically defined at the time the Social and Environmental Assessment is undertaken; and (iv) areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location." *Id.*

ronmental Assessment.[224] However, the MIGA operational regulations do not include a section that details the contents of an Environmental Assessment report. MIGA defines environmental impact assessment as "an instrument to identify and assess the potential environmental impacts of a proposed project, evaluate alternatives, and design appropriate mitigation, management, and monitoring measures. An environmental action plan is an integral part of an environmental impact assessment."[225] MIGA makes no reference to cumulative or indirect impacts, and, similar to IFC, there is no mention of sectoral or regional Environmental Assessments.

ADB ADB requirements also do not contain a formal section describing the contents of an Environmental Assessment report. Regarding general requirements for Environmental Assessment, ADB's operational procedures state that important considerations in undertaking Environmental Assessment include, among others, identifying potential environmental impacts, *including indirect and cumulative impacts*, and assessing their significance.[226]

In summary, NEPA requires consideration of direct, indirect, and cumulative impacts. IBRD requires consideration of indirect and cumulative impacts only in sectoral and regional environmental assessments, but states that Environmental Assessments takes into account global and transboundary environmental aspects. IFC states that a full, project-specific environmental impact assessment should normally cover direct and indirect impacts. IFC also states that cumulative impacts may be considered as appropriate to specific projects, but discusses them only in an Annex to its procedures. MIGA does not address indirect or cumulative impacts. ADB specifies consideration of environmental impacts, including indirect and cumulative impacts.

IFC and MIGA do not address sectoral and regional Environmental Assessments in their policies. While IFC could probably perform sectoral and regional environmental assessments, MIGA is not in a position to as effectively address these broader assessments because of its later and lesser involvement in many projects.

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224. MIGA Operational Regulations, *supra* note 173 at Annex B, ¶ 3.

225. *Id.* at Annex B, "Definitions."

226. ADB OM, *supra* note 174, § F1, ¶ 4. In a footnote, ADB lists major elements typically included in an environmental assessment report. This list includes "anticipated environmental impacts and mitigation measures." *Id.* § F1, fn 7.

7. Consideration of Alternatives

Alternative project development scenarios are at the core of the Environmental Assessment process. Are there other or better alternative locations, technologies, scales, or techniques that have lesser adverse impacts on the environment? Must the assessment quantify the environmental impact and must it compare the impact to the environmental situation without construction of the project? Are there environmental impact thresholds that can not be crossed? Most renewable energy projects, and most smaller SPP projects, fair relatively well in such analyses.

NEPA NEPA regulations define the "Alternatives" section as the heart of the EIS. The EIS needs to "rigorously explore and objectively evaluate all reasonable alternatives," including reasonable alternatives not within the jurisdiction of the lead agency and the alternative of no action.[227] The environmental impacts of the proposal and the alternatives should be presented in comparative form to provide a clear basis for choice by the decision maker and the public.

IBRD IBRD requires that the "Analysis of Alternatives" section "systematically compares feasible alternatives to the proposed project site, technology, design, and operation – including the 'without project' situation – in terms of their potential environmental impacts; the feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements."[228] Additionally, environmental impacts are to be quantified to the extent possible for each alternative, and economic values are to be attached where feasible. In this section, the basis for selecting the particular project design is stated and the recommended emission levels and approaches to pollution prevention and abatement are justified.

IFC IFC requires that "[p]rojects with potential significant adverse impacts that are diverse, irreversible, or unprecedented will have comprehensive social and environmental impact assessments."[229] The assessment is required to "include an examination of technically and financially feasible alternatives to the source of such impacts,

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227. 40 C.F.R. § 1502.14.

228. IBRD OP 4.01, *supra* note 218, at Annex B, ¶ 2(f). In Annex B of Operational Policies 4.01, "Content of an Environmental Assessment Report for a Category A Project."

