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ENERGY JUSTICE AND SUSTAINABLE DEVELOPMENT

Lakshman Guruswamy, Ph.D.*

ABSTRACT

Sustainable Development ("SD")—an expression of distributive justice—is the foundational premise of international energy and environmental law. It posits that international answers to environmental and energy problems cannot be pursued as independent and autonomous objectives but must be addressed within the framework of economic and social development. SD has been politically institutionalized in the Millennium Development Goals and a plethora of significant international instruments. Perhaps more importantly from a legal standpoint, SD is unequivocally codified, in the most widely accepted international energy and environmental treaties. This Article affirms the importance and continuing applicability of SD to the "other" third of the world afflicted by energy problems who live on less than a dollar or two a day. Two-thirds of the world, those in developed and advanced developing countries, are high energy (fossil fuel) users who are responsible for problems of global warming. By contrast, the primary energy relied on by the "other" third of the world, numbering around two billion peoples, is biomass-based fire. The kind of fire they rely upon fails to supply the majority of their basic energy needs. These fires also cause indoor pollution leading to over a million and a half premature deaths per year, primarily of women and children. However, the last five to ten years have witnessed the growth of a different worldwide

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movement concerned with global warming and climate change. The singular focus of the climate change movement is the reduction of carbon dioxide emissions. Unfortunately, the objectives of carbon dioxide reduction and SD can and do diverge. Despite a ritualistic bow to SD, the global warming movement has generally ignored the energy oppressed poor ("EOP"). They have done so because the EOP use hardly any fossil fuels and their carbon dioxide emissions are less than negligible. Instead, climate change and global warming advocates and decision makers have concentrated their attention only on high energy users in the developed world, and advanced developing countries like China and India. The other third of the world—the "EOP"—have been ignored. This Article explains why energy justice ("EJ"), which provides the philosophical and jurisprudential underpinnings of SD, demands that the developed and high energy world should act to address the condition of the EOP. Such action must begin with tackling indoor air pollution. Providentially, doing so will also have the co-benefit of mitigating black carbon which is the second most important cause of global warming. But actions based on EJ and SD should extend far beyond that single measure and calls for sustainable energy that will enable the EOP to develop, and break the bonds of poverty and energy deprivation. The right of the EOP to SD must be re-affirmed.

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I. INTRODUCTION

Energy Justice ("EJ") conjugates justice with energy. Justice is the first virtue of social institutions;[1] energy is a fundamental need and the driving determinant of human progress.[2] Energy justice seeks to apply basic principles of justice as fairness to the injustice evident among people devoid of life sustainable energy, hereinafter called the energy oppressed poor ("EOP"). EJ is an integral and inseparable dimension of the universally accepted foundational principle, or grundnorm,[3] of international law and policy: Sustainable Development ("SD").

The original formulators of the concept, the World Commission on Sustainable Development, also known as the Brundtland Commission, pointed to the abject poverty of the developing world, and articulated a distributional principle which they called sustainable development. They reasoned that SD would meet the basic needs of the world's poor by providing economic and social development without which environmental protection could not be achieved.[4] This distributional principle of SD is now re-affirmed and expressed in the most widely accepted energy [5] and environmental treaties[6] and declarations.[7] EJ,

1. JOHN RAWLS, A THEORY OF JUSTICE 3 (Harvard Univ. Press 1971) [hereinafter A THEORY OF JUSTICE].

2. LESLIE A. WHITE, THE EVOLUTION OF CULTURE: THE DEVELOPMENT OF CIVILIZATION TO THE FALL OF ROME 33–57 (McGraw-Hill 1959).

3. The Grundnorm, a German word translated as "Basic Norm," was propounded by Hans Kelsen to mean the foundational principle that will ultimately govern a legal system. It is a premise or predicate against which all other rights and duties can be validated or falsified. HANS KELSEN, GENERAL THEORY OF LAW & STATE 110–13 (Harvard Univ. Press 1946).

4. U.N. World Comm'n on Env't & Dev., *Our Common Future*, 43–54, U.N. Doc. A/42/427 (1987) *available at* http://www.un-documents.net/ocf-01.htm [hereinafter *Our Common Future]*.

5. *See, e.g.*, U.N. Framework Convention on Climate Change art. 3, ¶ 4, art. 4, ¶ 7, May 9, 1992, 31 I.L.M. 849 [hereinafter UNFCCC]; Kyoto Protocol to the U.N. Framework Convention on Climate Change, Dec. 10, 1997, 37 I.L.M. 32 [hereinafter Kyoto Protocol] (giving expression to the principles embodied in the UNFCCC). The

however, has been egregiously ignored in international discourse and negotiations about energy and the environment. The present article impugns such global malfeasance.

The facts about energy justice are distressing. A disturbingly large swath of humanity is caught in a time warp. Between 2 and 2.5 billion people, amounting to nearly a third of the world, rely upon biomass-generated fire as their principal source of energy. These fires are made by burning animal dung, waste, crop residues, rotted wood, other forms of "bad" biomass, and raw coal. Unlike the rest of the world, the other third live without access to energy generated lighting, space heating, cooking, and mechanical power. They suffer from grinding poverty, lamentable diseases, lack of safe drinking water and sanitation, non-access to education, and barely experience economic and social development. Moreover, the biomass-generated fire they rely upon is an inadequate source of energy. It does not provide the kind of exogenous energy required for sustainable human development. Fire can be used for cooking and heating but fails to supply the majority of other basic energy needs. Fire does not power water pumps, grinding mills, vehicles, or agricultural equipment. Further, it does not provide clean lighting, water filtration, or more generally help create the goods and services required for food, clothing, and shelter.

In responding to this challenge, the nations of the world and the United Nations ("UN"), arrived at an obvious, rational, and integrated application of SD. In 2000, they agreed on the Millennium Development Goals ("MDGs") and Millennium Development Project ("MDP"). The objectives of the MDGs and MDP are to halve global poverty and

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UNFCCC is particularly pertinent to this issue; it has received 194 instruments of ratification, and is the most extensively adopted treaty in the world.

6. *See generally* Convention on Biological Diversity art. 20 ¶ 4, June 5, 1992, 1760 U.N.T.S. 79; United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, Oct. 14, 1994, 1954 U.N.T.S. 3; Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Mar. 22, 1989, 1673 U.N.T.S. 126; Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution on Persistent Organic Pollutants, June 24, 1998, 37 I.L.M. 505; U.N. Conference on Environment and Development, June 3-4, 1992, *Rio Declaration on Environment and Development*, U.N. Doc. A/CONF.151/26 (1992) [hereinafter Rio Declaration]; U.N. Millennium Declaration, G.A. Res. 55/2, U.N. Doc. A/RES/55/2 (Sept. 8, 2000) [hereinafter U.N. Millennium Declaration]; World Summit on Sustainable Development, Aug. 26–Sept. 4, 2002, *Johannesburg Declaration on Sustainable Development*, U.N. Doc. A/CONF.199/20 (Sept. 4, 2002) [hereinafter Johannesburg Declaration]; U.N. Climate Change Conference, Dec. 7–18, 2009, *Copenhagen Accord*, U.N. Doc. FCCC/CP/2009/L.7 (Dec. 18, 2009) [hereinafter Copenhagen Accord].

7. Rio Declaration, *supra* note 6; U.N. Millennium Declaration, *supra* note 6; Johannesburg Declaration, *supra* note 6; Copenhagen Accord, *supra* note 6.

hunger, increase access to safe water and sanitation, provide primary education, and improve gender equality. They further seek to reduce child and maternal mortality by sixty-six percent, and reverse the growth of malaria, HIV/ AIDS, and other major diseases. The target year for achieving these goals is 2015.[8] Two aspects of the MDGs are worthy of special notice. First, they require access to energy, and second, they are a prerequisite for dealing with global warming.

The MDGs cannot be satisfied without access to energy.[9] First, the goal of reducing poverty depends on the availability of energy because even the most rudimentary forms of income-generating activities, like agriculture and small businesses, need energy to power machines for milling or grinding, for transportation to market goods and services, for telecommunications, and for education. Second, the goal of reducing hunger requires that more food be grown and distributed. Most forms of irrigation require energy to power water pumps, as well as for machines that harvest crops. Processing food requires energy, as does transportation and distribution. Third, water treatment plants that provide safe drinking water require energy, and hospitals need energy for refrigeration of vital medications and vaccinations. Finally, in order to provide primary education, schools require energy for lighting and heating, and students need lighting at home to do their homework. It seems almost obvious that the MDGs, as an instrument of SD, should concentrate on the developmental objectives of the EOP.

The environmental and global warming implications of the MDG are equally clear. It empowers and enables healthier, more educated peoples, including women, to adapt to and mitigate global warming. There is no doubt that healthier, more educated peoples, are better able to combat global warming than an ill educated population dying from illness, disease, hunger and malnutrition. The MDGs should be used to further SD by fulfilling the developmental objectives of the EOP as a necessary first step in meeting their environmental and global warming challenges.

Particularly during the last five to ten years, however, the international agenda has been dominated by fervent and dedicated global warming crusaders and blinkered decision-makers from the developed world, who appear anaesthetized to the plight of the EOP. Consequently,

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8. *See infra* Section III(D).

9. *See* MODY ET AL., ENERGY SERVICES FOR THE MILLENNIUM DEVELOPMENT GOALS (The Int'l Bank for Reconstruction & Devel. 2005), *available at* http://www.unmillenniumproject.org/documents/MP_Energy_Low_Res.pdf.; GWÉNAËLLE LEGROS ET AL., THE ENERGY ACCESS SITUATION IN DEVELOPING COUNTRIES 2 (World Health Org. & U.N. Dev. Programme 2009), *available at* http://content.undp.org/go/cms-service/stream/asset/?asset_id=2205620 [hereinafter LEGROS ET AL.].

the bulk of development assistance has been funneled toward reducing carbon dioxide and other greenhouse gas ("GHG") emissions at the expense of the MDGs. For example, Secretary Clinton recently confirmed that the U.S. Agency for International Development's ("USAID") key focus on development assistance for over a decade has been on environmental programs that have reduced growth in GHG emissions.[10] Given that the EOP hardly emit any GHGs, left unsaid is the stark fact that those USAID resources are not available for the MDGs. The obvious result is that international resources for achieving the MDGs are drying up. A recent report of the UN Development Program ("UNDP") diplomatically emphasized this point. The report points out that economic growth, eradication of poverty, and the MDGs remain the highest priorities of developing countries, but that the focus of world leaders on reducing GHG emissions may constrain those priorities and efforts.[11]

Climate change negotiations have ignored the EOP. In the most recent chapter of climate change negotiations under the UN Framework Convention on Climate Change ("UNFCCC") at Copenhagen in December 2009, the world's decision-makers, while paying lip service to SD, demonstrated once again that they remain impervious to the EOP and their lament of disease, public health problems, lack of safe drinking water, non-access to education, sickness, death, and economic deprivation that is not attributable to carbon dioxide. Consistent with their preoccupation with GHG reductions, world leaders continued to ignore the energy-based problems afflicting one-third of the world's population, which are caused by the absence of modern sustainable energy. The Copenhagen Accord stated in passing that "Developing countries, especially those with low emitting economies should be provided incentives to continue to develop on a low emission pathway."[12] However, this provision was left without reference to any funds to help fulfill such an objective. Instead, the only reference to funding made available to developing countries was for mitigation, adaptation, technological development and transfer, and capacity-building.[13] Once again, the primacy of global warming was emphasized and funded while the plight of the non carbon dioxide generating EOP—and the countries they inhabit— were almost totally ignored. The

10. USAID, *Global Climate Change Program*, http://www.usaid.gov/our_work/environment/climate/ (last visited May 2, 2010).

11. U.N. MILLENIUM CAMPAIGN, SEAL A JUST DEAL: THE MDG PATH TO A CLIMATE CHANGE SOLUTION 2 (2009), *available at* http://southasia.oneworld.net/Files/MDGs%20and%20Climate%20Change.pdf.

12. Copenhagen Accord, *supra* note 6, art. 7.

13. *Id*. art. 8.

amaurosis afflicting climate change negotiators is perplexing for a number of reasons.

Indoor pollution is the clearest example of an energy problem that extracts a horrendous toll of death and sickness, especially among women and children. It blights the EOP who rely on fire as their sole source of energy for cooking, illumination, and heating. Using an open fire, or a traditional stove fueled by biomass, results in inefficient combustion that releases dangerous quantities of carbon monoxide, particulate matter, and other pollutants into the air. These indoor pollutants result in the premature death every year of 2 million women and children from pneumonia, chronic obstructive pulmonary diseases, lung cancer, and asthma. They also cause chronic respiratory ailments and debilitating sickness for many more millions.[14]

With regard to indoor pollution, recent scientific investigations published in well established and respected peer-reviewed journals conclude that black carbon or black soot emitted by the burning of biomass makes the second strongest contribution to current global warming after carbon dioxide emissions.[15] According to these studies, the particulates in black carbon absorb reflected solar radiation, as well as direct solar radiation, thus warming the atmosphere more severely than other greenhouse gases like methane, halocarbons, and tropospheric ozone. Moreover, black carbon can travel potentially thousands of miles on air currents, and eventually settle out of the air, onto land, water, and ice. Black carbon may lower the albedo, or reflectivity, of polar ice that covers vast stretches of the Arctic and Antarctica. The presence of overlying black carbon may result in ice retaining more heat, leading to increased melting and eventually a warmer Earth.[16]

These scientific facts offer compelling evidence that the EOP unmistakably and objectively fall within the economic, social, and environmental dimensions of SD. Providing cook stoves for example, could save millions of people from premature death and sickness, and free them to embark upon income generating economic activities. Moreover, the environmental co-benefits are incontestable. Apart from establishing a healthier population that can fight global warming, reducing black soot or black carbon by using cook stoves, will positively

14. LEGROS ET AL., *supra* note 9, at 2. Prior to this premature deaths were estimated at 1.5 million. WORLD HEALTH ORG., FUEL FOR LIFE 4, 12 (WHO Press 2006), *available at* http://www.who.int/indoorair/publications/fuelforlife.pdf [hereinafter WHO, FUEL FOR LIFE].

15. V. Ramanathan & G. Carmichael, *Global and Regional Climate Changes Due to Black Carbon*, 1 NATURE GEOSCIENCE 221, 221 (2008).

16. NASA & Goddard Space Flight Center Conceptual Image Lab, *Ice Albedo: Black Soot and Snow*, http://svs.gsfc.nasa.gov/goto?10023 (last visited May 2, 2009).

and directly reduce global warming.

Furthermore, reducing black carbon will cost only a fraction of the price of carbon dioxide mitigation. Unlike carbon dioxide, which remains in the atmosphere from 50 to 200 years and is very costly to mitigate, black carbon is short-lived and significantly cheaper to remove. Even if all carbon dioxide emissions were miraculously stopped today, the effects of existing carbon dioxide will continue for a century. Conversely, black carbon dissipates and disappears within a week. Thus, the beneficial effects of the removal of black carbon will be felt within a short time frame.

First, we introduce the topic. Then Section II illustrates the problems of the EOP by examining indoor air pollution caused by burning biomass and the resulting public health and global warming repercussions. Section III analyzes the concept of SD and its legal incorporation into international law. It provides the historical context as to why the broader socio-political and legal responses to the problems of the EOP must be predicated on SD. Section IV deals with SD and John Rawls. SD expresses the foundational concepts of international justice developed by Rawls in his *Law of Peoples*.[17] This section argues that Rawls offers the jurisprudential and philosophical foundations of SD. Section V addresses the question of global warming and SD, explaining why global warming is not the most important of the myriad problems confronting developing countries. Further, section V takes issue with the position of the developed world only to pledge scarce resources toward GHG mitigation and adaptation. Energy justice cries out for relief for the EOP who have no access to hydrocarbon-based energy, and do not emit significant quantities of GHGs. The decision made at Copenhagen to restrict global funding to the reduction of GHG emissions flies in the face of SD because it confines its assistance only to countries and peoples emitting carbon dioxide and other GHGs, and effectively penalizes the EOP for not being GHG emitters. The Conclusion will point out that addressing the problem of indoor pollution caused by burning biomass is only one step toward creating a more comprehensive basis for the energy-based SD of the EOP. This important first step, along with the mainstreaming of women[18], should become part of an unbroken sustainable energy continuum spanning indoor pollution, agriculture, cottage industries, distributed energy, public health, and

17. *See infra* Section IV.

18. In essence this refers to the process of integrating gender considerations and women's rights into the mainstream of the development process. Gender inequities clearly reduce women's capabilities, and thus run directly counter to the goals of development. Expanding the capabilities of all people, including women, is an indispensable part of human development.

education to address the needs of the EOP.

II. NEGATIVE EFFECTS OF INDOOR ENERGY AIR POLLUTION

Humans are engaged constantly in energy conversions—processes that transform one form of energy into a more useful form. Because energy is necessary for meeting basic needs like cooking, sanitation, lighting, and heating, efficient human organization bears a strong correlation to effective energy conversion. The extent to which good organization can convert human labor to produce energy of the kind unimaginable before the industrial revolution is offered by the building of the Great Pyramid of Khufa.[19] Technological innovations help convert fossil fuels, solar radiation, or nuclear fuels into other, more useful energy forms such as electricity, mechanical energy, or heat. The fossil fuel based civilization of the more prosperous two-thirds of the contemporary world has developed by exploiting the rich energy endowment embodied in fossil hydrocarbons. The very high energy density of these sources, along with the technological systems that have been fashioned to harness them, has created an enormously effective development subsidy for the prosperous.

In contrast, the world's remaining third, comprising fifty-two percent of the total population in developing countries, rely on biomass such as agricultural waste, animal dung, fuel wood, and charcoal, as their primary fuel source.[20] Using biomass for fuel, the process of cooking over an open fire, or even with a traditional stove, results in inefficient combustion. For instance, when using a traditional biomass-burning stove, only about eighteen percent of the energy from the fire goes into the pot. This inefficiency means that more biomass must be burned to

19. The Great Pyramid of Khufu at Giza has been described as perhaps the most colossal single building ever erected on the planet. *See* Encyclopædia Britannica Online, *Pyramids of Giza*, http://www.britannica.com/eb/article-9036944/Pyramids-of-Giza (last visited May 2, 2010). It was built by humans using slave labor or human energy converted by innovative social organization and management without the use of modern technology. Many archaeologists now believe that the Egyptian Pharaohs did not use slaves to build the pyramids, but rather conscripted peasants or even paid workers. *See, e.g.*, Jonathan Shaw, *Who Built the Pyramids?*, HARVARD MAGAZINE, July-Aug. 2003, at 49–50, *available at* http://harvardmagazine.com/2003/07/who-built-the-pyramids. Regardless, the enormity of the Pharaohs' organizational achievement stands whether the workers involved were enslaved or free, and is perhaps more incredible if the workers were not coerced.

20. INT'L ENERGY AGENCY, WORLD ENERGY OUTLOOK 2006 419, 421 (2006), *available at* http://www.iea.org/textbase/nppdf/free/2006/weo2006.pdf.

cook meals, creating more pollution.[21] Depending on the type of fuel and stove being used, indoor air pollution can contain a variety of dangerous pollutants, such as carbon monoxide, nitrous oxides, sulfur oxides, formaldehyde, carcinogens (such as benzene), and small particulate matter.[22] This section discusses the effects of burning biomass on human health, local economics, and global warming.

A. Effects on Human Health

Reliance on biomass as a primary source of energy leads to many adverse consequences for human health.[23] The poverty associated with biomass dependence usually means that kitchens are small and poorly ventilated, causing extremely elevated concentrations of dangerous indoor air pollution. For instance, whereas the U.S. Environmental Protection Agency ("EPA") sets a limit of 150 $\mu g/m^3$ for small particulates in the United States, the World Health Organization ("WHO") reports that a typical twenty-four hour mean level for homes burning biomass fuels is between 300 to 3,000 $\mu g/m^3$.[24] This results in pollution levels that are far more deadly in EOP countries than the atmospheric pollution allowed by the developed world.

The negative health effects of indoor air pollution are not solely created by its high concentration in the air. Rather, negative health effects are also a function of the exposure level, based on the amount of time an individual spends inhaling the polluted air.[25] As women traditionally are responsible for cooking and childcare in the home, they spend more time inhaling the polluted air that is trapped indoors. Women and children thus have the highest exposure to indoor air pollution and disproportionately suffer from the associated negative health effects.[26]

The time spent by EOP women cooking greatly increases their health risks[27] in addition to possible burns and injuries associated with

21. *See* HUGH WARWICK & ALISON DOIG, SMOKE—THE KILLER IN THE KITCHEN (ITDG Publishing 2004), *available at* http://practicalaction.org/smoke/docs/smoke/itdg%20smoke%20report.pdf.

22. WHO, FUEL FOR LIFE, *supra* note 14, at 8.

23. Martin Donohoe & Emily P. Garner, *Health Effects of Indoor Air Pollution From Biomass Cooking Stoves*, MEDSCAPE PUBLIC HEALTH & PREVENTION, May 19, 2008, http://www.medscape.com/viewarticle/572069?src=mp&spon=42&uac=5243EK.

24. WHO, FUEL FOR LIFE, *supra* note 14, at 10.

25. SANDY CAIRNCROSS ET AL., HEALTH, ENVIRONMENT AND THE BURDEN OF DISEASE, A GUIDANCE NOTE 24 (Dep't for Int'l Dev. 2003), *available at* http://www.dfid.gov.uk/Documents/publications/healthenvirondiseaseguidenote.pdf.

26. Donohoe & Garner, *supra* note 23.

27. CAIRNCROSS ET AL., *supra* note 25, at 24.

cooking over an open fire. Depending on the demands of the local cuisine, women who cook over biomass fires generally spend between three and seven hours each day near the stove preparing food.[28] Not only do these women spend more total time around the fire, but they are also exposed to the most intense pollution which "occurs during short peaks when fuel is added or moved, the stove is lit, the cooking pot is placed on or removed from the fire, or food is stirred."[29] Because these factors are generally not considered when calculating exposure from average pollution levels, the exposure of women to indoor air pollution may be underestimated by more than fifty percent.[30]

Children are also particularly susceptible to the hazards of burning biomass, and often suffer from burns or injuries from interactions with open fires in addition to indoor air pollution effects. In many cultures, the provision of childcare involves mothers carrying their infants on their backs as they work and supervising young children inside. As a result, children spend many hours breathing indoor air pollution during the first few years of their lives. Infants and young children are particularly vulnerable to indoor air pollution because their airways are still developing, thus fifty-six percent of all indoor air pollution-attributable deaths occur in children under five years of age.[31]

Children may also be affected by indoor air pollution in utero. Emerging evidence suggests that pregnant women exposed to indoor air pollution may increase the risk of low birth weight and prenatal mortality, stillbirths, and deaths during the first week of life.[32] Exposure to tobacco smoke is known to be a significant factor in decreased birth weight, and the health effects from the combustion of wood and other biomass are qualitatively similar to burning tobacco.[33] A study in Guatemala found that pregnant women using wood fuel gave birth to babies with a lower mean birth weight than women using cleaner fuels, even when socioeconomic status was taken into consideration.[34] Low birth weight impacts infant mortality and morbidity rates and puts children at further risk of developing respiratory illnesses if they survive past infancy.[35]

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28. World Health Org., Indoor Air Pollution and Health Fact Sheet No. 292 (June 2005), http://www.who.int/mediacentre/factsheets/fs292/en/index.html (last visited May 2, 2010) [hereinafter WHO, Indoor Air Pollution and Health].

29. CAIRNCROSS ET AL., *supra* note 25, at 24.

30. *Id*.

31. WHO, Indoor Air Pollution and Health, *supra* note 28.

32. *Id*.

33. WARWICK & DOIG, *supra* note 21, at 11–12.

34. CAIRNCROSS ET AL., *supra* note 25, at 26.

35. *Id*.

Indoor air pollution is responsible for approximately 1.6 million deaths per year in developing countries, amounting to one life lost every twenty seconds.[36] Most of these deaths take place in eleven countries—Afghanistan, Angola, Bangladesh, Burkina Faso, China, the Democratic Republic of the Congo, Ethiopia, India, Nigeria, Pakistan, and the United Republic of Tanzania—where indoor air pollution kills a total of 1.2 million people each year.[37] According to the WHO, exposure to high concentrations of indoor air pollution presents one of the ten most important threats to public health worldwide.[38] Exposure to indoor pollution results in acute respiratory infections ("ARI"), chronic obstructive pulmonary disease ("COPD"), lung cancer, tuberculosis, and asthma. Each of these conditions deserves brief mention.

The WHO estimates that 35.7% of all instances of ARI worldwide, such as pneumonia, are caused or worsened by exposure to biomass smoke.[39] Indoor air pollution can also increase the incidence of acute lower respiratory infections (ALRI) by affecting the body's defense systems, such as the ability to filter and remove particles in the upper airways. ALRI is the most important single cause of death in children under age five, responsible for 3 to 5 million deaths in this age group annually.[40] There is consistent evidence that exposure to indoor air pollution can lead to ALRI in young children.[41] A series of studies in developing countries indicates that young children living in homes dependant on biomass have a two to three times greater risk of suffering from ALRI than unexposed children. This figure was reached even after other factors, such as socioeconomic status, were accounted for.[42] Although ALRI deaths have been declining in the industrialized world with improvements in vaccines and antibiotics, such remedies are often unavailable to the EOP.[43]

Indoor air pollution is also considered a risk factor for chronic obstructive pulmonary disease ("COPD"), such as chronic bronchitis.[44]

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36. World Health Org. & U.N. Dev. Programme, *Indoor Air Pollution—the Killer in the Kitchen* (Oct. 14, 2004), http://www.who.int/mediacentre/news/statements/2004/statement5/en/index.html (last visited May 2, 2010), [hereinafter WHO, *Killer in the Kitchen*].

37. World Health Org., *Indoor Air Pollution Takes Heavy Toll on Health* (Apr. 30, 2007), http://www.who.int/mediacentre/news/notes/2007/np20/en/index.html (last visited May 2, 2010).

38. *Id*.

39. WARWICK & DOIG, *supra* note 21.

40. CAIRNCROSS ET AL., *supra* note 25, at 26.

41. WHO, Indoor Air Pollution and Health, *supra* note 2.

42. WARWICK & DOIG, *supra* note 21, at 11.

43. *Id*.

44. WHO, Indoor Air Pollution and Health, *supra* note 28.

In industrialized countries, tobacco smoking accounts for over eighty percent of COPD cases. However, this disease also occurs in the developing world in areas where tobacco smoking is rare. The UNDP states that the use of poorly ventilated, inefficient stoves "can have the same adverse health impacts as smoking two packs of cigarettes a day."[45] A person who is exposed to a biomass fire on a daily basis is two to four times more likely to suffer from COPD than a person who remains unexposed. The WHO estimates that twenty-two percent of all COPD cases worldwide are caused by exposure to indoor air pollution from biomass fires.[46]

Smoke inhalation is also associated with lung cancer. In developing countries, specific country studies[47] illustrate the general fact that even women who do not smoke tobacco form an unexpectedly high proportion of lung cancer patients,[48] While a clear link between lung cancer and biomass smoke has yet to be demonstrated, the International Agency for Research on Cancer ("IARC") concluded that indoor emissions from household combustion of biomass is probably carcinogenic to humans.[49] Furthermore, after a thorough review of published scientific evidence, the IARC concluded that indoor emissions from household combustion of coal are, in fact, carcinogenic to humans.[50]

There are several additional negative health effects associated with the daily inhalation of biomass smoke. Three published studies suggest that people in homes using wood for cooking are at 2.5 times greater risk of active tuberculosis than those who do not.[51] Moreover, there is growing evidence suggesting that indoor air pollution causes cataracts.[52] Furthermore, there is some evidence that wood smoke pollution can trigger and exacerbate asthma when combined with other ambient pollutants.[53]

In sum, indoor pollution caused by biomass burning takes place in small, ill ventilated huts and kitchens, and leads to a noxious cocktail of

45. WARWICK & DOIG, *supra* note 21, at 11.

46. *Id*.

47. *See* YC Ko, et al., *Risk factors for primary lung cancer among non-smoking women in Taiwan*, 26 INT'L J. OF EPIDEMIOLOGY 24, (1997), *available at* http://ije.oxfordjournals.org/cgi/content/abstract/26/1/24.

48. Press Release, Int'l Agency for Research on Cancer, Indoor Emissions From Household Coal Combustion Carcinogenic: Women in Low- or Medium-Resource Countries Most Exposed (Nov 29, 2006), http://www.iarc.fr/en/media-centre/pr/2006/pr172.html (last visited May 2, 2010).

49. *Id*. at 30.

50. *Id*.

51. WARWICK & DOIG, *supra* note 21, at 11.

52. *Id*. at 12.

53. *Id*. at 11.

diseases that particularly afflict women and children. The resulting afflictions range over a spectrum from ALRI to bronchitis, tuberculosis, lung cancer, cataracts, and bodily harm by way of burns and injuries.

B. Economic Effects

In addition to the disproportionate health burden placed on women and children, biomass fuel collection also imposes a serious economic burden on the EOP. The average amount of time that a family spends collecting fuel falls between thirty minutes and two hours each day. Where biomass has become scarce, fuel collection can take much longer.[54] Children, particularly girls, may be kept out of school in order to assist their mothers with collecting fuel.[55] There are significant risks associated with collecting large amounts of biomass. Transporting large loads of fuel exposes women and children to injuries and pregnant women to miscarriages.[56] In areas of war and civil unrest, women and children may be exposed to violence and injury as they search for fuel away from their homes.[57]

This perpetual chore of collecting fuel is both a cause and a result of poverty. Poor households often do not have the resources to obtain cleaner, more efficient fuels and appliances. These families are not faced with a choice, but a fact: they must cook using biomass or they will not eat.[58] Women in these circumstances tend to have limited decision-making power in the home, which decreases their ability to change the system, making household energy needs a lower priority than women might wish.[59] Reliance on biomass denies EOP women and children the opportunity for education and income-generating activities that could increase their family's standard of living.[60] Other consequences of poverty, such as malnutrition, deprivation, poor sanitation, and low standards of available medical services, further intensify the negative health effects of indoor air pollution.[61] Thus, dependence on biomass contributes to a vicious cycle of poverty.

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54. *Id*.

55. WHO, Indoor Air Pollution and Health, *supra* note 28.

56. WARWICK & DOIG, *supra* note 21, at 12.

57. *Id*.

58. WHO, *Killer in the Kitchen*, *supra* note 36.

59. CAIRNCROSS ET AL., *supra* note 25, at 25.

60. World Health Organization, Broader Impacts of Household Energy (2008), http://www.who.int/indoorair/impacts/en/ (last visited May 2, 1010) [hereinafter WHO, Broader Impacts].

61. CAIRNCROSS ET AL., *supra* note 25, at 25.

C. Environmental and Climate Change Effects

In addition to perpetuating poverty and negatively affecting the health particularly of women and children, there are also severe environmental impacts of biomass dependence. The reliance on wood as a fuel source puts considerable pressure on local forests, particularly in areas where fuel is scarce and demand for wood outstrips natural re-growth.[62] Depletion of woodland can lead to soil erosion and loss of a carbon sink.[63] Furthermore, it has been well established that burning dung and agricultural residues emits carbon dioxide and methane.[64] Arresting new research findings—well-received, though they have not yet garnered universal consensus among the scientific community—have now identified emissions from the burning of biomass as a significant cause of anthropogenic global warming.

According to an article in *Nature Geoscience*[65] discussed in *Science*,[66] the black carbon emitted by burning biomass makes the second strongest contribution to current global warming after carbon dioxide emissions. The article concludes that black carbon warms the atmosphere more severely than other greenhouse gases such as methane, halocarbons, and tropospheric ozone by absorbing both direct and reflected solar radiation contributing to a significant enhancement of lower atmosphere solar heating.[67]

Unlike carbon dioxide, the primary cause of anthropogenic global warming that has a life cycle of 50 to 200 years, black carbon remains in the atmosphere for less than one year, and perhaps only for one week.[68] Although black carbon leaves the atmosphere much more quickly than carbon dioxide, its global warming capacity stays intact as long as its ambient concentrations remain high, which happens so long as newly emitted black carbon replenishes what is removed. However, if

62. WHO, Broader Impacts, *supra* note 60.

63. CAIRNCROSS ET AL.,, *supra* note 25, at 25.

64. *See, e.g.*, Ambuj D. Sagar, *Alleviating Energy Poverty for the World's Poor*, 33 ENERGY POL'Y 1367, 1368 (2005). Sagar notes that burning crop residue and dung also degrades local farmland, as this biomass is not allowed to decompose and enrich the soil.

65. Ramanathan & Carmichael, *supra* note 15, at 221.

66. Robert F. Service, *Study Fingers Soot as Major Player in Global Warming*, 319 SCIENCE 1745, 1745 (2008).

67. Ramanathan & Carmichael, *supra* note 15, at 222–23. "Lower atmosphere" exists between the Earth's surface and an altitude of roughly 3 km. In atmospheric "hotspots," or regions with 15 W m^{-2} forcing, black carbon can increase solar heating by as much as fifty percent.

68. *Id*. at 221. This results from the amplification of black carbon's warming effect when mixed with other aerosols such as sulfates. The removal of black carbon from the ambient air removes a significant cause of pollution.

emissions were to cease today and not replenished, the existing ambient concentrations of black carbon would be gone in as little as one week. Thus, helping to move one-third of the global population away from biomass burning will have the effect of reducing global warming more efficiently than merely reducing carbon dioxide emissions. Furthermore, black carbon has also been implicated in interfering with the albedo effect of ice cover. Snow and ice are very reflective, and albedo refers to a specific form of reflectivity that allows between seventy and eighty percent of the suns rays that hit snow and ice to bounce back into space. Two credible scientists conclude that black soot on snow impairs its albedo and may amount to a quarter of global warming. [69]

Indoor pollution demonstrates the poverty of the EOP and the extent to which their plight cries out for SD. Human progress is largely determined by, and may even be equated with, the harnessing and use of energy. Accordingly, the economic and social development of the EOP must address the fact that a predominant reason for the poverty of the EOP lies in their lack of access to exogenous energy. Their right to energy places a correlative duty on developed countries. The contours of such a duty are defined by SD.

III. THE CONCEPT OF SUSTAINABLE DEVELOPMENT

The concept of SD has evolved over the last forty years and a brief description of its history sheds light on the importance of John Rawls's thinking, its relevance to SD, and the EOP. A quick synopsis of the major international conferences from 1972 reveals the extent to which the environment has lost its autonomous position as a subject worthy of protection in its own right. Currently, global environmental protection can only be pursued in tandem with economic and social development. Moreover, even one of the great environmental problems facing the world, carbon dioxide pollution resulting in global warming, can only be addressed within a framework of distributive justice, as part of the overall right to economic and social development established by the foundational norm of SD. A synoptic account of international diplomacy and law making casts light on how this transpired.

A. Stockholm Conference on the Human Environment

It began differently. The 1972 Stockholm Conference on the Human

69. James Hansen & Larissa Nazarenko, *Soot Climate Forcing via Snow and Ice Albedos*, 101 PROC. NAT. ACAD. SCI. 423, 428 (2004).

Environment ("Stockholm Conference") was an environmental protection event. Up to about the time of the Stockholm Conference, international environmental problems had been dealt with in a sporadic and ad hoc manner resulting in few significant treaties or political declarations. These treaties and political instruments were isolated events that did not constitute a recognizable corpus of international environmental law. The development of law and policy leading to the Stockholm Conference was influenced by the world's thinking, ideology, and culture of concern about the environment.

The themes articulated in Rachel Carson's book, Silent Spring (1962), Barry Commoner's book, The Closing Circle (1971), and Kenneth Boulding's *Spaceship Earth*[70]resonated from the United States into the thinking of other industrial nations. Many of these and other themes were melded and expressed with crusading cogency within an international context in Limits to Growth[71] a computer modeled study sponsored by the Club of Rome, a private group of industrialists and world leaders. The Meadows project team painted an apocalyptic picture of the growth of population, pollution, and exhaustion of natural resources leading to a break down of the carrying capacity of the earth.[72] Along with a growing awareness of environmental phenomena such as acid rain and the poisoning of Japanese fisherman in Minimata Bay, these publications led to a realization of the frailty of the planet earth and created a ferment of apprehension among a cross section of common people, influential elites and decision makers in the developed industrial world.

In the face of these concerns, the UN was moved to convene a special international environmental conference to discuss the human environment in 1972. Sweden, which had begun to experience trans-boundary acid rain, volunteered to host it in Stockholm. The overall sense of crisis crying out for global action was brilliantly captured in the book by Rene Dubos and Barbara Ward, specially commissioned for the Stockholm Conference.[73] At the same time, the seeds of discord were actually sown at Stockholm.

While concern about the environment motivated many rich, developed, industrial countries, the poor, developing countries did not

70. *See generally*, RACHEL CARSON, SILENT SPRING (Houghton Mifflin, 1962); BARRY COMMONER, THE CLOSING CIRCLE: NATURE, MAN, AND TECHNOLOGY (New York : Knopf, 1971); Kenneth E. Boulding, *The Economics of the Coming Spaceship Earth*, *in* ENVIRONMENTAL QUALITY IN A GROWING ECONOMY 3 (Henry Jarrett ed., 1966).

71. Meadows et al., The Limits to Growth 9–12 (1974).

72. *Id*. at 23–24.

73. *See generally*, BARBARA WARD & RENÉ DUBOS, ONLY ONE EARTH: THE CARE AND MAINTENANCE OF A SMALL PLANET 12 (1972).

share the view that environmental degradation was the biggest threat facing the planet. For developing countries, poverty and the alleviation of misery remained a more poignant and real problem. In the preparatory meetings leading to Stockholm, the developing countries—which called themselves the Group of 77 (their original number)—sharply and forcefully articulated the view that the worst pollution was caused by poverty. Developing countries believed that greater development leading to material prosperity far outweighed any damage that might be caused by resource use and pollution. They were particularly scornful of the claim that developed countries were genuinely trying to steer them away from pitfalls into which they had fallen. Developing countries expressed resentment over the fact that the developed countries—whose drive toward wealth had consumed a great part of the earth's resources and had led to devastating pollution—were now asking the developing countries to remain poor, and, more gallingly, to pay for the clean up, restoration, and conservation of the earth. Moreover, many developing countries feared that new environmental standards adopted by developed countries would effectively bar the entry of developing country goods into developed country markets.

This ideological impasse presented a formidable challenge to international environmental diplomacy and the question was resolved, as best it might be, by way of a compromise worked out in a meeting at Founex, near Geneva, Switzerland.[74] The compromise held that economic development was not necessarily incompatible with environmental protection, and that development could proceed, provided it avoided damaging the environment. The essence of that understanding was summed up in the Preamble to the Stockholm Declaration of the UN Conference on the Environment ("Stockholm Declaration").[75] It stated that in developing countries, "[m]ost of the environmental problems are caused by under-development" and that developing countries must direct their efforts to development with due regard to the priority of safeguarding and improving the environment.[76] Similarly, the industrialized countries were exhorted to make efforts to reduce the developmental gap between themselves and the developing countries.

In sum, the developing countries successfully thwarted potential

74. The Secretary-General, Development and Environment: Report and Working Paper of a Panel of Experts convened by the Secretary-General of the United Nations Conference on the Human Environment, Founex, Switzerland, U.N. Doc. GE 71-13738 (June 4–12 1971).

75. Declaration of the United Nations Conference on the Human Environment pmbl., June 16, 1972, U.N. Doc. A/CONF.48/14/Rev.1 (1973), *reprinted in* 11 I.L.M. 1416 (1972).

76. *Id*. § I, ¶ 4.

environmental laws and policies from damaging their efforts to develop and grow economically, whether by industrial progress or trade. The concept of SD had not been born yet and they did not obtain substantial bankrolling for environmentally conscious development. The Stockholm Declaration also did not meaningfully advance the doctrine of "common but differentiated responsibility. This concept later accepted at the1992 Earth Summit or UN Conference on Environment and Development ("UNCED"), in Rio de Janeiro, Brazil as a means of recognizing the different needs of developed and developing countries.

B. World Commission on Environment and Development

Despite the uneasy truce at Founex reflected in the Stockholm Declaration, the persistent clash of two cultures—environmental protection and development—continued to obstruct the progress of international environmental law and policies. In order to resolve this problem, the World Commission on Environment and Development ("WCED" or "Brundtland Commission") was created by the UN General Assembly in 1983 and charged with proposing long-term environmental strategies for *sustainable development*. That elusive term was not defined by the UN, and, despite the efforts of the Brundtland Commission and the Earth Summit, still eludes satisfactory definition. After four years of deliberation and worldwide consultation, the Brundtland Report, entitled *Our Common Future*, articulated the paradigm on which the Earth Summit, and indeed most environmental laws and policies, has since been based. In essence, it rejected the despairing thesis that environmental problems were past repair, spiraling out of control, and could only be averted by arresting development and economic growth: a policy of no growth. Instead, it argued that economic growth was both desirable and possible within a context of sustainable development.[77]

Although sustainable development was not clearly defined, some of its key attributes are identifiable. It calls for developmental policies and for economic growth that can relieve the great poverty of the LDCs while simultaneously protecting the environment from further damage. Such development and growth should be based on policies that sustain and expand the environmental resource base in a manner that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

Pursuant to the report, the UN General Assembly summoned UNCED, or Earth Summit, directing it to take account, *inter alia*, of the Stockholm Declaration and further develop International Environmental

77. Our Common Future, *supra* note 4, ch. 1.

Law. An ambitious agenda was drawn up for the Earth Summit that included the following three endeavors: (1) an Earth Charter that would be the successor to the Stockholm Declaration; (2) an action plan for the planet called Agenda 21; and (3) the ceremonial signing of two conventions on biodiversity and climate change.