229. IFC PS 1 ¶ 9.

and documentation of the rationale for selecting the particular course of action proposed."[230]

MIGA MIGA's operational regulations do not include a section on contents of an Environmental Assessment report and therefore do not provide an extensive description of how project alternatives are to be determined and analyzed. However, the "Environmental Screening" section of MIGA's Environmental Assessment Policy states that "environmental assessment for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the 'without project' situation), and recommends any measures needed to prevent minimize, mitigate, or compensate for adverse impacts and improve environmental performance."[231]

For Category B projects, no discussion of project alternatives is presented. Rather, the project's potential negative and positive environmental impacts are to be examined and recommendations are to be made for any measure needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

ADB A list of "important considerations" for an environmental assessment includes "examining alternatives."[232]

8. Mitigation Requirements

If a project is funded, and environmental impacts result, is there an obligation to consider and/or implement measures to mitigate adverse environmental impacts? Do these mitigation measures become conditions of the loan covenants?

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230. *Id.* In a footnote, *Performance Standard 1* defines technically and financially feasibility: "'Technical feasibility' is based on whether the proposed measures and actions can be implemented with commercially available skills, equipment and materials, taking into consideration prevailing local factors such as climate, geography, demography, infrastructure, security, governance, capacity and operational reliability. 'Financial feasibility' is based on commercial considerations, including the relative magnitude of the incremental cost of adopting such measures and actions compared to the project's investment, operating and maintenance costs and whether this incremental cost could make the project nonviable to the client." *Id. at* n. 1.

231. MIGA, Operational Regulations, *supra* note 173, at Annex B, ¶ 8(a).

232. ADB OM, *supra* note 174, § F1, OP, ¶ 4. In a footnote, ADB's operational procedures document lists elements included in an environmental assessment report, including "alternatives." *Id.* § F1, n.7. There is no mention of consideration of a "without project" alternative.

NEPA "Appropriate mitigation measures" not already included in the proposed plan must be included in the Alternatives section of the environmental impact statement.[233] Mitigation measures are not required to be adopted. The lead agency final record of decision must, however, state whether "all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted, and if not, why they were not."[234] If mitigation measures are included as part of the lead agency's record of decision, the agency must condition the funding of actions on mitigation.[235]

IBRD The environmental impact assessment report should include an environmental management plan (EMP).[236] The operational policies also state that IBRD's decision to support a project is predicated in part on the expectation that the EMP will be executed effectively.[237]

IFC The Environmental Assessment report should include an environmental action plan (EAP).[238] IFC predicates its decision to support a project, in part, on the expectation that the EAP will be executed effectively.[239]

MIGA The preparation of an Environmental Action Plan (EAP) is not separately addressed in MIGA policies or procedures. Unlike IBRD and IFC, there is no separate section with a description of the intent and content of an EAP. [240] In MIGA's Environmental and Social Review Procedures (ESRP), the section "Revision to the Environmental Action Plan" states that for Category A projects, "the

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233. 40 C.F.R. § 1502.14.

234. 40 C.F.R. § 1505.2.

235. 40 C.F.R. § 1505.3.

236. IBRD OP *supra* note 176, at 4.01, Annex B, ¶ 2(g) and Annex C. A general description of an EMP is provided as Annex C to Operational Policy 4.01. For mitigation, "[t]he EMP identifies feasible and cost-effective measures that may reduce potentially significant adverse environmental impacts to acceptable levels. The plan includes compensatory measures if mitigation measures are not feasible, cost-effective, or sufficient."

237. *Id.* at 01 Annex C, ¶ 5.

238. IFC PS, *supra* note 177, at 1, ¶ 16.

239. *Id.* at 1, ¶ 1.

240. In the "Definitions" section of MIGA's environmental assessment policy, the definition for environmental impact assessment states that "[a]n environmental action plan is an integral part of an environmental impact assessment." The policy also includes an EAP in a list of different instruments that can be used to satisfy MIGA's environmental assessment requirements. MIGA's Environmental Assessment Policy, *supra* note 173, ¶ 7.

Environmental Action Plan is an essential and critical part of the environmental assessment report."[241]

ADB ADB's operational procedures state that designing least-cost mitigation measures and developing appropriate environmental management plans are important considerations in undertaking environmental assessment.[242] Category A and environmentally sensitive category B projects require the development of environmental management plans that outline specific mitigation measures as part of the Environmental Assessment process. Loan agreements include specific environmental covenants, including environmental management plan requirements.

9. Timing of EIA Process

The history of project funding and approval is replete with instances where the environmental assessment or EIS was prepared after the project decision was made, often as an after-thought to comply with legal requirements.[243] When in the funding and approval cycle must the assessment be performed? How many levels of approval are required? When in the process is it available for public inspection?

NEPA On a strategic level, an EIS is designed to be prepared "early enough so that it can serve practically as an important contribution to the decision-making process and will not be used to rationalize or justify decisions already made."[244] A federal agency cannot make a decision on a proposed action until at least 30 days after the publication of a notice in the Federal Register that an EIS has been completed and filed.[245]

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241. The only reference to what the EAP should include is in the "Definitions" section of the Environmental Assessment Policy. "Environmental action plan: An instrument which provides details of the measures to be taken during the implementation and operation of a project to eliminate or offset adverse environmental impacts or to reduce them to acceptable levels. Included are the actions needed to implement them." MIGA's Environmental Assessment Policy, Definitions. *Id.* ¶ 46.

242. ADB OM, *supra* note 174, § F1, ¶ 4.

243. *See generally*, Lynton K. Caldwell, INTERNATIONAL ENVIRONMENTAL POLICY: EMERGENCE AND DIMENSIONS (Duke University Press 2d ed. 1991).

244. 40 C.F.R. § 1502.5.

245. 40 C.F.R. § 1506.10(b)(2).

IBRD The environmental assessment report must be made available in a public place accessible to affected groups and local NGOs and must be officially submitted to the World Bank before the Bank proceeds to project appraisal. The Bank Task Team advises the borrower of this requirement in writing.[246]

IFC There is no specific reference to a deadline for completing or submitting an environmental assessment report in the ESRP or environmental assessment policy The Introduction of the ESRP notes that its lays out the "review and supervision responsibilities for environmental and social performance throughout the project life cycle."[247] However, the ESRP goes on to point out that "IFC does not control the timing of its entry into a project; IFC's engagement, more times than not, occurs well after the project is conceived, with the site selected and development started. When considering whether or not to participate in a transaction, IFC's review takes into account any project development work undertaken beforehand."[248] Even the public disclosure sections do not indicate a hard deadline.

MIGA There is no specific reference to a deadline for completing or submitting an environmental assessment report in Annex B of MIGA's Operational Regulations document or in MIGA's Environmental and Social Review Procedures.[249] This timeline is flexible.[250] Because MIGA provides insurance rather than loans, MIGA

246. IBRD BP, *supra* note 218, at 4.01, ¶ 9.

247. IFC ESPR, *supra* note 172, at 9, "Introduction."

248. *Id.*

249. MIGA ESRP, *supra* note 173, ¶ 8(c). The ESRP does state that "[w]hen an environmental impact assessment report is required, the project sponsor is required to give public notification and disclose locally, as early as possible in an appropriate manner, the environmental impact assessment report at a public place accessible to project-affected groups and local interest groups such as nongovernmental organizations." The ESRP also states that the purpose of the environmental review process is to determine whether the project is in compliance with MIGA's policies, and that ideally, significant environmental issues should be addressed before submission of the President's Report to the Board of Directors.

250. *Id.* ¶ 34. "The purpose of the environmental review process is to determine that either the project is in compliance with MIGA's environmental policies and consistent with the guidelines, or to suggest measure the invest must take to ensure compliance and consistency. Ideally, all significant environmental issues should be satisfactorily addressed before submission of the President's Report to the Board of Directors. However, a decision may be made, on the recommendation of MIGA Management and with Board concurrence, to issue a guarantee which is conditional on the sponsor completing necessary environmental activities or mitigation measures within a reasonable, specified time."

usually becomes involved in projects at a later point than IBRD or IFC, and MIGA regulations provide it more flexibility with the timing of environmental assessments.