C. The UN Conference on Environment and Development, 1992 (UNCED)

The Earth Summit, as UNCED was popularly called, was held in Rio de Janeiro in June, 1992, and attended by over 180 countries and 100 heads of state. It was heralded as the greatest summit level conference in history. It led to four institutional results: (1) the Rio Declaration on Environment and Development ("Rio Declaration");[78] (2) Agenda 21;[79] (3) the Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests;[80] and (4) the ceremonial signing of the Climate Change and Biodiversity Convention.

UNCED marked a watershed in international environmental law and policy-making. It made abundantly clear that the pursuit of environmentalism cannot be divorced from the right of developing countries to economic advancement. Some environmentalists were upset by the manner in which UNCED subjugated the environment to the right to development, or the way in which environmentalism was inextricably tied to the hips with economic development. From an environmental standpoint, the legal results of the Earth Summit were, at best, mottled. While it did draw universal attention to environmental protection and raised many issues onto the global agenda, the substantive environmental legacy of Rio—apart from the Climate Change Convention—remained unimpressive and inchoate.

From an environmental standpoint that does not cede normative or temporal priority to social and economic progress, the braided rope of SD effectively turned the clock back from the Stockholm Conference. For example, the nascent right to a wholesome environment embodied in the Stockholm Declaration was abandoned in favor of a right to

78. Rio Declaration, *supra* note 6.

79. U.N. Conference on Env't and Dev., June 3–14, 1992, *Agenda 21*, U.N. Doc. A/CONF. 151/26(1992), *available at* http://www.un.org/esa/dsd/agenda21/res_agenda 21_00.shtml.

80. U.N. Conference on Environment and Development, June 3–14, 1992, *Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests*, U.N. Doc. A/CONF. 151/26 (Vol. III) (1992).

development,[81] and the obligation to *conserve* implied by the duty to protect the environment for the benefit of future generations found in the Stockholm Declaration is replaced in the Rio Declaration by a right to *consume* or develop. Moreover, the Rio formulation refers to "developmental and environmental needs of present and future generations"[82] and in doing so impliedly negates or weakens the obligation to conserve expressed in the Stockholm Declaration. Finally, the Rio Declaration frowns upon action such as that taken by the United States under the Marine Mammal Protection Act of 1972[83], to prevent the slaughter of dolphins by prohibiting imports of tuna caught in dolphin killing nets. Principle 12 of the Rio Declaration states that "unilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided."[84]

Agenda 21, a comprehensive albeit non-binding call to action, was also shaped by the tension between development and environmental protection, and calls for the "integration of environment and development concerns and greater attention to them."[85] Like the Rio Declaration, as contrasted with the Stockholm Declaration, it incorporated several concessions to developmental needs. While Agenda 21 calls for the conservation and protection of resources, it also mirrors the Rio Declaration in acknowledging the unique position of economies in transition, affirming the priority of political and social challenges in developing nations.[86] Specifically, Chapter 3.2 gives substantial deference to the use of natural resources to combat poverty. Chapter 39, which deals with the review and development of international environmental policy, stresses the importance of participation by developing countries in drafting new legal instruments, but reaffirms the need to weigh their developmental needs against the obligations that might be imposed by those instruments.

D. The UN Millennium Declaration

The need for distributional justice that alleviates poverty was further institutionalized at the 2000 Millennium Summit. The resulting Millennium Declaration is a UN document that expresses and outlines the collective commitment of the world to achieve eight major

81. Rio Declaration, *supra* note 6, Principle 2.

82. *Id.* Principle 3.

83. Marine Mammal Protection Act of 1972, 16 U.S.C. §§ 1361–1421 (1994).

84. Rio Declaration, *supra* note 6, Principle 12.

85. *Agenda 21*, *supra* note 79, Chapter 1.1.

86. *Id*. ch. 1.5.

development goals by the year 2015.[87] These goals, which have come to be known as the Millennium Development Goals ("MDGs"), seek to (1) eradicate extreme poverty and hunger; (2) achieve universal primary education; (3) promote gender equality and empower women; (4) reduce child mortality; (5) improve maternal health; (6) combat HIV/AIDS, malaria and other diseases; (7) ensure environmental sustainability; and (8) develop a global partnership for development.[88]

The MDGs presaged an important re-conceptualization of SD that became fully evident at the World Summit on Sustainable Development ("WSSD") in 2002. Prior to the WSSD the concept of SD was widely viewed as consisting of two elements—environmental protection and economic development. Social development was not treated as an explicit and co-equal element of SD, but was instead considered a part of the economic development half of SD. The MDGs, however, placed a primary emphasis on the importance of achieving sustainable development by addressing the many dimensions of poverty—such as hunger, disease, inadequate shelter and exclusion—and other social concerns such as gender equality and access to education.[89] The MDGs signal a conceptual shift with respect to the definitional understanding of SD—a shift that moves from the binary environment-economy paradigm to a tripartite understanding that incorporates social development. This new definition of SD embraces a more specific overlap between its three components: social development, economic development, and environmental protection. The commitment of the international community to ensuring "the timely and full realization of the [MDGs]" was reaffirmed at the 2005 World Summit.[90]

E. World Summit on Sustainable Development 2002

The WSSD gave birth to two documents: a political Declaration and an Implementation Plan,[91] that were clearly riveted to the problems created by poverty not environmental degradation. The Declaration

87. U.N. Millennium Declaration, *supra* note 6, § 1.

88. *See* U.N. DEPT. OF ECON. AND SOC. AFFAIRS, THE MILLENNIUM DEVELOPMENT GOALS REPORT (2006), *available at* http://mdgs.un.org/unsd/mdg/Resources/Static/Products/Progress2006/MDGReport2006.pdf [hereinafter MILLENNIUM DEVELOPMENT GOALS].

89. *See* The Secretary-General, *Road Map Towards the Implementation of the United Nations Millennium Declaration*, U.N. Doc. A/56/326 (Sept. 6, 2001) [hereinafter *Road Map Towards Implementation*].

90. *See* U.N.G.A. RESOLUTION, 2005 WORLD SUMMIT OUTCOME, A/RES/60/1 (2005), *available at* http://unpan1.un.org/intradoc/groups/public/documents/un/unpan021752.pdf.

91. Johannesburg Declaration, *supra* note 6.

affirmed "a collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development—economic development, social development and environmental protection—at the local, national, regional, and global levels."[92] The same principles were endorsed in the Implementation Plan.[93]

This re-articulation of SD confirms the third element in the definition of SD introduced at the Millennium Summit. Social development, which hitherto had been subsumed under the rubric of economic development, is now treated as a separate concept. This is a significant development to the extent that SD—which hitherto consisted of two legs (economic development and environmental protection)—has now been given a third (social development). Consequently, environmental protection, which had enjoyed rough parity with economic development, has now been reduced to a third part of a tripartite concept.

F. Legal Institutionalization of Sustainable Development

The UN Framework Convention on Climate Change ("UNFCCC") is the most important energy convention in the world. Having obtained 194 instruments of ratification, it is probably the most extensively adopted treaty in the world.[94]

Its Preamble affirms and recognizes that:

> . . . responses to climate change should be coordinated with social and economic development . . . with a view to avoiding adverse impacts on the latter, taking into full account the legitimate priority needs of developing countries for the achievement of sustained economic growth and the eradication of poverty . . . [and] that . . . *energy consumption will need to grow* . . . (emphasis added).

The UNFCCC coalesced with another widely accepted treaty, the Convention on Biological Diversity ("CBD"), by forcefully and unequivocally expressing the developmental priority of SD. Art. 4(7) of the UNFCCC, and Art. 20(4) of the CBD,[95] re-affirm in unison that parties "*will take fully into account that economic and social development and poverty eradication are the first and overriding*

92. *Id*. art. V.

93. *Id*. ch. 1, ¶ 2

94. *See* UNFCCC, *supra* note 5, art. 4 ¶ 7. *See also* Kyoto Protocol, *supra* note 5. The Kyoto Protocol is a Protocol to the UNFCCC.

95. Convention on Biological Diversity, 49 U.N. GAOR Supp. (No. 49), U.N. Doc. A/49/49 (June 5, 1992), *available at* http://www.cbd.int/convention/convention.shtml.

priorities of the developing country Parties . . . ."

There are a number of other notable provisions reiterating the developmental facets of SD. Art. 3(1) of the UNFCCC states that the Parties have a *right* to and should promote sustainable development, and that economic development is essential for adopting measures to address climate change, while Art. 3(2) affirms that full consideration be given to the special circumstances of developing countries. Parties are required to protect the climate system on the basis of equity and in accordance with their common but differentiated responsibilities and respective capacities.[96] The principle of common but differentiated responsibility affirms the responsibility of the developed country parties to take the lead in combating climate change and the adverse effects thereof.[97]

What is clear is that the objective of preventing dangerous anthropogenic interference with the climate system is built upon the foundation of SD and that climate change, which is interlinked with SD, should not threaten economic development.[98] Moreover, the importance of SD is also incorporated in numerous other treaties,[99] while the human, social, economic and environmental dimensions of SD are referred to in numerous quasi-legal documents.[100]

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96. UNFCCC, *supra* note 5, art. 3 ¶1, art. 4 ¶ 1.

97. *Id*. art. 3 ¶ 1.

98. *Id*. art. 2.

99. International Convention on the Elimination of All Forms of Racial Discrimination, G.A. Res. 2106 (XX), annex arts. 1, 5, 6, 7, 11, 12 and 13, 20 U.N. GAOR Supp. (No. 14), U.N. Doc. A/6014 (Dec. 21, 1965); International Covenant on Economic, Social and Cultural Rights, G.A. Res. 2200A (XXI), arts. 24, 27, 28, 29, and 32, 21 U.N. GAOR Supp. (No. 16), U.N. Doc. A/6316 (Dec. 16, 1966); Convention on the Elimination of Discrimination Against Women, G.A. Res. 34/180, arts. 3, 7, 10, 11, 13, and 14, 34 U.N. GAOR Supp. (No. 46), U.N. Doc. A/34/46 (Dec. 18, 1979); Convention on the Rights of the Child, G.A. Res. 44/25, annex, 44 U.N. GAOR Supp. (No. 49), U.N. Doc. A/44/49 (Nov. 20, 1989); Convention concerning Indigenous and Tribal Peoples in Independent Countries (No.169), *adopted* June 27, 1989, 72 ILO Official Bull. 59 (1989) (entered into force Sept. 5, 1991).

100. It is possible for governments to begin the process of creating customary law (which is based on the two requirements of state practice and *opinio juris*) by the act of voting for declarations and resolutions within international organizations such as the UN. After being passed, such aspirational resolutions and declarations could evolve first into a quasi-legal or "soft law" instruments, and subsequently develop into legally binding (hard law) instruments by attracting state practice and *opinio juris*. These declarations include: Universal Declaration of Human Rights, G.A. Res. 217A (III), arts. 21, 23, 24, 25, 26 and 27, U.N. Doc. A/810 (Dec. 12, 1948), *available at* http://www.un.org/Overview/rights.html; Declaration on the Right to Development, G.A. Res. 41/128, annex, 48 U.N. GAOR Supp. (No. 53), U.N. Doc. A/41/53 (Dec. 4, 1986); Rio Declaration, *supra* note 6; MILLENNIUM DEVELOPMENT GOALS, *supra* note 88.

G. Differences Among Developing Countries

Unfortunately, for too long, the EOP have been glossed over or lost in the categorization of their predicament simply as being problems of the developing world, or they have been painted with the same socio-political and economic brush as the states in which they are located. For example, the EOP tend to be seen primarily as a problem of India or China or Brazil and not perceived as a burdened society apart from the geopolitical entities in which they reside. Such classification is unhelpful to the extent that the EOP in many countries are not stakeholders in the government or political machinery exercising control over their geographical location.

All developing countries tend to be conceptualized within a single typology based on the binary division of the world into developing and developed countries or north and south. The inaccuracy and mistake of doing so is underlined by a recent authoritative joint report of the UNDP and WHO emphasizing the plight of the LDCs and sub-Saharan African countries.[101] While twenty-eight percent of people in developing countries lack access to electricity, the number in the LDCs is seventy-nine percent.[102] Thus, the differences between the LDCs, located primarily in sub-Saharan Africa and parts of Asia, in contrast to the advanced developing countries ("ADCs"), like China, India, the Asian Tigers,[103] and Brazil, must be recognized. It is therefore necessary at the outset to acknowledge at least two major categories among the developing countries: LDCs and ADCs, and not treat all of them simply as developing countries. Obviously, there are no cookie cutter solutions. The commonalities, differences, and variegated energy needs, uses and demands of ADCs and LDCs call for complex, nuanced, and demanding responses that would vary on a case-by-case basis.

The LDCs consist of fifty countries and 767 million people located largely in Africa and Asia.[104] The LDCs have been officially identified by the UN as "least developed" in the light of their low income (GDP of less than $7,500); weak human assets (low nutrition, high mortality, lack of school enrollment, and high illiteracy); high economic vulnerability; exposure to natural shocks and disasters; prevalence of trade shocks;

101. LEGROS ET AL., *supra* note 9, at 1−4.

102. *Id*. at 1.

103. Originally called the Four Asian Tigers or East Asian Tigers, the term referred to the economies of Taiwan, Singapore, Hong Kong, and South Korea, but the term has been extended to include Thailand and Indonesia.

104. U.N. Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States, Least Developed Countries: Country Profiles, http://www.unohrlls.org/en/ldc/related/62/ (last visited May 3, 2010).

economic smallness; and economic remoteness.[105] They do not share the economic or technological strengths of the ADCs. It is worth noting in this context that the push for more energy and specifically for coal-powered energy arises from the ADCs, not the LDCs. The problems facing the LDCs and the predominantly rural EOP located within them, unlike those of ADCs, arise from their woeful lack of energy and suboptimal energy conversions. In contrast, most ADCs use fossil fuel energy and hunger for more of it to satisfy their industrial appetite.

Furthermore, the differences between the energy rich or high-energy users and the low energy using EOP in ADCs have not been recognized. The fact that the EOP reside in the same country as the energy rich should not obscure the monumental disparities between them. While the top echelons of the economic pyramid in ADCs are inhabited by high-energy users, the EOP—who have no access to power or electricity—populate the much larger lower parts of the economic pyramid. The substance of these realties is echoed, by recent reports of the WHO and the UNDP.[106] Indeed, as the middle classes of China and India rapidly approach lifestyles comparable to the middle classes in Europe and North America, the EOP in these countries remain hidden in the toxic haze of windowless huts, cut off from the attention of their governments and the wider world.

ADCs like China and India have been treated as monoliths, when in reality those who inhabit the developed parts of these countries live dramatically different lives from the rural and urban EOP. Such mega-sovereign states may count as single nations under international laws and relations, but in fact consist of a plurality of socio-political, economic, cultural, and geographical entities. The similarity between the EOP in LDCs and the EOP in ADCs has generally been ignored. The socioeconomic condition and lack of technological knowledge among the

105. *Id*.

106. LEGROS ET AL., *supra* note 9, at 1–4; U.N. DEVELOPMENT PROGRAMME, HUMAN DEVELOPMENT REPORT 2007–2008 355–357 (2007), *available at* http://hdr.undp.org/en/media/HDR_20072008_EN_Complete.pdf. Each year since 1990, the Human Development Report ("HDR") of the UN Development Program ("UNDP") publishes the Human Development Index ("HDI"). This index looks beyond gross domestic product ("GDP") to a broader definition of well-being. The HDI seeks to capture three dimensions of human development: a long and healthy life (measured by life expectancy at birth); being educated (measured by adult literacy and enrolment in primary, secondary and tertiary education); and GDP per capita measured in U.S. dollars at Purchasing Power Parity ("PPP"). According to a recognized Indian commentator, India rose from ranked number eight in the Forbes list in 2006 to number four in 2007 in the dollar billionaire rankings, but slipped from 126 to 128 in human development of the UN Development Programme. *See* P. Sainath, *India 2007: High growth, low development*, THE HINDU, Dec. 24, 2007, http://www.indiatogether.org/2007/dec/psa-i2007.htm (last visited Mar. 26, 2010).

500 million EOP in China and India are analogous to the 750 million EOP in the LDCs. These EOP form distinct burdened societies, and justice calls for them to be treated as such.

Given the widespread existence of energy poverty, the services provided by energy could save millions of EOP lives in any type of developing country. Ideally, energy services could power pumps and filters to supply relatively safe drinking water and help provide sanitation to reduce water-borne diseases. Cooking devices powered by solar, kerosene, gas, or electricity would shrink indoor pollution responsible for millions of premature deaths from pulmonary diseases, primarily of women and children, caused by the need to collect and use wood and other biomass for cooking and heating. Energy would free young girls from the drudgery of fuel collection and enable them to go to school. Energy is the key component of a functional health system, providing lights for operating rooms, refrigeration for life-saving vaccines and life-saving drugs, and power for communication systems.[107] Cheap accessible energy would decrease deforestation, reduce air borne pollutants, and prevent injuries and desertification arising from the search for fuel, food, and water in semi-desert climates.

Ideally, the availability of modern energy services would promote income generation in developing countries. Electricity can provide illumination to permit longer working hours and power for irrigation, both of which help yield high-value crops. The use of process heat for grinding, milling, husking, and preserving can create value-added products from raw agricultural commodities. Refrigeration can enable sales to higher value markets. Computers, internet, and telephone can provide access to information and markets and facilitate greater trade.[108] But, as has been argued elsewhere,[109] the true costs of and collateral damage caused by modern fossil fuel energy outweighs its benefits. Consequently, reliance should instead be placed on appropriate sustainable energy technologies ("ASETs") to produce energy that

107. CHRISTOPHER FLAVIN & MOLLY HULL AECK, ENERGY FOR DEVELOPMENT: THE POTENTIAL ROLE OF RENEWABLE ENERGY IN MEETING THE MILLENNIUM DEVELOPMENT GOALS 24 (Worldwatch Institute 2005); R.M. Shrestha, et al., *Application of Productive Uses of Renewable Energy for Small, Medium and Micro Enterprises* 2, prepared for the U.N. Development Programme Expert Meeting on Productive Uses of Renewable Energy, May 9-11, 2005, *available at* http://www.serd.ait.ac.th/ep/epkas/presentation/Papers/AIT%20Paper%20PURE%20and%20SMEs%20Final.pdf.

108. *See* GLOBAL NETWORK ON ENERGY FOR SUSTAINABLE DEVELOPMENT, REACHING THE MILLENNIUM DEVELOPMENT GOALS AND BEYOND: ACCESS TO MODERN FORMS OF ENERGY AS A PREREQUISITE 5 (2007), *available at* http://www.gnesd.org/Downloadables/MDG_energy.pdf.

109. Lakshman Guruswamy, *Energy Justice*, *in* CLIMATE CHANGE: A READER (William H. Rodgers, Jr., et al., eds., 2009).

satisfies the energy needs of the EOP while avoiding the damage caused by hydrocarbons.

While SD calls for the energy dominant two-thirds of the world to recognize and remedy the afflictions of the EOP, it is important, however, to go beyond assertion and conceptualize the jural foundations or predicates for remedying the plight of the EOP. The original proponents of SD—the World Commission on Environment and Development, major international treaties incorporating the concept, and even the UN Millennium Declaration[110] and the MDGs[111]—did not examine the philosophical or jurisprudential foundations of SD.[112] Nor is it examined in numerous well-meaning reports from science academies.[113] The moral and jural bases for the provision of modern energy services to the EOP based on SD and EJ are best encapsulated in the work of John Rawls.

IV. RAWLS AND SUSTAINABLE DEVELOPMENT

John Rawls's foundational concepts of international justice, particularly in his *Law of Peoples*,[114] provides a moral justification for SD. Rawls's elucidates the duty of liberal democratic and decent hierarchical peoples to assist "burdened societies" to the point where burdened societies are enabled to join the "society of peoples." It is of particular pertinence that Rawls's duty of assistance does not absolve developing country governments of their obligation to take appropriate action. While Rawls discusses a "realistic utopia" grounded in socio-political, institutional, and psychological reality,[115] he is still dealing with a utopian future. This section attempts to reconcile Rawls's ideas with present realities insofar as they apply to SD and the EOP.

110. U.N. Millennium Declaration, *supra* note 6.

111. *Road Map Towards Implementation*, *supra* note 89.

112. *See* UNFCCC, *supra* note 5.