ADB The summary environmental assessment report is required to be available to the general public and circulated to ADB's Board of Directors at least 120 days before the Board of Directors considers the loan, or in some cases, before approval of significant changes in project scope or subprojects.[251]

10. Review and Public Participation

How many levels of review of the environmental assessment occur before a binding agency decision on the project? What is the process for public participation to critique a draft environmental assessment before it is deemed "final" and project approval and funding decisions based on it are implemented? How does it influence loan appraisal?

NEPA Once the draft environmental impact statement is prepared and before preparation of the final environmental impact statement, the lead agency must obtain the comments of any federal agency which has jurisdiction by law or special expertise relevant to any environmental impact involved, or which is authorized to develop and enforce environmental standards. The agency charged with preparing the EIS must also request the comments of appropriate state and local agencies, Indian tribes, and any agency which has requested that it receive statements on actions of the kind proposed. The agency must also request comments from the applicant and the public.[252]

IBRD For Category A and B projects, the Task Team and the Regional Environment Sector Unit (RESU) review the results of the environmental assessment to ensure that the environmental assessment report is consistent with the Terms of Reference agreed by the borrower. For Category A projects, the appraisal mission team includes one or more environmental specialists with relevant expertise.

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251. ADB OM, *supra* note 174, § F1, ¶ 10; ADB Private Sector Development: Strategy, Policies, Modalities and Procedures, Environmental Considerations, at 13 (1996).

252. 40 C.F.R. § 1503.1 (a)(3)-(4). Regarding the final EIS, federal agencies with jurisdiction by law or special expertise or agencies which are authorized to develop and enforce environmental standards must comment on EISs within their jurisdiction, expertise, or authority. 40 C.F.R. §1503.2.

The review gives special attention to the nature of the consultations with affected groups and local NGOs and the extent to which the views of these groups were considered. If the RESU is not satisfied with the environmental assessment, it may recommend one of three actions to regional management. It may recommend that the appraisal mission be postponed, that the mission be considered a pre-appraisal mission, or that certain issues be reexamined during the appraisal mission.[253] The appraisal mission normally begins only after IBRD has received and reviewed the official environmental assessment report. The RESU provides a formal clearance of the environmental aspects of the project at the project decision stage. This clearance includes the treatment of the environmental aspects in the draft legal documents prepared by the Legal Department.

IFC The IFC ESRP requires several stages of review and supervision throughout the entire life cycle of the project.[254] Annex 3.5 of the ESRP sets forth several performance standards as well as two review streams intended to evaluate community support and the impact of the project on the affected communities.[255]

MIGA MIGA staff undertake a detailed review of the environmental assessment and other environmental information when they receive it from the applicant.[256] For category A projects, there is a desk review of the environmental impact assessment report.

ADB Environment specialists in ADB regional departments review the environmental assessment reports. Quality assurance of projects and programs is performed by the project team, and formal peer review of category A projects is performed through ADB's environment committee.[257]

11. Final Approvals

Which entity makes the final decision as to whether to proceed with a proposed project?

NEPA The agency responsible to prepare the EIS, that is the lead agency designated for the proposed project, makes the decision whether to proceed with the proposed project. The agency prepares a public record of decision that states what the decision is, identifies

253. IBRD BP, *supra* note 218, at 4.01, ¶ 12.
254. IFC ESPR, *supra* note 172, at 9.
255. *Id.* at 27-34.
256. MIGA Environmental and Social Review Procedures, ¶ 33.
257. ADB OM, *supra* note 174, § F1, ¶ 5.

all alternatives considered by the agency in reaching its decision, and states whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted, and if not, why they were not.[258]

IBRD The Regional Environment Sector Unit provides formal clearance of the environmental aspects of the proposed project.[259] IBRD's Board of Executive Directors makes the final decision as to whether to support a proposed project.

IFC The Environment and Social Development Department decides whether the project can comply with appropriate IFC environmental and social requirements. If the Department is satisfied, it sends an Environmental and Social Clearance Memorandum to the Investment Department. The Department Director then holds an Investment Review meeting, and IFC negotiates with the project sponsor to establish the terms and conditions of IFC participation. The proposed project is then submitted to the IFC Board for approval.[260]

MIGA MIGA decides whether to provide risk guarantees to the proposed project. After a President's Report is prepared, a Risk Management Committee decides whether to recommend the proposed project for approval. Once the President's Report is recommended for approval, the Executive Vice President, on behalf of the President, approves the President's Report. This approval is subject to Board concurrence.[261]

ADB A project team (the Mission) prepares an internal Report and Recommendation of the President that is circulated internally for a staff review meeting. After the terms and conditions of ADB's investment are negotiated, the Report and Recommendation of the President is finalized and sent to ADB's Board of Directors for consideration.[262]

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258. 40 C.F.R. §1505.2.

259. IBRD BP, *supra* note 218, at 4.01, ¶ 14.

260. IFC ESRP, *supra* note 172, ¶¶ 3.3, 4.3, 6.3, 1.3.

261. MIGA's Environmental and Social Review Procedures, *supra* note 173, ¶¶ 21-22.

262. ADB Private Sector Development: Strategy, Policies, Modalities and Procedures, "Processing Procedures," at
p. 21.

12. Post-Approval Monitoring and Auditing

What assurance does a lender have that the environmental representations and covenants of the energy project sponsor will be honored and effectuated in fact? Is there the ability to monitor and audit compliance with environmental conditions?

The monitoring and auditing programs differ between the entities. IBRD, IFC and ADB have several reporting requirements and options for monitoring the environmental aspects of project implementation.[263] NEPA does not require that a monitoring and enforcement program be adopted unless this requirement is added by the lead agency.[264] MIGA primarily relies on warranties and representations by the applicant in loan covenants, although monitoring visits and requests for monitoring reports are permitted for Category A projects.[265] IBRD, IFC, MIGA and ADB each use the World Bank Pollution Prevention and Abatement Handbook as a guideline for normally acceptable pollution prevention and abatement measures and emission levels. IBRD, IFC and ADB provide that they may accept alternative emission levels and approaches to pollution prevention and abatement depending on national legislation and local conditions.

NEPA There is no discussion of auditing in NEPA, and there is limited discussion of monitoring. NEPA does state that in its record of decision, "[a] monitoring and enforcement program shall be adopted and summarized where applicable for any mitigation."[266] Agencies *may* provide for monitoring to assure that their decisions are carried out and *should* do so in important cases.

IBRD During the project, the borrower reports on compliance with measures agreed to with the Bank, including implementation of any Environmental Management Plan. The borrower also reports on the status of mitigatory measures and the findings of monitoring programs.[267] IBRD prepares an Implementation Completion Report

263. IBRD BP, *supra* note 218, at 4.01, ¶ 19; ADB; ADB OM § F1, ¶ 32.

264. 42 U.S.C. 4332 (2004).

265. MIGA ESRP, *supra* note 173, ¶ 13

266. 40 C.F.R. §1505.2.

267. IBRD, OP, *supra* note 176, at 4.01, ¶ 20. This section has a footnote reference to "OP/BP 13.05, *Project Supervision.*" The Task Team, in consultation with the Regional Environment Sector Unit and Legal department, reviews the reports and determines whether the borrower's compliance is satisfactory. If it is not satisfactory, the Task Team discusses corrective actions with the borrower and fol-

which evaluates environmental impacts, noting whether they were anticipated in the environmental assessment report, and the effectiveness of any mitigatory measures that were taken.

IFC IFC performs project monitoring in one or more of three ways. First, IFC may review annual monitoring reports prepared by the project company. Second, IFC may supervise missions carried out by the Investment Department and the Environment and Social Development Department. Third, staff of the Environment and Social Development Department may perform project site visits.[268] IFC prepares Project Supervision Reports annually, and these reports must include an environmental and social compliance section regarding covenants in the investment agreement.

MIGA MIGA's post-decision monitoring is different from that of IFC. MIGA confirms that guarantee holders operate in compliance with MIGA's environmental requirement through warranties and representations. For Category A projects, MIGA can make requests for environmental monitoring reports or perform site visits.[269]

ADB For Category A and environmentally sensitive Category B projects, the borrower or executing agency must submit semiannual reports on implementation of environmental management plans. This requirement is reflected in the loan agreements. Additionally,

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lows up on the implementation of the actions. IBRD BP *supra* note 218, at 4.01 ¶ 21.