113. For example, the InterAcademy Council ("IAC") concluded recently that meeting the basic energy needs of the poorest people on this planet is a moral and social imperative. In May 2000, all of the world's science academies created the IAC to mobilize the best scientists and engineers worldwide to provide high quality advice to international bodies—such as the UN and the World Bank—as well as to other institutions. *See* INTERACADEMY COUNCIL, LIGHTING THE WAY TOWARD A SUSTAINABLE ENERGY FUTURE (2007), *available at* http://www.interacademycouncil.net/Object.File/Master/12/096/First%20half.pdf.

114. JOHN RAWLS, THE LAW OF PEOPLES 106 (Harvard Univ. Press 1999) [hereinafter THE LAW OF PEOPLES].

115. *Id*.

This section first explains Rawls's theory of justice. Following this, it delineates how he provides a rational jurisprudential and philosophical foundation for SD, as well as for dealing with the EOP as burdened societies or peoples distinct from countries or nations. As burdened societies, the EOP are denuded of human capital by sickness and death, and lack the knowledge-based, monetary or technological resources necessary to break free from their energy bondage and become fulfilled members of a well-ordered society. This section then canvases Rawls's assertion that the prosperous peoples in the developed world *have a duty to assist burdened societies*[116] to reduce their burdens, and to raise them to a position where they make intelligent and effective use of their unburdened status, and lead reasonable and worthwhile lives.

A. Rawls's Theory of Justice

Rawls's unique contribution to moral and political philosophy lies in the manner in which he unites moral philosophy (intuitionism) and social philosophy (contractarianism) to formulate principles that are constructive and rational for liberal democratic societies. According to Noah Feldman, "Rawls's historical importance thus derives from his extraordinary accomplishment of grafting a Kantian-inspired moral theory onto a familiar—yet modified—discourse of social contract and then using the resulting product to justify the Western welfare state, and thus welfare capitalism itself."[117]

The law of peoples would be a kind of higher law, creating rights and duties for peoples and states. It would impose moral duties and obligations on all persons and states living in well-ordered hierarchical societies. Rawls now arrives at a critical conclusion: well-ordered peoples "*have a duty to assist burdened societies*"[118] to reduce their burden, and to raise them to a position where they may join the ranks of well-ordered peoples.[119] According to Rawls, "burdened societies" do not fall within the category of well-ordered societies because they may have become denuded of human capital by sickness and death or lack the knowledge-based, monetary or technological resources needed to be a well-ordered society.

Rawls's "original position," a thought experiment expounded in *A Theory of Justice* and developed in numerous other works,[120] envisioned

116. *Id*.

117. Noah Feldman, *Cosmopolitan Law?* 116 YALE L.J. 1022, 1038 (2007).

118. THE LAW OF PEOPLES, *supra* note 114, at 106 (emphasis added).

119. *Id*. at 111.

120. *See* A THEORY OF JUSTICE,*supra* note 1; JOHN RAWLS, POLITICAL LIBERALISM (Columbia Univ. Press 1993) [hereinfafter POLITICAL LIBERALISM]; THE LAW OF

a collection of negotiators from liberal democratic societies. The negotiators assembled behind a veil of ignorance and shorn of any knowledge that might be the basis of self-interested bias—such as knowledge of their gender, wealth, race, ethnicity, abilities, and general social circumstances. Rawls explains that the purpose of such a negotiation was to arrive at legitimate principles of justice under fair conditions—hence "justice as fairness."[121] He further stipulates two governing principles for any fair negotiation. First, each person is given equal rights to the most extensive basic liberties. Second, social and economic inequalities are to be re-arranged so that they may bestow the greatest benefit to the least advantaged, and attach to offices and positions open to all under conditions of equality and liberty.[122] This second principle is known as the difference principle.

In his *Law of Peoples*, concerning justice and international law, Rawls extends his theories from liberal democratic states to "decent" peoples living in non-democratic international societies. Rawls envisions such "well-ordered hierarchical societies" to be "non liberal societies whose basic institutions meet specified conditions of political right and justice (including the right of citizens to play a substantial role, such as participating in associations and groups making political decisions) and lead their citizens to honor a reasonably just law for the Society of Peoples."[123] Well-ordered societies must satisfy a number of criteria: they must eschew aggressive aims as a means of achieving their objectives, honor basic human rights dealing with life, liberty, and freedom, and possess a system of law imposing bona fide moral duties and obligations, as distinct from human rights. Moreover, they must have law and judges to uphold common ideas of justice.[124]

Rawls emphasizes the crucial importance of peoples rather than states because of a people's capacity for "moral motives" that is lacking

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PEOPLES, *supra* note 114; JOHN RAWLS , JUSTICE AS FAIRNESS: A RESTATEMENT (Harvard Univ. Press 2001); John Rawls, *Justice as Fairness*, 67 PHIL. REV. 164 (1958); John Rawls, *Justice as Fairness: Political Not Metaphysical*, 14 PHIL. & PUB. AFFAIRS 223 (1985).

121. JOHN RAWLS, JUSTICE AS FAIRNESS: A RESTATEMENT, *supra* note 120.

122. POLITICAL LIBERALISM, *supra* note 120, at 5–6. According to Rawls, persons in an original position agree that all basic liberties such as political freedom and freedom of choice in occupations, opportunity, income, wealth, and self-respect will be distributed equally unless an unequal distribution of any or all of these goods is to the advantage of the least favored. Rawls thus depicts justice as an issue of fairness permitting an unequal distribution only to the extent that the weakest members of society benefit from that inequality. To Rawls, therefore, redistribution is justified where it would improve the situation of the disadvantaged.

123. THE LAW OF PEOPLES, *supra* note 114, at 3.

124. A THEORY OF JUSTICE, *supra* note 1, at 64–67.

in the bureaucratic machinery of a state.[125] Samuel Freeman correctly observes that a "people" for Rawls is a philosophical construct. It is an abstract conception needed to work out principles of justice for a particular subject—in this case, relations among different well-ordered liberal and "decent" societies.[126] The assumption that states lack moral motives is partially refuted by their acceptance of SD. Nonetheless, Rawls remains trenchant when it comes to the application of SD. Rawls is not talking then about a people regarded as an ethnic or religious group (e.g. Slavs, Jews, Kurds) who are not members of the same society. Rather, a people consists of members of the same well-ordered society who are united under, and whose relations are governed by, a political constitution and basic structure. Comprised of members of a well-ordered society, a people is envisioned as having effective political control over a territory that its members govern and within which their basic social institutions take root. In contrast to a state, however, a people possess a "moral nature" that stems from the effective sense of justice of its individual members. A people's members may have "common sympathies" for any number of non-requisite reasons, including shared language, ethnic roots, or religion. The most basic reason for members' common sympathies, however, lies in their shared history as members of the same society and consequent shared conception of justice and the common good.

Rawls's concept of "peoples" has been criticized. Among his more cogent critics, Pogge[127] and Nussbaum[128] question the validity of the distinction between peoples and states, and the difficulties of defining peoples. They claim their criticisms assume importance in any attempt to realize the 'society of Peoples' Rawls envisions as his realistic utopia. Such criticisms have actually been anticipated by Rawls, who pointed out that he eschewed the "state" as a polity because of its historical Hobbesian connotations in "realist" international political theory, which suggests that the power of states can be limited only by the states, and not by moral or legal constraints.[129] Here again, the legal and political acceptance of SD by the community of nations refutes Rawls at the theoretical level. But Rawls still remains relevant at the practical and functional level, when it comes to the implementation of SD. As more fully discussed in the next section, dealing with climate change and SD,

125. THE LAW OF PEOPLES, *supra* note 114, at 17.

126. *See* Feldman, *supra* note 117.

127. Thomas W. Pogge, *The Incoherence Between Rawls's Theories of Justice*, 72 FORDHAM L. REV. 1739, 1743 (2004).

128. MARTHA C. NUSSBAUM, FRONTIERS OF JUSTICE: DISABILITIES, NATIONALITY, SPECIES MEMBERSHIP 236–244 (Harvard Univ. Press 2006).

129. THE LAW OF PEOPLES, *supra* note 114, at 23–30.

the principle of SD has been invoked and erroneously applied to the ADCs while the EOP in the LDCs have been ignored.

Rawls demonstrated how the law of peoples may be developed out of liberal ideas of justice similar to, but more general than, the idea of "justice as fairness" presented in *A Theory of Justice*.[130] Just as individuals in the first original position were shorn of knowledge about their attributes and placed behind a veil of ignorance to create principles for a just domestic society, the bargainers in the so-called second original position are representatives of peoples who are shorn of knowledge about their people's resources, wealth, power, and the like. Behind the veil of ignorance, the representatives of peoples—not states, since states lack moral capacity—develop the principles of justice that will govern relations between them: the Law of Peoples.

Rawls seeks to determine the principles of cooperation for such "well-ordered peoples." Rawls thinks non-ideal conditions cannot adequately be addressed unless principles of justice are determined for ideal conditions. Otherwise, it is impossible to know what kind of just society to aim to establish and the necessary means to do so.[131] A "realistic utopia," as Rawls prefers to call his theory, is aspirational and does not reflect the existing reality of international law and relations. It is, however, possible to relate the Rawlsian ideal and square it with social reality in a functional manner that concentrates on those areas of the existing international framework that lend themselves to the Rawlsian ideal.[132]

B. Burdened Societies and Duty of Assistance

A starting point for analyzing the international phenomena of the EOP must begin with the fact that the EOP should be identified primarily as "burdened societies"[133] in the Rawlsian sense. Rawlsian principles will ensure that SD is applied to the EOP. Furthermore, their special status as burdened societies must be highlighted rather than hidden. It also becomes important to draw attention to Rawls's suggestion on how the duty of assistance should be discharged, bearing in mind his particular conclusion that merely dispensing funds will not suffice to

130. *Id*. at 5, 60–71.

131. *Id*. at 128.

132. David Mitrany pioneered in conceiving of need-based responses by international organizations, which linked scientific knowledge, expertise, and technology, and created its own dynamic to provide a "functional" supra-national authority and basis for action. *See* DAVID MITRANY, THE FUNCTIONAL THEORY OF POLITICS (St. Martin's Press 1976).

133. THE LAW OF PEOPLES, *supra* note 114, at 106.

rectify basic and political injustice.[134] Rawls warns that the mere distribution of funds will not rectify the targeted problems now becomes of special relevance. Many rulers, Rawls points out, have been callous about the well-being of their own peoples,[135] and transferring resources to national governments does not ensure that they will be applied to the problems of the EOP. For this reason Rawls advocates that assistance be tied to the advancement of human rights. Tying assistance to human rights will also embrace the status of women who often are oppressed. It has, moreover, been proven that the removal of discrimination against women has resulted in major economic and social progress.[136]

Such measures almost certainly will be resisted by authoritarian regimes that will argue this approach amounts to an intrusion into the national sovereignty of a country and violates international law. These rulers might fear that establishing human rights as a condition for helping the EOP will expose their own corruption and lack of good governance. Such rulers have reason to fear the granting of human rights where they have not confronted their problems or have demonstrated weak governance. As an example of this, Rawls cites to the works of Amartya Sen and Partha Dasgupta who have demonstrated that the main cause of famine in Bengal, Ethiopia, Sahel, and Bangladesh was government mismanagement rather than shortage of food.[137]

Corruption remains a major problem in many developing countries, where large numbers of complex, restrictive regulations are coupled with inadequate controls.[138] In both ADCs and LDCs, people have learned to live with corruption, even considering it, fatalistically, as an integral part of their culture. Not only are official decisions—for instance, the award of government contracts or the amount of tax due—bought and sold, but very often citizens must pay for access to a public service or the exercise of a right, such as obtaining civil documents. The process of allocating political and administrative posts—particularly those with powers of

134. *Id*. at 108.

135. *Id*. at 109.

136. *See generally*, MUHAMMAD YUNUS, A WORLD WITHOUT POVERTY: SOCIAL BUSINESS AND THE FUTURE OF CAPITALISM (PublicAffairs 2007); MUHAMMAD YUNUS, BANKER TO THE POOR: MICRO-LENDING AND THE BATTLE AGAINST WORLD POVERTY (PublicAffairs 2003).

137. *See generally*, AMARTYA SEN, POVERTY AND FAMINES: AN ESSAY ON ENTITLEMENT AND DEPRIVATION (Oxford Univ. Press 1981); JEAN DREZE & AMARTYA SEN, HUNGER AND PUBLIC ACTION (Oxford Univ. Press 1989); PARTHA DASGUPTA, AN INQUIRY INTO WELL-BEING AND DESTITUTION (Oxford Univ. Press 1995).

138. Corruption refers to the use of public office for private gain where an official entrusted with a public task engages in some sort of malfeasance for private gain. Pranab Bardhan, *Corruption and Development: A Review of Issues*, 35 J. ECON. LITERATURE 1321(1997).

decision over the export of natural resources or import licenses—is influenced by the gains that can be made from them.[139] As these exchanges of privileges are reciprocated by political support or loyalty, it cements the political foundations.[140] Corruption in turn takes it toll on the countries as a whole. It has been estimated, for example, that moving from a relatively "clean" government like that of Singapore to one as corrupt as Mexico's would have the same effect on foreign direct investment as an increase in the marginal corporate tax rate of fifty percent.

What this proves is that developed countries play a dominant part in alleviating the condition of the EOP, as required by SD. It also invokes the need for action by national governments. Justice requires both that assistance be given and that such assistance be properly administered. The failure of foreign aid has been debated,[141] and better ways of granting assistance must be found. Justice also requires that national governments take on the task of addressing the EOP. It is not possible to lay the blame on avaricious rich countries alone.

What about costs? The costs of the MDGs call for comparison with those spent on mitigating GHGs. According to Goklany, who based his calculations on the lowest estimates produced by the IPCC's 2001 report,[142] the costs of reducing GHG emissions to 1990 levels is U.S. $165 billion per year.[143] Bjorn Lomborg concludes it is U.S. $180 billion.[144] The Stern Report estimates that the cost of stabilizing GHGs at levels of 500-550ppm of CO_2—a far more ambitious endeavor—will cost about one percent of annual GDP by 2050.[145] The Stern Report has

139. The link between political and economic power can be direct, such as in the system of patrimonialism in Morocco, or indirect too, such as in the Philippines where political position in a patronage-based system can be bought and sold.

140. Irène Hors, *Fighting Corruption in the Developing Countries*, OECD OBSERVER NO. 220, April 2000, *available at* http://www.oecdobserver.org/news/printpage.php/aid/291/Fighting_corruption_in_the_developing_countries.html (last visited May 3, 2010).

141. *See generally*, WILLIAM EASTERLY, THE WHITE MAN'S BURDEN: WHY THE WEST'S EFFORTS TO AID THE REST HAVE DONE SO MUCH ILL AND SO LITTLE GOOD (Penguin Group 2006).

142. *See generally*, IPCC, CLIMATE CHANGE 2001: SYNTHESIS REPORT (2001), http://www.grida.no/publications/other/ipcc_tar/?src=/climate/ipcc_tar/vol4/english/index.htm (last visited May 3, 2010).

143. Indur M. Goklany, *What to Do about Climate Change*, 609 POLICY ANALYSIS 16 (2008), *available at* http://www.cato.org/pubs/pas/pa-609.pdf.

144. Bjorn Lomborg, *Global warnings: The Copenhagen protocol will not succeed unless China and India sign up, but bribing these nations to take part is counter-productive***,** GUARDIAN, Feb. 15, 2009, *available at* http://www.guardian.co.uk/commentisfree/2009/feb/13/climatechange-carbonemissions (last visited May 3, 2010).

145. NICHOLAS STERN, THE ECONOMICS OF CLIMATE CHANGE: THE STERN REVIEW

been criticized as woefully underestimating the true costs of the carbon dioxide reductions it calls for,[146] but those figures will be assumed as correct. Estimating GDP at 35 trillion dollars, this would cost $350 billion per year. The contrast between the costs of reducing carbon dioxide and meeting the MDGs is sobering. It would cost $3 billion per year to reduce malaria by seventy-five percent,[147] and the first MDG goal of reducing income poverty and hunger by fifty percent reduction of hunger could be achieved at a cost of $39 to 54 billion per year. [148] According to the World Bank, the additional cost of attaining all the MDGs is approximately $40 to 70 billion,[149] which is around a third of the cost of implementing the Kyoto Protocol.

A pressing question arising from Rawlsian ideology pertains to SD and global warming. To what extent can developed countries discharge their duty of assistance to burdened societies by funding ADCs to cut down GHGs? The next section argues that developed countries are circumventing and evading their duty of assistance by confining their financial and technological help to ADCs for GHG mitigation and adaptation measures.

V. SUSTAINABLE DEVELOPMENT AND GLOBAL WARMING

According to its proponents, the rationale for regulating carbon dioxide is a legitimate application of the principle of SD, because carbon

239 (Cambridge Univ. Press 2006) [hereinafter STERN REPORT] (*See also* Executive Summary) http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/d/Executive_Summary.pdf

146. *See* Bjorn Lomborg, *Stern Review: The Dodgy Numbers Behind the Latest Global Warming Scare*, WALL ST. J., Nov. 2, 2006, *available at* http://www.opinionjournal.com/extra/?id=110009182 (last visited May 3, 2010); William Nordhaus, *Critical Assumptions in the Stern Review on Climate Change*, 317 SCIENCE 201 (2007).

147. AWASH TEKLEHAIMANOT, ET AL., COMING TO GRIPS WITH MALARIA IN THE NEW MILLENNIUM 2, (U.N. Dev. Programme 2005), *available at* http://www.unmillenniumproject.org/documents/malaria-complete-lowres.pdf.

148. WORLD BANK, THE COSTS OF ATTAINING THE MILLENNIUM DEVELOPMENT GOALS *available at http://www.worldbank.org/html/extdr/mdgassessment.pdf. Also See* PEDRO SANCHEZ, ET AL., HALVING HUNGER: IT CAN BE DONE 31, (U.N. Dev. Programme 2005), *available at* http://www.unmillenniumproject.org/documents/Hunger-lowres-complete.pdf.

149. WORLD BANK, ACHIEVING THE GOALS *available at* http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTHEALTHNUTRITIONANDPOPULATION/EXTHNPMDGS/0,,contentMDK:20283934~menuPK:975723~pagePK:64207168~piPK:64207060~theSitePK:563129,00.html.

dioxide is the pollutant most responsible for global warming. Furthermore, the effects of global warming will impact the poorest countries of the world most severely. Proponents argue that scientific assessments demonstrate that global warming disproportionately afflicts the EOP because they are unable to adapt to changes in climate, increased droughts, or rising seas. Millions of EOP, particularly in Africa, face some of the biggest risks from disease, drought, and disrupted water supplies. As the oceans swell with water from melting ice sheets, the crowded river deltas in Asia and Egypt, along with small island nations, are most at risk. While developed countries are hardly immune from drought and flooding, their wealth will largely insulate them from severe harm, at least for the next generation or two. Some advocates targeting global warning point out that the position of the EOP is exceptionally perilous. They argue that the way forward must therefore lie in concentrating global action on mitigating the effects of GHGs. The claim that global warming is the greatest problem facing burdened societies is unfounded and unsubstantiated. While global warming is a serious problem, it is certainly not the most important public health, ecological or bio-physical problem facing the EOP. The alleged devastation caused to the EOP in three areas is dealt with briefly in the next three sections.

A. Health

To begin with health, the WHO has issued a number of reports on the comparative quantification of disease caused health risks based on mortality and disability adjusted life years ("DALY's"). Of the twenty-eight diseases and conditions that increased the chance of mortality and DALYs, global warming ranked below the top twenty.[150] Underweight caused by hunger, unsafe drinking water, poor sanitation, diseases, vitamin A deficiency, poor nutritional intake and indoor air pollution, all ranked higher than global warming.

In this context, it has been argued hunger and malaria are among the foremost threats to health aggravated by global warming. The extent to which hunger and malaria are intensified by global warming was addressed by two internationally influential reports published by the UK

150. *See, e.g.*, WHO, *Risk Factors*, *available at* http://www.who.int/healthinfo/global_burden_disease/risk_factors/en/index.html (last visited Mar. 20, 2010); WHO, *World Health Report 2002: Reducing risks, promoting life*, *available at* http://www.who.int/whr/2002/en/ (last visited March 20, 2010); WHO, *Comparative Quantification of Health Risks*, *available at* http://www.who.int/healthinfo/global_burden_disease/cra/en/ (last visited Mar. 20, 2010).

government: Fast Track Assessments ("FTA")[151] and the Stern Review on the Economics of Climate Change.[152] Upon examination of the reports, a perspicacious commentator found the figures attributing additional risks to hunger and malaria from global warming to be inflated, but accepts them nonetheless.[153] He then shows how total mortality from hunger, malaria and extreme events will not exceed seven percent for the coolest Intergovernmental Panel on Climate Change ("IPCC") scenarios, and thirteen percent for the warmest IPCC scenarios.[154]

B. Water Stress

Water stress occurs when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use. Lack of supply is often caused by contamination, drought, or a disruption in distribution. Water stress causes deterioration of fresh water resources in terms of quantity by aquifer over-exploitation, dry rivers, and quality leading to eutrophication, organic matter pollution, and saline intrusion.[155] An assertion by the IPCC Summary for Policy Makers that global warming will expose hundreds of millions to increased water stress[156] misrepresents the full facts and is misleading. The full report of the IPCC on which this summary purports to be based tells a different story. According to the full report: "An analysis of six climate models . . . and the SRES scenarios . . . shows a likely increase in the

151. *See* Martin L. Parry, et al., *Effects of Climate Change on Global Food Production Under SRES Emission and Socio-Economic Scenarios*, 14 GLOBAL ENVIRONMENTAL CHANGE 53, (2004), *available at* http://www.preventionweb.net/files/1090_foodproduction.pdf.