268. IFC ESRP, *supra* note 172, ¶¶ 2.2.2-4. The Transaction Leader is responsible for ensuring that supervision reports include information on the project company's compliance with environmental and social requirements. The Transaction Leader also makes sure that annual environmental monitoring reports are provided to the Environment and Social Development Department. The Environment and Social Development Department is responsible for reviewing these reports and determining whether the compliance is satisfactory. In cases of non-compliance, the Environment and Social Development Department discusses courses of action with the Investment and Legal Departments and specialists in the Environment and Social Development Department. The Transaction Leader is responsible for follow-up with the project company and the Environment and Social Development Department until the non-compliance situation is resolved. *Id.* ¶¶ 2.3.2, 3.3.2, 4.3.2.

269. "For all Category A projects, the guarantee holder is required to submit at MIGA's request an environmental monitoring report confirming compliance with local environmental laws and regulations, and demonstrating compliance with the Environmental Action Plan. MIGA may also carry out monitoring visits, request specific data, or carry out other measures as necessary to verify information. Frequency of site visits will depend on environmental and social complexity of the project. Evidence that a project is not in compliance are grounds for canceling coverage or denying a claim." MIGA ESRP, *supra* note 173, ¶ 48.

review missions from ADB regional departments conduct annual reviews of environmental aspects of the project.[270] ADB also prepares project and program performance audit reports that include some analysis of environmental aspects of the project. [271]

V. CONCLUSION

The future of greenhouse gas emissions, linked with global warming, is a function of the combustion of fossil fuels for electric power production.[272] It is "given" that populations are increasing.[273] It is the aspiration of these populations to achieve increasing degrees of development. In fact, it is the policy of nations and international organizations to reduce poverty and increase standard of living.

With increased standard of living and development, inexorably comes increased consumption of energy.[274] Amid the constellation of increased consumption of energy, electricity is paramount in developing nations (where because so many developing nations are in tropical climates, there is not a significant demand for winter heating energy, air conditioning is provided by electricity-driven machinery, and food refrigeration with electric refrigerators is a significant demand). No national governments are encouraging their people to forsake the conveniences of development. No governments of developing nations' governments are urging their countries to forsake greater use of electricity for the sake of forestalling global climate policy. Exponential increases in electric demand in developing na-

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270. ADB OM, *supra* note 174, § 20, OP, ¶ 25. The project completion report, prepared by ADB's regional departments, includes three items related to the environmental aspects of the project. First, the report includes "a concise history of the environmental aspects of the project to completion, including an account of the performance of environmental indicators during project implementation." Second, an evaluation of the implementation of the Environmental Management Plan and environmental loan covenants is included. Third, an assessment of the performance of the executing agency is included. ADB OM, § 20, OP, ¶ 26.

271. "ADB's Operations Evaluation Department prepares project and program performance audit reports that are independent evaluations and include an analysis of the effectiveness of the EMP in achieving the intended objectives. The reports will also assess the PCR's environmental reporting for its adequacy, and focus on specific environmental issues as documented in the PCR." ADB OM, § 20, OP, ¶ 26.

272. *Id.*

273. *Id.*

274. *Id.*

tions is unavoidable both as a natural progression of modern societies, but also as a goal encouraged by national governments and international agencies.

Therefore, two of the three variables in the demand for energy – population and development – are fixed in relationships that are not easily influenced by public policy, government regulation or laws. It is only the third variable –energy technology –that can be influenced significantly by institutions of government and actions of law. While this limits the factors in the energy formula that can be manipulated, this is not necessarily pessimistic news.

There are alternatives for electric energy. Wind, hydroelectric, biomass, landfill-gas and photovoltaic technologies are available to generate electric energy or produce combined heat and power.[275] They are demonstrated and reliable in the context of applications in both developed and developing countries. They are true alternatives.

While we are still devising the policy and legal tools to influence these choices, the technology choices are exigent, proven and available. Moreover, they are evolving in positive vectors over time, as greater efficiency and innovation change the way of doing mechanical and informational tasks. With the technology available, the issue becomes where will these renewable technologies be deployed in what capacities and where will conventional technologies be deployed.

The power sectors of the nations of the world operate either pursuant to competitive market designs or government controlled allocations and operations. This differentiates the mechanism by which renewables can be promoted. To some degree, in a deregulated environment, market forces and pricing considerations drive the selection criteria. However, even in those 18 supposedly "deregulated" U.S. state retail electric regimes,[276] there remains significant regulation over aspects of the grid. And despite deregulation, there still remains operating control by regulators at both the federal and state levels over operation of power plants.[277] The California electric crisis of 2001 illustrated both this emergency power, as well as the con-

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275. The Law of Independent Power, *supra* note 3, § 2:11.

276. *See* STEVEN FERREY, ENVIRONMENTAL LAW: EXAMPLES & EXPLANATIONS, Chapter 12: Deregulation of Power and Wheeling (Aspen Publications, 4th Ed. 2007); Ryan Wiser, et al., *The Experience with Renewable Portfolio Standards in the United States*, 20 Electricity J. 8, (May 2007).

277. *See generally*, The New Rules: A Guide to Electric Market Regulation, supra note 1, at Chapters 2, 3, 8, 9.

sequences of not exercising prudently or in a timely manner that residual power.[278]

In developing nations, where the growth or electric power requirements and potential emission of greenhouse gases are most extreme, there seldom is a deregulated power market. Despite efforts by the World Bank and other international agencies to create more rational, independent and transparent power markets in developing nations,[279] most still employ a single state utility operating as a division of national or state government, dependent on political budgetary allocations and operating not on sound economic or regulatory principles. In these situations there is often ironclad control over power decisions at a centralized point.

While this may be inimical to certain Western concepts of the regulatory compact for power generation,[280] it can greatly simplify the objective of implementing a sustainable power profile. With this centralized decision making and control, comes the ability to deal with international agencies that will facilitate or subsidize renewable power development. Also, in systems where there is no competition in the power sector, the financial risk of one competitive power developer forfeiting profits by deploying more capital intensive or expensive renewable technologies than a competitor, is not an issue. Therefore, this centralization of decision making and lack of competition, while not ideal from the perspective of efficient and transparent market design, affords the ability to implement a more sustainable global warming strategy if the government is amenable.

The embodiment of the selection metric to determine whether to deploy renewable or conventional technology is the environmental assessment. Because environmental assessment and clearance must occur prior to financing of a project, the environmental clearances are early critical path gates to clear for the project developer. These environmental assessment processes control the clearance process for funding for power plant construction. The environmental assessments are prerequisite to, and control, the flow of, international

278. Steven Ferrey, *Soft Paths, Hard Choices*, 23 VA. ENVTL. L.J. 251 (2004); Steven Ferrey, *The Eagles of Deregulation*, 32 ENVTL. L. 297 (2002).

279. The author has served as legal advisor and counsel of World Bank and United Nations Development Program teams working with governments and utilities in countries across Asia and Africa during the past 15 years to address some of these utility issues.

280. The New Rules: A Guide to Electric Market Regulation, *supra* note 1, at Chapters 3, 7.

loans for power generation and transmission facilities. Yet, their importance as a gate for development is not well appreciated.

This article analyzed the similarities and differences in the primary international environmental assessment processes. The project sponsor must satisfy the most demanding of these environmental assessment criteria where multiple agencies fund or support a particular power project. Since environmental impacts and externalities are the concerns primarily associated with fossil fuel technology, the type of environmental assessment required by relevant law and regulation is pivotal. The environmental assessment is more than a mere formality for financing and support. Rather, it is a critical path hurdle to successful project completion.

The environmental assessment is the key "gate keeping" function on the architecture of the power future. By establishing the appropriate standards for satisfactory environmental assessment, the flow of international financing for power projects can be significantly influenced as to what is built where and when to satisfy burgeoning global power requirements. This is the critical regulatory piece to mitigate global warming.