152. *See* STERN REPORT, *supra* note 145.

153. Indur Goklany, *Global Health Threats: Global Warming in Perspective*, 14 J. OF AM. PHYSICIANS AND SURGEONS 69, 69 (Fall 2009).

154. In its attempt to depict possible futures in the face of evolving dynamics based on changing social, economic, technological and political facts, the IPCC, after a five-year study, completed a Special Report on Emission Scenarios ("SRES") in March 2000, presenting a cluster of scenarios based on differing "story lines." The report posited six possible emission scenario groups, all beginning in 2000 and ending in 2100, which were included in the Fourth Assessment Report in 2007. The six scenario groups each represent a different combination of population growth, energy intensity and alternative energy adoption. Together these factors help determine future GHG emissions and therefore the severity of future climate change.

155. U.N. Env't Programme ("UNEP"), Glossary, *available at* http://www.grid.unep.ch/product/publication/freshwater_europe/glos.php (last visited May 3, 2010).

156. IPCC, Climate Change 2007: Working Group II: Impacts, Adaption and Vulnerability, Ch.9 4.1 (2007), *available at* http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch9s9-4-1.html (last visited March 20, 2010).

number of people who could experience water stress by 2055 in northern and southern Africa . . . In contrast, more people in eastern and western Africa will be likely to experience a reduction rather than an increase in water stress . . . ."[157] FTA research confirms that even more millions will experience reduced water stress.[158] This is because global warming will increase precipitation, and although some areas will have less, there will be increased rain in the more populated parts of the world.[159]

Nonetheless, there is no doubt that water stress presents a huge problem in sub-Saharan Africa. A report of the Council on Foreign Relations points out that while water stress occurs throughout the world, no region has been more afflicted than sub-Saharan Africa.[160] It goes on to attribute water stress to weak governments, corruption, mismanagement of resources, poor long-term investment, and a lack of environmental research and urban infrastructure. Global warming is not mentioned. One of the primary conclusions of this report is that economic development, incorporating water infrastructure, is necessary to end the severe problems caused by water stress and to improve public health and advance the economic stability of the region.[161] Consequently, what is required for the EOP who inhabit sub-Saharan Africa is more development within the framework of SD. Cutting down of carbon dioxide emissions is largely irrelevant to their present plight.

C. Sea Level Rise

The rise in sea level has received popular press and cinematic attention and serves as a proxy for the most certain and most damaging consequences of global warming. According to the IPCC's 2007 Physical Basis report, the rise in sea level corresponds with rising temperatures, and seas have risen by an average of 1.8 millimeters per year between 1961 and 2003. This is less than 5 centimeters over the whole period with higher sea rises (about 3 centimeters) from 1993 to 2003. The IPCC cannot tell if the higher sea level rises from 1993 to 2003 reflect a long-term trend. They consider it "very likely" that ice sheet losses from Greenland and Antarctica contributed—though they cannot say by how

157. *Id*.

158. *See* Parry, *supra* note 151.

159. *See* Oki T and Kanae S, *Global Hydrological Cycles and World Water Resources*, 313 SCIENCE 1068–1072 (2006).

160. *See* Christopher W. Tatlock, *Water Stress in Sub Saharan Africa, Council on Foreign Relations* (2006), *available at* http://www.cfr.org/publication/11240/ (last visited May 3, 2010).

161. *Id*.

much—to the higher sea levels between 1993 and 2003.[162] The IPCC concluded that the total contribution of snow, river and lake ice, sea ice glaciers, ice caps, ice sheets and frozen grounds (the cryospheric component) ranged from 0 to 0.2 centimeters between 1961 and 2003, and from 0.08 to 0.16 centimeters between 1993 and 2003.[163]

While the Greenland ice pack has melted at its fringes, the extent to which it has done so has been the subject of numerous studies, models, and predictions. None of the predictions posit rises higher than 3 millimeters per year by the end of the century which amounts to about 30 centimeters over 100 years. The IPCC estimates that Greenland is expected to contribute 3.5 centimeters over the century by itself, while other studies indicate Greenland's ice may be less susceptible to massive meltdown predicted by computer models of climate change.[164]

The importance of Greenland ice melt in the alleged impacts of sea level rises have been graphically demonstrated by former Vice President Al Gore's academy award-winning, apocalyptic film: *An Inconvenient Truth*. The film suggests that Greenland could melt or break up and slip into the sea—or half of Greenland and half of Antarctica could melt or break up and slip into the sea. It then shows how the resulting sea level rises inundate large parts of Florida, including all of Miami, flood San Francisco Bay, wipe out the Netherlands, submerge Beijing and then Shanghai, make Bangladesh uninhabitable for 60 million people, and deluge even New York and its World Trade Center Memorial.

But this scary scenario—based on tendentious assumptions—is not corroborated by existing scientific studies. Bjorn Lomborg, who believes that the consequences of global warming have been "vastly exaggerated" relies on the Greenland studies to point out that none of them posit rises higher than 3 millimeters per year by the end of the century, whereas Gore's claim—even within the span of a century—would need to raise sea levels around Greenland to 120 millimeters. This is forty times

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162. IPCC, *Climate Change 2007: Synthesis Report Summary for Policymakers*, 5–7 (2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf (last visited May 3, 2010).

163. IPCC, WORKING GROUP I REPORT: THE PHYSICAL SCIENCE BASIS OF CLIMATE CHANGE 340 (2007) [hereinafter WORKING GROUP I REPORT].

164. Eske Willerslev et al., *Ancient Biomolecules from Ice Cores Reveal a Forested Southern Greenland*, SCI., July 6, 2007 at 111-14. Colin Nickerson, *Greenland Ice Yields Hope on Climate, DNA Hints Warm Era Didn't Melt Entire Cap*, BOSTON GLOBE, July 6, 2007, at 1A, *available at* http://www.boston.com/news/local/articles/2007/07/06/greenland_ice_yields_hope_on_climate. According to the principal author of this international study "This may have implications for how the ice sheets respond to global warming. They may withstand rising temperatures."

higher than the very highest model estimate.[165]

In its report, the IPCC raises the question: How likely are major or abrupt climate changes, such as loss of ice sheets or changes in global ocean circulation? It then answers: "Abrupt climate changes, such as the collapse of the West Antarctic Ice Sheet, the rapid loss of the Greenland Ice Sheet or large scale changes of ocean circulation systems, are not considered likely to occur in the 21st century based on currently available model results . . . ."[166]

In summary, even if it is possible to reduce carbon dioxide emissions to between five and seven percent below 1990 levels it would reduce mortality from hunger malaria and extreme events in 2085 by thirteen percent under the warmest IPCC scenarios, while exposing 1.2 billion people to water stress.[167] Water stress is a major problem in sub-Saharan Africa, but the causes for it are political and economic, and the cure lies in more economic and social development not the cutting down of carbon dioxide emissions. The impact of global warming on sea level rises is certain but will not be devastating in the foreseeable future.

D. ADCs and SD

Geopolitically, even though the world now focuses on global warming and not the MDGs, the rhetoric of SD continues to be used in the climate change negotiations. The primary negotiating position of the ADCs is that they need to burn more coal and emit more carbon dioxide emissions to advance SD. China and India, who act as proxies for other ADCs, claim that reducing carbon dioxide emissions will obstruct SD. India's external affairs Minister Pranab Mukherjee recently stated that while India is very concerned about climate change, that issue needs to be seen in the perspective of the imperative to remove poverty so that all Indians can live a life of dignity.[168] Similarly, Chinese premier Wen Jiabao stated that "it's difficult for China to take quantified emission reduction quotas at the Copenhagen conference, because this country is still at an early stage of development. Europe started its industrialisation several hundred years ago, but for China, it has only been dozens of

165. *See* Al Gore, *Testimony Before a Joint Meeting of U.S. House Subcommittees on Energy and Air Quality, and Energy and Environment* (Mar. 21, 2007).

166. WORKING GROUP I REPORT, *supra* note 163, at 818.

167. Goklany, *supra* note 153 at 73.

168. Pranab Mukherjee, *Climate Treaty Shouldn't Impose Greater Burden*, THAINDIAN NEWS, Feb. 5, 2009, *available at* http://www.thaindian.com/newsportal/uncategorized/climate-treaty-shouldnt-impose-greater-burden-pranab-mukherjee_100151361.html (last visited May 3, 2010).

years."[169] India and China object to limitations on their rights to SD.

Conversely, ADCs offer an alternative argument based on the feasibility of moving to sustainable energy. If the developed countries want them to take a path to SD based on sustainable energy, ADCs argue that the developed countries should provide them with the necessary financial and technological transfers that will enable them to do so. In the Copenhagen Accord, developing countries pledged to commit $30 billion during the period 2010 to 2012 and to further mobilize $100 billion per year by 2020 to be used for mitigation and adaptation.[170] This would be in addition to what developed countries spend on the mitigation of carbon dioxide.

The distribution of resources in this manner is difficult to justify on ethical grounds. It is erroneous to rationalize. Spending scarce resources on the industrial sectors of advanced developed countries, that are in fact served by high energy based on fossil fuels, is ethically dubious. These ADCs have advanced up the energy ladder, in contrast to those who are trapped at the bottom of the energy ladder. A recent report of the UNDP focused on the LDCs and Sub Saharan Africa paints a grim picture of the extent to which these countries and their peoples lack access to energy.[171] They conclude that, "[a]lthough energy access varies widely across developing countries, it is much lower in poorer developing countries than in other developing countries, *placing poorer countries at a huge disadvantage. Seventy-nine percent of people lack electricity in LDCs and seventy-four percent in sub-Saharan Africa compared to twenty-eight percent of those in developing countries as a whole.*"[172]

EJ calls for a different approach and a new consensus. First, unlike the Copenhagen Accord, the new consensus should not be fixated on the reduction of GHG emissions alone and should instead be focused on SD as a way of combating global warming. The interdiction of black carbon, which is not a GHG, should be included in the new consensus. This will help to address indoor pollution as well as global warming. Second, unlike the Copenhagen Accord, there should be a specific reference to the EOP and an emphasis on how a significant part of the resources committed by developed countries should be devoted to EJ and SD.

As burdened societies in the Rawlsian sense, the EOP are owed assistance by both developed and developing countries until they are capable of integrating into the liberal democratic or well-ordered hierarchical society that controls their geographical area. Of course, the

169. Lomborg, *supra* note 146.

170. Copenhagen Accord, *supra* note 6, art. 8.

171. *See* LEGROS ET AL., *supra* note 9.

172. *Id*. at 1(emphasis added).

amount and type of assistance required from developed and developing countries will differ from one segment of the EOP to another depending upon the needs of the EOP and the capabilities of the developing state. Like responsibility for climate change, the responsibility for assistance to the EOP is common to all peoples, but differentiated by ability to help.

Rapidly developing ADCs such as Brazil, China, and India must mobilize their governments to provide administrative support to internationally-based sustainable energy programs from developed countries and the UN to the EOP. Indeed, without action from the domestic government to promote the rule of law and provide a framework for organization of labor, capital, and energy (through markets or otherwise) to the EOP, international technological and financial assistance such as disseminating ASETs or microfinancing will fall flat. The primary concern of ADC governments is development for their populations; that development must, according to the law of peoples, include not only their rising middle classes, but the impoverished burdened society they have hitherto left behind.

While the EOP may reside within the borders of the ADCs, the obligation of the liberal or decent peoples in the ADC to assist them resides in the law of peoples. The division of responsibility here is relatively clear. Developed nations should provide resources that facilitate the advancement of knowledge and the adoption of intermediate energy technologies that improve the energy conversions of the EOP. For their part, the ADCs should provide the administrative, managerial, and legal frameworks for advancing the behavioral changes leading to the adoption of those technologies, and thereby raising the EOP out of poverty so that they might integrate into the larger society. The importance of managerial and administrative assistance by the ADCs to the EOP cannot be ignored.

But because LDCs lack the financial resources of ADCs, and the EOP constitute a far larger proportion of the population of LDCs, developed nations bear a greater responsibility for ensuring that the assistance they provide actually reaches the EOP in LDCs. Such a responsibility is a corollary to the primary duty of liberal and decent peoples to assist burdened societies. It is not enough to provide cookstoves, treadle-pumps, and bio-intensive agriculture plans to the governments of LDCs as part of foreign aid or assistance. Too often such assistance is based on the assumption that recipient governments have the resources and knowledge to publicize, organize, and administer those technologies in ways that both reach and impact the EOP. But that, equally often, is not the case. This kind of aid often fails to satisfy the duty of assistance to burdened societies, because it may never reach those who need it, or have any significant impact on their lives.

Developed nations providing sustainable energy assistance must not only promote appropriate sustainable energy technologies, but also work with the LDC governments to create the administrative, managerial, and legal frameworks for publicizing, educating, and training the EOP on how to utilize them. Developed nations must work sensitively with LDC governments to create and maintain these frameworks in a way that does not challenge the self respect or sovereignty of the LDCs. Furthermore, administrative and legal frameworks for mainstreaming energy technologies to the EOP must be crafted in ways that comport with the culture, religion, and values of the burdened EOP. A developed country's stipulation of administrative requirements attached to technological aid extends only to advance the "common institutions and practices of all liberal and decent societies," with the "final aim of assistance: freedom and equality for the formerly burdened societies."[173]

Rawls concluded that the law of peoples "will restrict a state's internal sovereignty or (political) autonomy, its alleged right to do as it wills with people within its own borders. . . . [W]e must therefore reformulate the powers of sovereignty in light of a reasonable Law of Peoples and deny to states the traditional rights to war and unrestricted internal autonomy."[174] As discussed, sovereignty cannot be a shield thwarting measures to address the crushing toll of death and suffering borne by the EOP.

This view of diminished importance of absolute sovereignty stems directly from Rawls's focus on peoples rather than states. States are instrumentalities for carrying out the rights and duties of peoples. They are not sacrosanct in their authority if that authority is being used in violation of the law of the peoples. While it would be unduly imperialistic for a developed nation to require an LDC to import a governmental framework that does not comport with its political culture, a state has no right to accept technological or financial assistance on behalf of a burdened society living within its borders and then fail to implement it. The moral conscience of the liberal democratic or decent hierarchical people cannot permit a state to act in such a way.

VI. CONCLUSION

Two thirds of the world in developed countries and ADCs are high energy users who rely primarily on hitherto abundant sources of fossil fuels for their prosperous life styles. They are responsible for problems of global warming and peaking oil. By contrast, the primary energy

173. THE LAW OF PEOPLES, *supra* note 114, at 111.

174. *Id*. at 26.

relied on by the "other" third of the world, numbering around two billion peoples, is biomass-based fire. They are the EOP who do not reside in the industrial high energy using sectors of advanced developing countries. Instead they inhabit the rural or peri-urban parts of the world and emit hardly any carbon dioxide. Their abject poverty and ill health, attributable to the absence of sustainable energy, cries out for SD and energy justice, but their cry has been unheard and unheeded.

The application of the true Rawlsian paradigm of EJ underlying SD will ensure, first, that the duty of assistance be exercised in a manner conferring direct benefit on the EOP residing primarily in the LDCs, and some ADCs, but not the governments of ADCs. Second, a Rawlsian duty of assistance will provide for energy conversions that advance sustainable development, while rejecting unsustainable development of the kind relied on by the other two-thirds of the world. Consequently, the socioeconomic development of the EOP resulting from such assistance will not foul the planet with more pollutants or inflict disease and death in the way that traditional coal-based power plants do. Third, such assistance will advance technologies, that are sympathetic to the cultural mores, and technological knowledge baseline of the EOP. Fourth, such technologies should empower women to take the vanguard in economic development and the generation of income. Finally, in practical terms, the use of cookstoves will help address the nearly two million premature deaths primarily of women and children.

Remedial action based on SD can begin with tackling indoor and atmospheric pollution but should extend far beyond that single measure to provide the EOP with sustainable energy that will enable them to develop and break the bonds of poverty and energy deprivation. Moreover, the abatement of black soot emitted by the burning of biomass by using cookstoves has the extraordinary co-benefit of reducing global warming. A dollar spent on eliminating black soot will have the double benefit of improving human health as well as of mitigating global warming, thereby benefiting not only to the EOP but the entire world. Even those developing countries driven by rational self interest alone may find it advantageous to finance such an efficient way of mitigating global warming. But other problems afflicting the EOP such as poor sanitation, lack of drinking water, absence of education or gender inequality, may not possesses such epiphenomenal consequences.

The daunting prospect of adding the energy demand and polluting emissions of 2 billion developing people to a global environment groaning under the load of traditional hydrocarbon energy generation can be avoided with ASETS.[175] Using ASETs to address the devastating

175. The case for doing so has been argued elsewhere: *See* Guruswamy, *supra* note 109.

effects of burning biomass only represents the beginning of a journey. It is a first step toward creating a more comprehensive basis for the energy-based sustainable development of the EOP. In other words, helping one-third of the world to address the public health crisis posed by indoor air pollution can also embark the EOP on a different developmental pathway that bypasses the problems created by the other two-thirds of the world.

Keynote Address[1]

Energy Justice Conference, October 23, 2009

Kandeh Yumkella, Ph.D.*

First, I am honored to be here in beautiful Colorado at such an important event. My friend Lakshman Guruswamy has done a great job being a thought leader in this area and helping coin an important term, "energy justice," for an important topic that I care deeply about. My job today is to try and put some of your discussions into context. I am not an energy expert, but I have always had a strong interest in energy issues; I'll tell you why later. So, to begin, the world is still in the clutches of the three Fs: food; fuel; and financial crisis. These problems don't fade away for people living in developing countries. In addition to dealing with these problems, poor countries must now deal with climate change.

A deepening crisis involving the three Fs emerged rapidly in 2008 and 2009. In April 2008, I was in New York with United Nations ("UN")

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1. This is the transcript of a speech, thus citations are not included.

* As the first Director-General from Sub-Saharan Africa, Yumkella's first term in office formally began on December 8, 2005. Yumkella joined the United Nations Industrial Development Organization ("UNIDO") in 1996 as Special Advisor to the then Director-General, Mauricio de Maria y Campos. In the same year he became Director of the Africa and Least Developed Countries Regional Bureau, and held that position until 2000 when he went to Nigeria as UNIDO Representative and Director of the Regional Industrial Development Center, a position he held until 2003. From then until his election as Director-General he was a Senior Advisor to the previous Director-General, Carlos Magariños. Prior to joining UNIDO, between 1994 and 1995 he was Minister for Trade, Industry, and State Enterprises of Sierra Leone. During his earlier career he occupied several academic and research positions in the United States. Dr. Yumkella has coauthored numerous articles, books, and staff papers on international trade and development issues. He holds a Ph.D. in Agricultural Economics from the University of Illinois.

colleagues. Our discussion focused on seven years worth of global efforts in promoting the Millennium Development Goals. Some of us were pulled aside and told that we should carefully watch rising fuel prices because they were beginning to wreak havoc in developing countries. By May, while we were in Yokohama, we were forced to hold a special session to address the impacts high fuel prices were having on the twenty-five most vulnerable countries in the world. Many heads of state were there, including those of Liberia and Sierra Leone. Bob Zoelick from the World Bank was there, too. Those heads of state were saying: "I need funds now. I need 20 to 25 million in balance of payment support to pay for fuel, to pay for food. We are having riots."

In October, we returned to New York; the chief executives meet with the Secretary General of the UN twice a year. We received briefings from the International Monetary Fund and the World Bank stating that a financial meltdown was spreading rapidly and becoming a full-scale global economic crisis. The rest is history.

For the poorest of the poor, rising fuel prices, the recent economic recession, and difficulties in obtaining food are converging crises. These crises may wipe out some of the Millennium Development Goals' accomplishments. Indeed, last year, it was estimated that almost 100 million people will return to living on below one dollar per day.

The world is experiencing an energy crisis too, but its repercussions are not equally felt among countries. As I said, I am not an energy expert, so why am I interested in energy issues? Because I live in the dichotomy between virtually unfettered and very limited access to energy in my lives in Austria and in Sierra Leone. My life in Vienna contrasts with my life in Sierra Leone in many ways. In 2009, Vienna was rated the world's best city to live in. Whatever people need is available in Vienna. But I was born in Sierra Leone. Last year, Sierra Leone was the poorest country in the world. It ranked last in the Human Development Index ("HDI") listings. Three weeks ago, President Calderón of Mexico launched the new HDI rankings; Sierra Leone has moved up two notches. Our HDI is higher than Afghanistan's and Niger's. We are still at the bottom of the heap; we have enjoyed this status since the HDI was created in 1990.

Thirty years ago, as an undergraduate student, there were many times I studied by candlelight. There were many times I walked down to the river, three kilometers from campus, to bathe. Fifteen years ago, I went back to Sierra Leone and volunteered to serve as the minister of trade, industry, and state enterprises. I was in charge of essential commodities, such as petrol and kerosene. Again, I had to work using candlelight in the office and at home. We still did not have electricity in the city. In December of 2008, I spent four good weeks in my native

village. It is one of the poorest villages situated on the estuary of a river. We still do not have enough electricity and our water supply is inadequate.

Freetown, Sierra Leone is a congested city. It was built for between 100 to 150 thousand people. Today, there are almost 2 million people living there. Trucks must go far out of Freetown to get food, wood, and charcoal. Instead of farming, we are cutting down trees because people make more money selling the wood in the city. For example, during the war, refugees cut down trees for this purpose, but also to use the wood for making shelter, for cooking fires, for heat. We have cut down most of the trees in the catchment area of the city's water reservoir, so the water level has decreased. Due to the erratic rainfall patterns in Africa, the reservoir levels have remained low, so the city has an insufficient water supply. Even if there is water in the reservoir, often, we do not have reliable running water because there is not enough electricity to pump water through the system.

This is still an important part of my reality. But I live in the First World and advocate for structural change in developing economies through technology transfers, investment flows, energy efficiency, and energy access. When I go home to Sierra Leone, I live in these developing economies. That is why I advocate for energy access. I know empirically that we cannot achieve any of the Millennium Development Goals without it.

What does energy justice mean for the bottom billion (those living on less than one dollar per day)? Or the 2.5 billion people living on less than two dollars per day? First, it simply means access to energy services to meet basic needs such as for cooking, heating, and preserving food. Energy justice means that there is basic lighting so children can study and women can do chores in the evening. It permits the storage of vaccines. It relieves our mothers and our sisters living in villages from having to walk very far to fetch water or from fetching wood at the end of the day so they can cook. Some women must wake up at six o'clock in the morning to pound rice. It also means having clean air. Our people still use wood to fuel their cooking fires which creates heavy smoke. Access to a reliable energy source could do amazing things for women and children. Energy justice for them simply means an opportunity to improve their lives a little bit. Sophisticated computerized power systems are not the first issue. These people first need an energy source at home to meet their basic human needs. Last year, Dr. Paccahuri, the head of the Intergovernmental Panel on Climate Change, said that energy access is the missing Millennium Development Goal; it is an important point.

The second meaning of energy justice for the poor is providing energy for productive uses. This dimension is very important to me.

Many people are trying to help by raising money to support communities in putting single solar panels on huts in Africa to provide lighting in homes. Although this is necessary, we are just shining a light on poverty. We need to provide energy sources so that the poor can enhance their productivity and thus their economies. We also need engineers to help us develop simple technology to reach this goal, too. For example, energy sources are needed so women can process more food using basic technology, saving time and physical energy. Or so women can fry food more easily and take it to the market to sell it. For example, my community needs 650 kilowatts of energy. They should have a rice mill so they can process more rice and sell more of it at the market. They should also have enough energy to power the clinic, some small businesses, and the school, not just their houses.

Energy for productive use is important because of demographic trends and the need to feed an increasing number of people. Some numbers: In Africa, the UN estimates that by 2030, sub-Saharan Africa's population may be between 1.2 to 1.4 billion people, a big as China's current population. By 2050, the UN estimates that this number will grow to about 2 billion. Over half of the population will live in cities that are already packed, such as Freetown or Lagos. Last week in Rome, the UN Food and Agriculture Organization ("FAO") estimated that by 2030, we must increase worldwide food production by fifty percent to meet growing need; by 2050, we must increase it by seventy percent.

If we do not develop energy for productive uses in poor countries, what will happen to all of these people packed in these cities? Humans are ingenious and they are mobile, too. I often tell my European friends that our African grandchildren will head to Europe, or to North America. But we do not want our people coming here as undocumented aliens. We want them coming as productive citizens with money to spend. Therefore, it is in our collective interest to avoid the demographic crisis that will occur in the future by developing energy systems that will make economies in poor countries viable, that will generate income so people will stay where they are.

The third meaning for energy justice has to do with its link to climate justice. I lived in North America for a long time. Now, I live in the "best city" in the world. I have had my share of driving cars and of using air conditioning. You and I enjoy the good life; we emit carbon dioxide while others pay the price. Those who pollute less should not pay a high price for our excessive energy use. Poor people are already living with climate change every day. From Angola to India to Indonesia, severe climatic events are increasing in frequency. I was in Kenya last month; the country has been dealing with serious drought and water shortages in the last three months. In America, we use the cliché of Hurricane Katrina to illustrate how the poor are bearing the burden of

climate change, how it punished the poorest of the poor, not wealthy people.

There is a moral argument for climate justice. Energy justice and climate justice are two sides of the same coin. Although currently China may be the country that is contributing to climate change more than other countries today, it has not been the case in the last 150 years. Developed countries have been the main contributors to the problem until recently. There will be problems in Copenhagen because equity and justice dictate that we take that into consideration. Countries must continue to acknowledge that they have "common but differentiated responsibilities."

The fourth aspect of energy justice is to use resources efficiently and obtain services through cleaner production. If the developing world decides to pursue the same consumption patterns as developed countries have followed in the last fifty years, we would probably need two or three more planet Earths for the resources to do so. The way we use resources must change. This is relevant because poorer countries provide some of those natural resources; not only must we use resources more efficiently, we must also make the industrial production of these resources cleaner.

To reach these goals we must first reduce the material intensity of production. In other words, we must decrease the amount of resources used per unit of output. Second, we need to optimize the use of water. The potential water crises and conflicts in the world are just as significant as the energy issues. Industry probably uses twenty percent of all water resources. Agriculture is one of the main culprits. And water bottling companies probably pollute one liter of water for every liter they bottle. Third, we must reduce the energy intensity of production. At the moment, there is a lot of post-harvest loss in poor countries. Thirty to fifty percent of what they produce rots in the supply chain because they cannot store their produce properly. Basic technology is key. Countries, such as China and India, and the poorest of the poor need, and want, to structurally transform their economies and move up the technology ladder. Value can be added through more jobs and more food by processing food more efficiently, using less energy. For example, in the United States, I know that only three percent of the population lives and works on farms, but the supply chain from farm to table employs perhaps fifteen to twenty percent of the population.

The fifth part of energy justice is the link between energy and global security. When I was a graduate student in the United States, we used to joke that for the Reagan administration, Africa was just Egypt because it was the only country that was of geopolitical and strategic interest to the United States. During the Bush administration, Africa as a whole

acquired strategic value for the United States, in light of its attempts to diversify its sources of petroleum and gas. Target areas for this include the Gulf of Guinea from Angola to Gambia. Some project that maybe seventeen to twenty-five percent of global oil and gas demand can be sourced from that region.

Today, the United States is the biggest buyer of oil from Equatorial Guinea, however, this oil will only last for twenty-five to thirty years. Equatorial Guinea is like Kuwait, a small country staying afloat on its oil. For global security reasons, when we source oil and gas and other raw materials from poor countries, we must ensure that we help diversify their economies, support good governance, and help them grow and create jobs for their people. This is the only way that these states will become wealthy and preserve democracies.

However, this is not was it happening now. A Large U.S. oil company, one of the most sophisticated oil drillers in the world, has been drilling for oil off the cost of Angola for twenty years, despite war. Nigeria is one the main suppliers of oil to the United States, however, its productivity depends on whether the rebels are controlling the oil pipeline or not. Along that same coast, Sierra Leone, Liberia, and Guinea-Bissau are becoming failed states; states without good governance, where drug dealers are taking over. This year, in Sierra Leone, a plane loaded with 400 kilograms of cocaine landed in the middle of the Freetown airport. When they interrogated the pilot, he asked: "but what are you doing, this was just my fourth flight?" The street value of that cocaine was higher than our total gross domestic product. Just imagine what drug dealers can do with that money; they are taking over countries. The UN is extremely concerned that these failed states are in the hands of drug dealers and potential terrorists, because this threatens world security.

Why am I interested in this? There is a selfish reason. Just four weeks ago, the Financial Times and BBC confirmed that Sierra Leone has discovered 1.9 billion potential barrels of oil on its territory. One of the poorest countries in the world suddenly has new wealth.[2] This is an opportunity. We should think about how oil can transform Sierra Leone's economy in a positive way and about how it can meet its own energy needs and provide energy access as it trades with the rest of the world. Trade policy and corporate social responsibility matter enormously. These companies cannot say our job is just to source a commodity. They should also help build roads, invest in agriculture, help generate enough

2. The consortium that discovered the oil is the same consortium that had previously discovered oil in Ghana: an Anadarko group, led by a U.S., British, and Spanish company.

power in cities so people can live a good life. They need to transform Sierra Leone's economy and help it become a viable state.

This is the context of why this conference is important. So, how do we move forward? First, I think at the global level we need a few things. We need some kind of agreement in Copenhagen. If we fail to reach a formal agreement in Copenhagen, let's make sure that in 2010 we get it. This agreement is about confidence building, it says to the rest of the world that the industrialized world cares about developing nations. We need serious evidence that countries that polluted the most are serious about cleaning it up. We need good targets for emissions reductions. We also need funding to transfer and deploy technology, so people have access to clean energy and cleaner production systems.

Second, we need to consider all energy options and establish a global goal on universal access to energy by 2030. As chair of UN-Energy and of the Secretary-General's Advisory Group on Energy and Climate Change, people, I say that all technologies must be on the table. We cannot rule out technologies when 2 to 3 billion people are still trying to get basic access to energy. We need to take carbon emissions out of current energy systems and need renewable energy to be accessible and affordable for the poorest of the poor.

Third, we need real dialogue. We need to talk to each other because I think the idea of energy independence is romantic, but I do not think it is feasible. The U.S. Council on Competitiveness estimates that if we continue business as usual, eighty-one percent of the United States' energy will be provided by fossil fuels. Although the United States sits on twenty-three percent of the world's coal reserves, it will need a whole lot more to power its iPhones, SUVs, air conditioners, and other things. We need to have a global dialogue and better global relationships.

This is not farfetched. I sit in Europe where this debate is already ongoing. Debate is occurring at the International Atomic Energy Agency and at the Organization of Petroleum Exporting Countries. The Germans and Russians talk about energy as a key dimension of foreign policy. The creation of the South Stream Pipeline, the North Stream Pipeline, and the Nabucco Pipeline is about international relations. For Europe, energy geopolitics and energy foreign policy is highly relevant. When the pipelines are shut off, Europeans suffer. I think the global dialogue on energy is just beginning. A mix of people need to be involved in these discussion, not just businessmen and investors. Lawyers, politicians, and environmentalists are necessary to create good public policy at the national and international levels.

My last set of comments will be about what we can do programmatically. At the national level, we can do several things. First, we should widen the applications of renewable energy by going beyond

the one solar panel on a hut scenario. We must look at energy for productive use. Second, we should coordinate action. In the car as we were coming here, we were discussing how in American universities, energy issues are discussed in various departments that do not talk to each other. The people in the forestry department say they can solve the world's problems with reforestation. But if they do not talk to the engineer who can design efficient stoves, people will keep cutting down trees. If you do not talk to an aggie like me, an agricultural economist, you do not know that farmers still enhance their productivity on the land by expanding and moving every four years. This is not an isolated problem anymore. All these issues are interconnected. Good legal and regulatory frameworks within countries are needed to accomplish these goals.

Third, we should not just talk about energy and climate change. Last week, some of the G7 countries expressed suspicions about my agenda. They said: "Dr. Yumkella, you talk too much about energy and climate change. You started three years ago with energy and development. Now we hear more from you about energy and climate change." It should not just be about energy and climate change, it should be about energy, poverty, and global security. These issues are interconnected.

Fourth, to accomplish all of this, we need good energy planning. Analytical input for policy making is very important. Countries must look at their energy needs for the next ten or twenty years. That time horizon makes investment and infrastructure strategies make sense. Countries must also consider what sources their energy should come from. What proportion should be from renewable sources? What kind of infrastructure is required? What proportion should be from other technologies?

Finally, here is a quote from a similar discussion I participated in at the United States Council on Competitiveness. I asked Deborah Wince-Smith, the person who invited me to the discussion, why she had invited me to a discussion between big university presidents and Fortune 500 companies. She said she wanted me to give them the other side of the story. The quote, by John Rowe, president and CEO of the Exelon Corporation, was from the publication they recently released. He said: ". . . the first thing the U.S. should do is to stop being a bad example. As the richest country in the world we should start addressing the problem in a moderate and constructive way. I don't believe we can be hypocritical in negotiating with China or India or with the African nations. I am not in favor of open-ended subsidies to any of these countries, but neither will I be smug. After all, all what they are demanding is the right to do what we have already done."

Energy justice, energy security, and energy access is not only for rich people; it is for all of us. Thank you for helping to improve the global discussion and including me in your deliberations.

END

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Put out the Fire: Developing a Sustainable Energy Policy for All Namibians

Julie Nania* & Doug Vilsack**

I. INTRODUCTION: ENERGY AND CLIMATE JUSTICE FOR ALL

Energy is necessary for sustainable development. At present, over 2 billion people, living predominantly in the rural areas of developing countries, do not have access to modern energy sources. Many of these people rely on fuels, such as wood, that are scarce due to environmental degradation and increasing population. Although culturally important for many peoples, burning wood in an open fire will not lead to the growth of sustainable rural communities in developing countries. Energy must provide heat, light, and power for the industrial processes that are necessary for growing economies. Needs such as healthcare, education, and communication, are dependent on reliable energy supplies; and access to energy raises life expectancy, lowers infant mortality, and increases literacy in developing countries. Furthermore, when electric energy is available in rural areas, residents are less likely to contribute to rapid urbanization by seeking better living conditions in cities.[1]

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1. *See Access to Energy in Developing Countries*, POSTNOTE, No. 191, (Parliamentary Office of Sci. & Tech, London, U.K.), Dec. 2002, at 1, *available at*

The provision of energy in developing countries is much more than an issue of economic security; it is an issue of justice. Energy justice requires access to reliable energy supplies for all people. The concept regards the provision of energy as a human right, or at least a necessary step for the realization of other human rights such as education, health, and a clean environment. Although energy justice as a concept is most applicable to the populations of developing countries, there are people in need of energy even in developed countries. In the United States, the United States Department of Agriculture's Rural Electrification Program ("REP") brought subsidized electricity to remote corners of the country in the early 1900s, spurring economic growth and modernizing rural areas. But despite its general success, the REP failed to bring electricity to all Americans. More than 18,000 households on the Navajo Nation, or approximately forty percent, are still without grid electricity.[2] The reasons for this failure are many, including limited funding, long transmission distances, cultural resistance, and land disputes, among others. Many of these same barriers exist with regard to the provision of electricity to rural populations in developing countries. If America cannot provide traditional, grid-based energy to all, how can Namibia?

Beyond the fundamental issue of energy justice is the concept of climate justice. While energy justice requires us to address the question of energy access, climate justice focuses on how this access is to be achieved. The climate justice concept is illustrated by the debate between rich and poor nations at the recent climate change conference in Copenhagen. Developed countries like the United States, whose past economic growth increased carbon dioxide in the atmosphere and caused our current climate crisis, are hesitant to commit to binding emissions reduction targets because of potential adverse economic impacts. These countries argue that if climate change is to be addressed, developing countries must also commit to emissions reductions over time. However, many developing countries refuse to hinder their economic growth by establishing emissions targets or other expensive policies to limit their emissions growth. These countries argue that due to their limited economic circumstances and adaptive abilities, expensive carbon-reducing technology must be paid for by the developed countries that caused the problem in the first place. If America built its economy on cheap energy from fossil fuels, why can't Namibia do the same?

Together, the concepts of energy justice and climate justice require us to develop solutions to this question: how does the international community ensure access to clean energy for the poorest residents of the

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http://www.parliament.uk/post/pn191.pdf.

2. Troy Turner, *Are Navajo Blueeyes Seeing Red?*, THE DAILY TIMES, Jan. 19, 2008, *available at* http://www.daily-times.com/farmington-navajo_travel/ci_8023300.

poorest nations? There is no doubt that developed countries must take the lead in combating climate change and increasing energy access in developing countries. However, development assistance, when provided, is ephemeral and has done little to spur sustainable development. Aid to developing countries has consistently fallen short of United Nations ("UN") targets.[3] Further, the massive write off of third world debt in 2005 illustrates that the traditional system of development assistance is itself fundamentally flawed. The global economic downturn and stalled climate negotiations have reinforced the fact that funding for development is limited, and that even when funding is available, there is no clear strategy for how it can be effectively put to use.

An international focus on clean energy technology that addresses the needs of developing economies and the energy poor is the only way to achieve both climate justice and energy justice. First, developed countries must commit significant resources to the development of large scale, grid-based clean energy projects in developing countries. Prior to the implementation of these projects, developed countries must work with local governments to revise outdated energy policies that stifle renewable energy development by subsidizing electricity produced from cheap fossil fuels. The governments of these countries must educate their citizens about the benefits of renewable energy and address barriers to renewable energy development, such as land tenancy issues, workforce development, and trade barriers.

Second, and more importantly, the international community and the governments of developing countries must shift their singular focus on providing electricity to large industry and promoting economic growth in urban areas to also promoting the utilization of cheap, reliable, small-scale renewable energy technologies to meet the needs of the rural energy poor. Energy poverty is acute: 1.3 to 1.6 million women and children die as a result of indoor air pollution each year caused by smoke inhalation from cooking fires,[4] while traditional three rock fires—so named because they are typically surrounded by rocks for the placement of a cooking pot—provide inadequate lighting and energy for study, commerce, communication, and industry. Furthermore, due to funding and other constraints, the reality is that on the current course, many rural communities will never have access to grid power.

While these problems seem insurmountable, inexpensive technologies are already available to address these issues. Modern wood-

3. *See* International Development Strategy for the Second UN Development Decade, G.A. Res. 2626 (XXV), ¶ 43, U.N. Doc. A/RES/25/2626 (Oct. 24, 1970), *available at* http://www.un.org/documents/ga/res/25/ares25.htm.

4. *See* Lakshman Guruswamy, *The Need for Energy Justice*, *available at* http://cees.colorado.edu/ej_whitepaper.pdf.

burning cook stoves can reduce soot by ninety percent and carbon dioxide emissions by up to eighty percent at a cost of less than US$20;[5] solar-powered lights can provide up to 1,000 nights of high quality illumination on one set of rechargeable batteries at a cost of less than US$20;[6] small solar panels can charge cell phones and radios at a cost of less than US$10;[7] and Solar Home Systems, albeit more expensive, can provide for numerous in-home energy needs.[8] Despite these technological breakthroughs, development assistance and climate change funding programs focus on the projects developing countries demand: large-scale, sexy solutions to energy shortages and climate change that do not address the current inequalities of energy access.

Renewable energy development in Namibia is not a matter of charity. Namibia's energy supply sector is an old, centralized system, which relies largely on imported energy generated with fossil fuels from abroad. Namibia's supply is increasingly vulnerable to fluctuations in the regional supply market and to fluctuations in the price of fossil fuels. Large-scale fossil fuel generation will only continue to become more expensive over time. A renewable energy solution is already more cost effective over a twenty-year span, and conversely will become less expensive as time progresses.

Without a concerted effort by the international community to address energy poverty in concert with climate change, the climate solution will only exacerbate the problem. Massive investments in large-scale, grid-based renewable energy technology will reinforce an unjust system, where only the wealthy and urban people in developing countries are allowed to benefit from energy development. With inexpensive, durable renewable energy technologies now available to meet the needs of the rural poor around the world, any climate solution that fails to address the needs of rural communities is unjust and unacceptable.

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5. *See* Envirofit, Clean Cookstoves, http://www.envirofit.org/?q=our-products/clean-cookstoves (last visited Feb. 26, 2010).

6. *See* Elephant Energy, Technology, http://www.elephantenergy.org/Technology.html (last visited Feb. 26, 2010).

7. *See* Tough Stuff, Products, www.toughstuffonline.com/products (last visited Feb. 26, 2010).

8. *See* Solar Electric Light Fund, Our Technology – Photovoltaics, http://www.self.org/solartechnology1.shtml (last visited Feb. 26, 2010).

II. ENERGY AND CLIMATE INJUSTICE IN NAMIBIA

Katima Mulilo is the bustling capital of the Caprivi Region in Northeastern Namibia (map cited [9]). The name, which means "put out the fire," was fixed to this particular crossing along the Zambezi River because unpredictable currents and winds tended to put out the fire of traveler's torches. Today, a new bridge links Katima with the neighboring country of Zambia, and at night the darkness is broken by a string of streetlights. The energy supply for these lights is no longer controlled by the elements, but by a generator in Katima and a power station in Zambia. Despite these twinkling lights, fire is still the most widely used energy source in Caprivi and the rest of rural Namibia. For many Namibians, energy access is limited by economic and geographic circumstances as uncontrollable as the waters and winds of the Zambezi River.

The energy situation in the region is constantly evolving. Energy impacts many facets of life. In neighboring Angola, the economy is emerging from a crippling, oil-fueled civil war; in Namibia's capital, Windhoek, policymakers have allocated money to build an emergency 20 megawatt ("MW") diesel generator to stave off power cuts; near Katima, legions of diesel-powered pickup trucks ply the road selling lifts to villagers; as fossil fuel use increases and the cooking fires continue to smoke, a changing climate threatens food and water supplies. For good reason, energy and climate change are on the minds of the people and the politicians of Namibia.

9. International Labour Organization, Subregional Office for Southern Africa, Namibia, http://www.ilo.org/public/english/region/afpro/mdtharare/country/namibia.htm (last visited Feb. 28, 2010).

A. Climate Injustice in Namibia

Climate change models have predicted that temperature increases will lead to increased climate vulnerability in Namibia.[10] Willem Konjore of the Namibian Ministry of the Environment and Tourism ("MET") has warned that, "[t]he arid environment, recurrent drought and desertification and fragile ecosystem have contributed to making Namibia one of the most vulnerable countries to the effects of climate change . . . [C]limate change could potentially become one of the most significant and costly issues that affect the national development process."[11]

Namibia's key economic sectors are reliant upon natural resources, them vulnerable to the effects of climate change. Climate change will impact whole ecosystems, destabilizing wildlife and vegetation. The impact on the tourism sector from habitat loss and ecosystem change could be enormous. Furthermore, Namibia's economy is highly dependent on agriculture and livestock production. Rural livelihoods and food production will be threatened by erratic weather patterns and gradual climate changes. The marine industry and coastal economy is also forecasted to be adversely affected by rising sea levels and warmer water temperatures.[12]

These threats are even more harrowing because Namibia has inadequate technological expertise and few financial resources to address the impacts of climate change. Given this predicament, the Namibian government has urged that, "[i]n order not to be diverted from our national development objectives, we must further develop and adopt preemptive, preventative and corrective actions and activities to address environmental and climate change issues and problems."[13] The government has already taken some preventative measures, such as initiating an adaptation project to enhance the adaptive capacity of agricultural and pastoral systems in Namibia's drought prone regions.[14] However, the country remains far from prepared to deal with the magnitude of environmental changes forecasted.

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10. Posting of Martin Nyambe to Climate Frontlines, *Energy Related Impacts to Climate Adaptations in Namibia*, http://www.climatefrontlines.org/en-GB/node/377 (Aug. 17, 2009).

11. Willem Konjore, MP, Minister of Env't & Tourism of the Republic of Namibia, Opening Remarks at the Official Launch of the Climate Change Booklets and the Second National Communication (Feb. 20, 2007) [hereinafter Konjore's Opening Remarks].

12. *Id*.

13. *Id*.

14. Willem Konjore, Minister of Env't & Tourism of the Republic of Namibia, Statement at the Occasion of the High-Level Segment of the UN Framework Convention on Climate Change 3 (Nov. 15, 2006) [hereinafter Konjore's Statement].

Low-income rural households have the least capacity to cope with the adverse effects of climate change; rural agricultural areas generally suffer the most climate stress and are equipped with the fewest resources to mitigate climate change impacts. Most of Namibia's population, particularly in poor rural areas, is heavily reliant on natural resources such as water, biomass (particularly firewood), and range for grazing. Namibia's environment is already stressed by over-population in rural farming and herding areas. Climate change is expected to compound the severity of this resource scarcity caused by increased consumption. Subsistence farmers will also be among those hit the worst. Cycles of drought and flooding will result in poor harvests as most farmers lack irrigation systems to support their production. To compound the problem, it is these smaller farmers who do not have additional finances to supplement their income.[15] For Namibia's rural populations, climate change is another barrier standing in the way of "sustainable development," a promise made over and over by the international community and national government since the Brundtland Commission coined the term over twenty years ago.[16]

NAMIBIA FACTS: FROM CIA WORLD FACT BOOK[17]	
History:	South Africa occupied the German colony of South-West Africa during World War I and administered it as a mandate until after World War II, when it annexed the territory. In 1966 the . . . South-West Africa People's Organization (SWAPO) guerrilla group launched a war of independence for the area that became Namibia, but it was not until 1988 that South Africa agreed to end its administration in accordance with a UN peace plan for the entire region. Namibia has been governed by SWAPO since the country won independence in 1990. Hifikepunye Pohamba was elected president in November 2004 in a landslide victory replacing Sam Nujoma who led the country during its first 14 years of self rule. Pohamba was reelected in November 2009.
Constitution:	Ratified 9 February 1990, effective 12 March 1990

15. Posting of Martin Nyambe, *supra* note 10.

16. *See* World Commission on Environment and Development, Aug. 4, 1987, Annex: Report of the World Commission on Environment and Development: Our Common Future, U.N. Doc. A/42/427, *available at* http://www.un-documents.net/wced-ocf.htm.

17. CIA – The World Fact book, Namibia, https://www.cia.gov/library/publications/the-world-factbook/geos/wa.html (last visited Feb. 28, 2010).

Ethnic Groups:	Black 87.5%, white 6%, mixed 6.5% *note:* about 50% of the population belong to the Ovambo tribe and 9% to the Kavangos tribe; other ethnic groups include Herero 7%, Damara 7%, Nama 5%, Caprivian 4%, Bushmen 3%, Baster 2%, Tswana 0.5%
Population / Age:	2,108,665 Total (2009 est.) 0-14 years: 35.9% (male 381,904/female 375,059) 15-64 years: 60.2% (male 641,995/female 627,146) 65 years and over: 3.9% (male 36,894/female 45,667) (2009 est.)
HIV / AIDS:	Adult prevalence rate of 15.3%, 200,000 people living with HIV/AIDS .
Literacy:	Definition: age 15 and over can read and write total population: 85% male: 86.8% female: 83.5% (2001 census)
Climate / Land:	Desert; hot, dry; rainfall sparse and erratic / arable land: 0.99%
Environmental Issues:	Limited natural fresh water resources; desertification; wildlife poaching; first country in the world to incorporate the protection of the environment into its constitution; some 14% of the land is protected, including virtually the entire Namib Desert coastal strip
GDP / per capita:	$13.44 billion (2008 est.); $6,400 (2008 est.)
Economy:	The economy is heavily dependent on the extraction and processing of minerals for export. Mining accounts for 8% of GDP, but provides more than 50% of foreign exchange earnings. Rich alluvial diamond deposits make Namibia a primary source for gem-quality diamonds. Namibia is the fourth-largest exporter of nonfuel minerals in Africa, the world's fifth-largest producer of uranium, and the producer of large quantities of lead, zinc, tin, silver, and tungsten. The mining sector employs only about 3% of the population while about half of the population depends on subsistence agriculture for its livelihood. Namibia

	normally imports about 50% of its cereal requirements; in drought years food shortages are a major problem in rural areas. A high per capita GDP, relative to the region, hides one of the world's most unequal income distributions. The Namibian economy is closely linked to South Africa with the Namibian dollar pegged one-to-one to the South African rand. . . . Increased payments from [the Southern African Customs Union ("SACU") put Namibia's budget into surplus in 2007 for the first time since independence, but SACU's [payments will decline after 2008 as part of a new revenue sharing formula.] Increased fish production and mining of zinc, copper, uranium, and silver spurred growth in 2003-08, but growth in recent years was undercut by poor fish catches [and high costs for metal inputs.]

B. Energy Injustice in Namibia

In an international climate change debate often focused on large-scale solutions in developed countries, it is often forgotten that over 2 billion people in the world lack access to sufficient energy resources. While more than seventy percent of Namibia's urban population has access to the national electric grid, only fifteen percent of rural households are connected.[18] Only one-third of Namibia's two million people have access to grid electricity.[19] A recent review of energy policy in Namibia found that "larger-scale off-grid electrification remains largely unaccomplished."[20] Despite this enormous gap in electricity supply between rich and poor, urban and rural, the optimistic target presented in Namibia's Third National Development Plan was only for twenty percent rural electrification by 2012.[21] Shockingly, many of these homes are not plotted to get access to grid electricity in the next twenty years, if ever. David Jarrett is a Senior Engineering Technician who

18. DETLOF VON OERTZEN, DESERT RESEARCH FOUND. OF NAMIBIA, NAMIBIAN NATIONAL ISSUES REPORT ON THE KEY SECTOR OF ENERGY WITH A FOCUS ON MITIGATION 3 (2008), *available at* http://www.undp.org/climatechange/docs/Namibia/Namibian%20national%20issues%20report%20on%20key%20sector%20of%20energy.pdf.

19. *Id.*

20. JOSEPH IITA ET AL., PLANNING POWER: REVIEW OF ELECTRICITY POLICY IN NAMIBIA, RESEARCH REPORT NO. 11 11 (Matthias Schmidt ed. Sept. 2009), *available at* http://www.ippr.org.na/Research%20Reports/Review%20of%20Electricity%20Policy%20in%20Namibia.pdf [hereinafter PLANNING POWER].

21. *Id.* at 5.

works on electrification and renewable energy development at NamPower's Renewable Energy Desk in Windhoek. Jarrett explains that even if the Master Grid Electrification Plans goes as scheduled, "[a]fter 20 years there are still a number of areas that will never see the grid."[22]

In Namibia, it is difficult to provide grid access to everyone because the population of the country exists primarily in small, scattered pockets. NamPower, the sole electricity supplier in Namibia, is first connecting the areas closest to the grid with larger populations, while informal settlements are passed over in the electrification process. Many believe that NamPower intends to stop grid electric just off the beaten path. Werner Schultz owns and operates Terrasol, an independent solar supplier in Windhoek. Schultz explains that, "[a]s you come to the rural Caprivi area, the rural areas, the southern areas, you can forget about NamPower."[23] For those people living in rural areas or in informal settlements, the chances of grid connection in the near future are very slim.[24]

Electrifying all of Namibia with grid electricity is simply not feasible economically or logistically. As explained in the Electricity Control Board's ("ECB") Green Energy in Namibia paper, "economic considerations prohibit the country's complete electrification using conventional grid electricity."[25] Lahja Amaambo is Head of the Renewable Energy Development Section at NamPower. Ms. Amaambo suggests that renewables are a better solution for villages in many circumstances, especially when villages are isolated far from the grid.[26] Other developing nations in Africa have the same problem. A recent study in Dakar found that the cost of connecting a house to the grid when less than thirty meters away cost up to US$650.[27] Namibia's distances are dauntingly farther.

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22. Interview with David A. Jarrett, Senior Engineering Technician, Renewable Energy Development, Energy Trading, Electrification & Renewable Energy Development, NamPower Centre, in Windhoek, Namibia (Aug. 2009).

23. Interview with Werner Schultz, Engineer & Owner, Terrasol, in Windhoek, Namibia (July 2009).

24. Interview with David A. Jarrett, *supra* note 22.

25. PLANNING POWER, *supra* note 20, at 14.

26. Interview with Lahja Amaambo, Head of Renewable Energy Development, NamPower, in Windhoek, Namibia (Aug. 2009).

27. Oscar Onguru & Touria Defrallah, *Findings of GNESD Peri-Urban Energy Access Study for East and Southern Africa*, *in* ENHANCING ENERGY ACCESS IN RURAL AREAS AND PERI-URBAN SETTLEMENTS: KNOWLEDGE-BASED POLICY ENGAGEMENT (2009), *available at* http://www.cemafrica.net/Events/Workshop_Report_Cape_Town.pdf (conference was sponsored by the UN Environmental Program and the UCT Energy Research Center).

Harald Schütt, a local Amusha consultant in renewable energy and energy efficiency, explains that it is economically more viable to use small-scale technologies rather than hooking into the grid because of the vast distances between isolated populations. In Mr. Schütt's eyes, "[i]t just doesn't make sense in Namibia to build up a nationwide grid."[28] Schütt explains his opinion using a hypothetical situation of connecting a community of one hundred people located ten kilometers away from the current grid. Using rough estimates, Schütt explains that building an eleven kilowatt ("KW") line from the grid to the community would cost about N$1,000,000 (roughly US$130,000), an estimate he deems conservative. If the community borrowed that money from the bank at twelve percent, the community would be paying N$120,000 per annum or N$10,000 per month. Out of the one hundred members in this representative community, approximately fifteen would have formal jobs, none of which are high paying. For these people to pay for the interest and credit, not to mention for the electricity, in addition to appliances and wiring of their houses, is what Schütt terms "economically absolutely impossible." The community would end up defaulting on the line almost immediately.

Access to electricity would provide many possibilities to improve the quality of life of Namibia's rural poor population. The September review of Namibia's national energy policy acknowledged that "[a] continued, systematic commitment by Government to systematically bring affordable energy services to rural Namibia is necessary, thereby also introducing new and decentralized livelihood, learning and business opportunities."[29] Namibians agree that with electricity comes community development and access to the outside world. Andreas and Viktoria Keding run the Namibian Desert Environmental Education Trust ("NaDEET"), an environmental center in the Namib Desert that educates children about sustainable living and the environment.[30] The Kedings believe electrification would have a great impact on people "living with the island system, isolated." It is their opinion that the ability to power cell phones alone would mean that rural populations "all of a sudden have access to the world. I think that's one big step of actually getting people out of poverty and education, also helping people regardless of their regimes and their politics."[31]

28. Interview with Harald Schütt, Energy Efficiency Consultant, Amusha cc, in Windhoek, Namibia (July 2009).

29. PLANNING POWER, *supra* note 20, at 14.

30. Interview with Viktoria Keding, NaDEET, in NamibRand Nature Reserve, Namibia (July 2009).

31. *Id*.

NamPower's Mr. Jarrett believes the potential benefits and uses of renewable energy in rural areas are abundant: photovoltaic ("PV") pumps can be used to irrigate farmland, increasing productivity; PV electricity can power enterprises such as haircutting businesses; eventually, people will be able to produce the resources they used to have to truck in, such as baking their own bread.[32] Mr. Jarrett explains that rural electrification "will facilitate the flow of information by providing communications for press conferences . . . . Even basic health care issues could be addressed, such as the refrigeration of medicine . . . so you get that first real development, urban development, taking place, but taking place in a rural setting."[33]

III. BUSINESS AS USUAL: SADC'S CARBON-INTENSIVE, LARGE-SCALE, URBAN-FOCUSED ELECTRIFICATION PLAN

A. SADC Background and Energy Crisis

The South African Development Community ("SADC") is an alliance of states formed in 1980 to coordinate development projects amongst signatories and to reduce the region's economic dependence on apartheid South Africa. In 1992, the Treaty of SADC was adopted to create a legal body through which to implement SADC policies. Since 1980, the alliance has grown, expanding from the nine original member states to fourteen current members, including South Africa, which signed the treaty in 1994.[34]

As SADC has developed, so too has its energy demand. The Southern African Power Pool ("SAPP") was created by SADC in 1995 to optimize the use of regional energy resources and to provide a way for SADC members to support each other in power emergencies.[35] Today, the SADC region is home to around 300 million people, many of whom lack access to electricity.[36] SADC cannot consistently meet the growing

32. Interview with David A. Jarrett, *supra* note 22.

33. *Id.*

34. Southern African Development Community (SADC), Dep't of Int'l Relations and Cooperation of Republic of South Africa, http://www.dfa.gov.za/foreign/Multilateral/africa/sadc.htm (last visited Feb. 26, 2010).

35. SADC, SADC ENERGY PROGRAMMES AND PROJECTS 1 (2006) *available at* http://www.gfse.at/fileadmin/dam/gfse/gfse%206/pdf/SADC_GFSE-6_Briefing_Paper.PDF.

36. Interview with Conrad Roedern, Managing Director and Founder, Solar Age, in Windhoek, Namibia (July 2009).

demand and has recently suffered severe electricity shortages.[37] SADC's supply constraints have worsened as the South African electricity utility, ESKOM, is increasingly unable to meet local electricity needs.[38]

While rapidly increasing demand is one cause of the SADC energy crisis, a lack of investment in energy infrastructure has exacerbated the problem. South Africa and other SADC nations tend to subsidize electricity, charging ratepayers enough to cover operating costs, but not enough to provide funding for investment in new power plants. Generation is not the only problem: throughout the SAPP, nearly one-sixth of the installed capacity was unavailable during the crisis because of inadequate regional interconnection systems and outdated equipment.[39]

At the SADC energy ministers meeting in 2008, the primary SADC issue of concern was the energy supply shortage plaguing the region.[40] SADC is attempting to address the electricity shortfall by installing 6,500 MW of additional capacity by 2012, with hopes to reach an additional 44,000 MW of capacity by 2025.[41] This additional supply will largely be achieved through the construction of large, coal-fired power plants, which take advantage of South Africa's abundant, cheap coal resources. Other hydropower projects have been proposed throughout the SADC region, although discussions concerning the the Inga 3 dam, which would have produced 5,000 MW at maximum capacity, collapsed when the Democratic Republic of the Congo pulled out of negotiations.[42]

B. Namibia's Energy Crisis

NamPower is the government parastatal that acts as the single buyer of electricity in Namibia. NamPower is "the sole generator, energy trader and transmitter of electrical power in Namibia" and consistently benefits from government subsidies.[43] In addition to having a monopoly over the

37. Petronella Sibeene, *5-Yearly Review for SADC Power Plan*, ALLAFRICA.COM, May 7, 2008, http://allafrica.com/stories/200805070805.html.

38. VON OERTZEN, *supra* note 18, at 4.

39. Richard Nyamanh, *Pooling of Resources Critical to Resolving SADC Energy Shortages*, SOUTHERN AFRICAN NEWS FEATURES, Dec. 2, 2008, *available at* http://www.sardc.net/editorial/newsfeature/08781208.htm.

40. Press Release, SADC, SADC Energy Ministers Meeting, Kinshasa, Democratic Republic of Congo, 30 April 2008 (Apr. 30, 2008), *available at* http://www.sapp.co.zw/docs/Untitled.pdf.

41. Brendan Peacock, *High Cost of Cheap Electricity*, SUNDAY TIMES (SOUTH AFRICA), Mar. 22, 2009 (Business and Finance section).

42. Jo-MarÉ Duddy, *DRC Pulls Plug on Inga*, ALLAFRICA.COM, March 1, 2010. http://allafrica.com/stories/201003010977.html

43. FITCH RATINGS, ELECTRIC-CORPORATE NAMIBIA CREDIT ANALYSIS.

energy sector, NamPower is inseparable from the central government. NamPower is wholly owned by the Namibian government, and its "investment programme forms an integral part of the state budget." It is so closely intertwined with government that even its credit rating "is aligned with that of the sovereign, based on strong legal, operational and strategic links" while government policy is directly reflected in NamPower's decision making.[44] The ECB was created under the Electricity Act of 2000 to serve as a check on NamPower by acting as the sole regulator of electricity in Namibia.[45] The structure of the ECB was designed so that it would be independent of government as the body responsible for the control, regulation, and promotion of Namibia's electricity supply industry.[46] The ECB currently sets all of Namibia's electricity tariffs.

In 2007, Namibia consumed approximately fifteen terawatt hours ("TWh") of energy.[47] Most of this consumption was attributable to imported liquid and gaseous fossil fuel use; twenty-five percent was electrical energy use, while biomass accounted for almost fifteen percent of consumption and renewable energy sources less than one percent.[48] Presently, Namibia's only real energy targets for the supply sector and generation targets are from the outdated 1998 White Paper on Energy Policy that set a target of seventy-five percent domestic energy self-sufficiency by 2010.[49]

Namibia's domestic electricity generation capacity is woefully inadequate to meet the country's peak demand. In 2008, Namibia's maximum demand reached 533 MW, 140 MW over the maximum capacity Namibia could produce in ideal conditions (393 MW).[50] In addition, Namibia uses energy intensively, even outside of the energy intensive mining industry. This is largely due to its dispersed population, which requires imported goods such as fuels and consumer goods to be

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CORPORATES: NAMIBIA POWER CORPORATION (PROPRIETARY) LIMITED 2 (Apr. 20, 2009), *available at* http://www.nampower.com.na/revamp/docs/Fitch%20Research%20Report%20NamPower%202009.pdf.

44. *Id*. at 2.

45. The Electricity Act § 2 (2000) (Namib.), *available at* http://www.mme.gov.na/energy/acts/act-electricity-2000.html.

46. ELECTRICITY CONTROL BD, GUIDELINES FOR ASPIRING NEW GENERATION APPLICANTS 3 (Sept. 28, 2007) (Namib.), *available at* http://www.ecb.org.na/pdf/ApplicantsGuidelineV4.pdf?m=8&sm=12 [hereinafter ECB GUIDELINES].

47. VON OERTZEN, *supra* note 18, at 3.

48. *Id*.

49. PLANNING POWER, *supra* note 20, at 39.

50. *Id*. at 7.

transported over long distances.[51] As a result, almost fifty percent of the electricity Namibia consumes is imported.[52]

Namibia has been dependent upon South Africa's energy export for decades; the country is economically and politically tied to South Africa by the grid. Two transmission lines from South Africa supply over fifty-two percent of Namibia's energy demand.[53] Currently, 92.8 percent of the electricity that Namibia imports from South Africa is from coal fired power plants.[54] The country's reliance on imported energy is particularly troublesome because "[t]he cost of sourcing electricity has almost tripled in the last eight years."[55]

Over the past few years, Namibia has directly experienced the shockwaves sent through the SADC power structure by South Africa's energy crisis. Pressured by domestic energy needs, South Africa has started to restrict the export of electricity to Namibia in order to satisfy its own increasing demand.[56] Under Namibia's current energy supply contract, South Africa has reserved the right to cut off Namibia's energy supply with twenty-four hours of notice.[57] This forces Namibia to meet its demand through purchases on the international spot market, which is very expensive.[58] In addition, other SADC nations are threatening to renege on their power purchase agreements with Namibia. Most recently, Zimbabwe threatened to withhold a substantial portion of Namibia's imported supply. In January 2010, Zimbabwe announced that it would no longer import electricity to fulfill its power purchase agreement with Namibia for MW daily.[59] This unstable energy supply situation has widespread repercussions throughout the country. Potential investors, looking to finance energy-intensive mining operations, are dissuaded because NamPower is unable to assure them that they will have the requisite energy available for industrial operations, much less provide them a general figure for the rate they would pay for that energy supply, if it were available.[60]

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51. VON OERTZEN, *supra* note 18, at 2.

52. *Id.* at 3.

53. Interview with Conrad Roedern, *supra* note 36.

54. *Id.*

55. VON OERTZEN, s*upra* note 18, at 4.

56. Interview with Harald Schütt, *supra* note 28.

57. *Id.*

58. *Id.*

59. Jo-Maré Duddy, *Power Panic Over Zim Report*, THE NAMIBIAN, Jan. 13, 2009, *available at* http://www.namibian.com.na/news/full-story/archive/2010/january/article/power-panic-over-zim-report/.

60. *Id.*

Namibia's energy sector has been slow to respond to the SADC energy shortage, even though the shortages Namibia is experiencing were predicted years ago. Little has been done to secure a reliable supply from abroad, and Namibia has not invested in substantial new electricity generation capacity in nearly thirty years.[61] Namibia's national production capacity includes the Ruacana hydroelectric plant on the Kunene River, which produces 249 MW from its three turbines at maximum capacity,[62] the 120 MW coal-fired Eck power station, and the Paratus diesel power station, which can produce 24 MW.[63] Construction is scheduled for a fourth turbine at the Ruacana power plant to be completed in 2012,[64] while smaller systems are scattered about the country. However, this will not increase the overall amount of power to be released on the grid since the amount of power generated is limited by the volume of water available.[65] Currently, Ruacana can only operate at maximum capacity five months of the year because of limitations during dry periods.[66] The newly constructed turbine will allow NamPower to meet peak demand hours, but will also use water and deplete reserves faster.[67]

Over the next thirty years, the energy sector is predicted to grow by an average of three percent each year.[68] Peak demand has been conservatively forecast to reach at least 700 MW in 2011 and 850 MW by 2018.[69] Unless drastic steps are taken, unserved demand will rapidly increase. Additionally, because of the growing interest in mining activities on the western coast, an additional load of approximately 300 MW will be needed at the coast in the near future.[70] NamPower has responded to the threat of an energy crisis with quick fixes that are less expensive, but more carbon intensive.[71] Little investigatory time is spent on consideration of long-term policy implications, as providing the grid with electricity is the primary concern.[72] To boost supply, NamPower

61. VON OERTZEN, *supra* note 18, at 5.

62. PLANNING POWER, *supra* note 20, at 3-4.

63. *Id.* at 4.

64. FITCH RATINGS, *supra* note 43, at 1.

65. Interview with Harald Schütt, *supra* note 28.

66. *Id.*

67. *Id.*

68. VON OERTZEN, *supra* note 18, at 3.

69. *Id.* at 5.

70. NamPower, Media Statement 4 (Dec. 11, 2008), *available at* http://www.nampower.com.na/revamp/docs/media/Projects%20update.pdf.

71. Christophe de Gouvello, Felix B. Dayo, & Massamba Thioye, *Low-Carbon Energy Projects for Development in sub-Saharan Africa: Unveiling the Potential, Addressing the Barriers* xxvi (The World Bank 2008).

72. Interview with Antonia Baker, Project Coordinator: CPP & Climate Change,

has initiated short-term energy generation projects to add an emergency capacity of 50 MW.[73] Among the projects NamPower is investigating are an expansion of the Paratus diesel-powered plant and building a coal-fired power station at Walvis Bay with anywhere from 300 to 800 MW capacity.[74] Both of these solutions increase Namibia's dependence on carbon-dioxide-producing, foreign-procured fossil fuels.

IV. THE PARTIAL ENERGY SOLUTION: LARGE-SCALE RENEWABLE ENERGY DEVELOPMENT

A. Namibian Renewable Resources and Technology-Specific Barriers

Namibia's environment is ideal for renewable energy generation. In Schütt's opinion: "Namibia is the one country in the world—due to its geographic, economic and social structure—which is best suited to be one hundred percent energized through renewable sources."[75] However, because the energy generated from renewables is intermittent and difficult to store, new power management strategies and hybrid systems to support low generation periods will be necessary. Wind turbines produce power around the clock, but generation is intermittent. Solar installations only generate electricity during sunlight hours. Storage of electricity is also a challenge, though reliable sources, such as hydro, diesel, and coal-fired plants can act as a buffer to be used when other renewable energy sources are not producing enough capacity. These difficulties aside, Namibia is blessed with tremendous renewable energy potential.

1. Solar Power

Namibia is an ideal location for electricity generation from PV systems and concentrated solar power. On average, most of Namibia experiences more than 300 days of sunshine per year.[76] The South can have up to 360 days of sun. [77] Sunny days produce a daily radiation rate of about five to six KW hours per square meter, situating Namibia's solar

Manager of Research, Namibia Nature Foundation, in Windhoek, Namibia (July 2009).

73. *Id*.

74. VON OERTZEN, *supra* note 18, at 6, 8.

75. Interview with Harald Schütt, *supra* note 28.

76. Konjore's Statement, *supra* note 14, at 4.

77. Interview with Harald Schütt, *supra* note 28.

regime amongst the world's best.[78] In terms of solar radiation, Schütt boasts that Namibia has "2.3 times what the Europeans have."[79] Namibia is already fairly advanced in terms of PV usage per capita. Conrad Roedern from Solar Age points out that, "[a]t 2 million people, especially under the developed world, [Namibia is] in the top per capita range of using PV."[80] Various sizes of PV installations have been installed all over the nation; Windhoek's hospital installed solar panels, the University of Namibia as well as the Polytechnic of Namibia installed solar water heaters, and companies like Solar Age have installed hybrid systems in rural schools.[81] More recently, the University of Namibia has announced a N$1.8 million investment in PV for its new Northern Campus in Windhoek.[82]

Aside from PV installations, concentrated solar is attractive to many renewable energy advocates because it can produce large amounts of power at a considerably cheaper rate than PV and is relatively easy to store. However, to adapt the technology to Namibia's vast distances, smaller concentrating plants would have to be dispersed around the nation, "building fifty megawatts here, seventy there, twenty-five there and so on."[83] While Ms. Amaambo reported that NamPower was in the pre-feasibility stage of looking at concentrated solar,[84] her colleague, David Jarrett, seemed doubtful about the prospects of adding concentrated solar to NamPower's portfolio because "it's a very expensive technology."[85] Integrated solar combined cycle plants, which combine a conventional combined-cycle gas plant with a solar driven booster, are another option currently being investigated by NamPower, as are large-scale PV plants.

Small-scale solar systems and products are also an option for Namibia. Particularly, solar home systems and solar water geysers have been popularized by the Ministry of Mines and Energy ("MME") programs and a Cabinet directive passed in 2007.[86] PV pumps are also ideal for Namibia. Although more expensive than their diesel equivalent up front, they save on fossil fuels, are less time consuming to maintain,

78. Baerbel Epp, *Solar Water Heaters Mandatory for Public Buildings* GLOBAL SOLAR THERMAL ENERGY COUNCIL Mar. 30, 2009, *available at* http://www.solarthermalworld.org/node/494.

79. Interview with Harald Schütt, *supra* note 28.

80. Interview with Conrad Roedern, *supra* note 36.

81. Interview with Noddy Hipangelwa, Ministry of Mines and Energy, in Windhoek, Namibia (Aug. 2009).

82. Interview with Harald Schütt, *supra* note 28.

83. *Id.*

84. Interview with Lahja Amaambo, *supra* note 26.

85. Interview with David A. Jarrett, *supra* note 22.

86. Interview with Noddy Hipangelwa, *supra* note 81.

and have the added benefit of pumping water when it's needed the most, during direct sunlight. Solar water heaters are also perfect for Namibia's climate, but are too expensive for the bulk of Namibians.

Solar ovens and cookers are also available to meet rural and urban needs. However, these products are expensive and not widely available for purchase. While there have been some successes, like the Volambola Solar Stove project, other programs established to disseminate the ovens and cookers have struggled, largely due to a lack of funds for professional marketing and continuous education of customers.[87] In addition, there has been some pushback from Namibian's who feel that adopting these methods of cooking substantially change their daily social routines. Preparing food around the fire is traditionally a time for women to socialize. Uazamo Kaura, Designated National Authority ("DNA") for the Clean Development Mechanism ("CDM"), believes "at the end of the day, people would still rather cut down wood to cook."[88]

2. Wind Power

Namibians have been using wind power since before 1914 in the form of wind driven water pumps.[89] Today there are approximately 33,000 wind pumps running in the country.[90] Marina Coetzee, Chief Agricultural Researcher at the Ministry of Agriculture, explains that "[a] lot of farmers, especially in the past, have used wind generators."[91] However, Namibians just recently have begun to explore the opportunities offered by wind plants tied into the grid system.

Recent studies have suggested that several onshore wind farms of twenty to fifty MW capacities each seem possible if the grid capacity is strengthened to accommodate them.[92] Other energy consultants have estimated twice those figures.[93] However, there are several impediments to wind resource development. Geography is an issue. Wind farms may be well suited for the coastal regions, but because of a lack of transmission capacity, wind power is not ideal for areas away from the coast where most of the power demand exists. Mr. Schütt articulates Namibia's predicament: "The problem is not the wind . . . the problem is that we do not have the infrastructure to take off the energy . . . [and] the

87. Interview with David A. Jarrett, *supra* note 22.

88. Interview with Uazamo Kaura, Designated National CDM Authority, Ministry of Environment and Tourism, in Windhoek, Namibia (Aug. 2009).

89. Interview with Viktoria and Andreas Keding, *supra* note 30.

90. Interview with Harald Schütt, *supra* note 28.

91. Interview with Marina Coetzee, Chief Agricultural Researcher, Ministry of Agriculture, Water and Forestry, in Windhoek, Namibia (July 2009).

92. VON OERTZEN, *supra* note 18, at 6.

93. Interview with Harald Schütt, *supra* note 28.

fact that wind energy is erratic."[94] Despite these challenges, NamPower has started to conduct feasibility studies in certain coastal areas.

3. Hydropower

Namibia has already developed hydropower resources and relies upon them heavily. Currently, the majority of Namibia's power is generated from the Ruacana hydropower plant on the Kunene River. The Namibian government is investigating the construction of a second hydropower plant on the Kunene River, the proposed Baynes hydro dam, which would have a generation capacity of some 360 MW.[95] Although hydroelectricity is generally thought to be one of the most reliable forms of renewable energy, decreased rainfall and drought has restricted hydropower capacity in recent years.

4. Geothermal and Wave Energy

Relatively little is known about Namibia's geothermal and wave energy capacity, both of which are largely unexplored. Hot springs north and south of Windhoek indicate that a rift exists, but no proper surveys have been conducted to determine whether this resource has any potential for utility-scale energy production.[96] Rough estimates have put the geothermal potential of Namibia at just over 100 MW.[97] Another understudied resource is Namibia's tidal and wave energy potential.[98] Harald Schütt explains that "[Namibia has] ocean stream energy, because the Benguela stream is coming over 7 km an hour 24/7."[99]

5. Biodiesel

Officials from different government Ministries are looking into developing biodiesel derived from the oil-bearing fruits of Jatrophas Curcas trees.[100] One of the concerns about adopting a biofuel program is how the fuel crop production will affect food security in Namibia and further deplete nutrients in Namibia's already poor soils.[101] Namibia's limited arable land and scarce water resources constrain the country's ability to produce food. The potential of non-native biofuel species to

94. *Id*.
95. VON OERTZEN, *supra* note 18, at 5.
96. Interview with Harald Schütt, *supra* note 28.
97. VON OERTZEN, *supra* note 18, at 4.
98. Interview with Noddy Hipangelwa, *supra* note 81.
99. Interview with Harald Schütt, *supra* note 28.
100. *See* VON OERTZEN, *supra* note 18, at 8.
101. Interview with Marina Coetzee, *supra* note 92.

become invasive is also a concern.[102] Because of these concerns, the Directorate of Forestry has placed a blanket ban on Jatrophas Curcas production for biofuels until more is known about how production will affect Namibia's resources.[103] For the time being, "quite a number of private investors [are] looking at bio-fuels,"[104] though there remains a hold at the moment until the food security issues are dealt with.[105]

6. Biomass and Bush to Electricity

Converting invader-bush to electricity is currently one of Namibia's most promising renewable energy options. Namibia has over 26 million hectares (64 million acres) of land choked with invader bush. In energy terms, the ECB has estimated that this would be the equivalent to 1,100 TWh hours of biomass energy, about seventy times the amount of energy that Namibia consumed in 2007. [106] Reducing invader bush would be an added benefit because the bush is too dense to allow livestock grazing and makes the land unusable for agricultural purposes. It also reduces the penetration of rainwater, which is essential to recharge Namibia's underground water reserves.[107]

There is substantial interest in both incinerating and gasifying invader bush to produce power. Various small-scale pilot projects are being conducted by the Desert Research Foundation ("DRFN") and the Ministry of Agriculture. The ECB reported that a 250 KW invader bush gasification pilot plant is expected to be completed in 2010.[108] Schütt proposes that "[Namibia] should have small-scale scattered technology to produce electricity from that bush." There would be multiple ancillary benefits from a bush-to-electric program. Because the electricity production would take place largely on individual farms, it would also create decentralized jobs and reduce urban migration. Additionally, because the process of conversion could take place at will, the bush-to-electricity regime would allow for the production of power during peak demand times, when Namibia's grid needs the energy most. Schütt reports that, "[Bush encroachment] has cost the farmers' community 700 million dollars (Namibian) a year in lost revenue." Farmers would benefit from reclamation of their grazing lands.

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102. Interview with Uazamo Kaura, *supra* note 90.

103. Interview with Antonia Baker, *supra* note 72.

104. Interview with Marina Coetzee, *supra* note 91.

105. Interview with Uazamo Kaura, *supra* note 90.

106. Detlof Von Oertzen, *Green Energy in Namibia*, ENERGY CONTROL BOARD at 4 (May 2009).

107. *Id*.

108. *Id*.

B. Breaking Down Barriers Hindering Namibian Renewable Energy Development

While Namibia has tremendous renewable resources, there are many barriers standing in the way of a large-scale renewable energy industry in the country. Many of these barriers are political, and are the result of outdated energy policies and development strategies. Other barriers are the result of the limited resources available to small, developing countries for energy development in general. Finally, many cultural barriers stand in the way of broad renewable energy development in the country. These barriers, and recommendations for the Namibian government, civil society, and businesses on how to overcome them, are discussed in the following sections.

1. Establish National Policies and Targets that Facilitate the Development of Renewable Energy

In 1998, Namibia created the White Paper on Energy Policy ("White Paper") that offered a strong foundation for a national renewable energy policy. Although it was quite progressive when it launched, the White Paper is in dire need of an update because of current circumstances surrounding the SADC energy supply crisis. In the White Paper, the Namibian government established a policy to promote renewable energy generation, but failed to set specific goals to further the policy.[109] According to a 2008 United Nations Development Program ("UNDP") report on mitigating Namibia's energy issues, Namibia currently has no national renewable energy targets in place, although NamPower has recently set a target of achieving ten percent of their capacity from renewables by 2011.[110] Many stakeholders are of the mindset that the MME should prepare an Energy Act to coordinate energy sector requirements and restraints into a coherent policy plan.[111] There are rumors that certain ministries are working to establish policies that would include renewable energy mandates. Mrs. Kaura at MET suggested that MET is in the process of developing a climate change policy and that MME has a draft energy policy currently in the pipeline."[112]

Despite indications that the government is becoming more receptive to alternative forms of energy production, a Western European

109. ENERGY POLICY COMM. OF THE MINISTRY OF MINES & ENERGY, WHITEPAPER ON ENERGY POLICY § 3.5 (May 1998), *available at* http://www.ippr.org.na/Research%20Reports/Review%20of%20Electricity%20Policy%20in%20Namibia.pdf.

110. FITCH RATINGS, *supra* note 43, at 7.

111. VON OERTZEN, *supra* note 18, at 12.

112. Interview with Uazamo Kaura, *supra* note 90.

development mentality lingers, driving government decision-makers toward coal and nuclear development. "The engineers at NamPower and the decision-makers in our Ministry are usually trained in the way of Western Europeans . . . . they have a vision that development is one big [government-owned] power station in the middle with one cable to each building . . . ."[113] Discussing the barriers to renewables, Mrs. Coetzee comments that "[r]enewable energy is not very mainstream in the minds of the decision makers in Namibia."[114]

Andreas Weinecke, manager and researcher at the Habitat Research and Development Centre ("HRDC"), believes that an energy crisis is what is necessary to get the government to recognize the importance of integrating renewables into the national energy supply. "All we need is a good crisis . . . the best way to wake up is to have a crisis."[115] National policy statements which promote the development of renewable energy should be promulgated as soon as possible to provide a solid foundation for other policies and regulations supporting renewables. Laws and regulations should be passed that facilitate the development of renewable energy within Namibia and support renewables as Namibia's preferred route of development.

First, climate change legislation restricting Namibia's carbon emission output should be passed to solidify the press statements by Namibian leaders into a tangible piece of legislation. Such legislation would incentivize government officials, NamPower, and investors to create and support renewable energy projects in lieu of higher carbon fossil fuel alternatives. More direct approaches, such as legislation setting binding benchmarks for renewable energy development or requirements that renewables constitute a certain percentage of NamPower's distribution portfolio would have a more immediate impact on the adoption of renewables. A policy statement expressing a national goal of promoting renewable energy projects and a preference for renewables in private sector energy development would be a strong charter document that could encourage entities, such as the ECB, facilitate the development of clean energy.

2. Implement Policies to Overcome Cost Barrier to Renewables

The initial capital costs of renewable energy technologies are higher than their fossil fuel equivalents. In a country with a relatively poor population and much wealth inequality, differences in upfront cost are

113. Interview with Harald Schütt, *supra* note 28.

114. Interview with Marina Coetzee, *supra* note 91.

115. Interview with Dr. Andreas Wienecke, Manager of Research, Habitat Research & Development Centre, in Windhoek, Namibia (2009).

frequently determinative for those investing in energy sources. In addition, when choosing between energy sources, Namibians may not take into account many of the long-term benefits of renewables due to lack of education concerning their benefits. National energy planners and consumers must include the long-term benefits of renewables in energy supply analyses, revealing that these technologies are actually less expensive over time than traditional energy sources. Policies incentivizing renewables in the short term will be essential to their widespread adoption.

Even when the upfront costs of renewable technologies are comparable to traditional technologies, most Namibians do not consider the long-term operating costs of traditional technologies, even though these costs are generally higher than renewable technologies.[116] Raising awareness about the long-term benefits of renewables and using incentives to reduce the initial capital costs of renewables in the short term will help overcome the general perception that renewable technologies are too expensive for Namibians. Both the private sector and government agencies have attempted to raise awareness of the costs and benefits of renewables. These efforts should be continued and expanded.

One policy change that could assist the renewable energy industry in the short term has to do with Value Added Taxes ("VAT"), which are levied on goods imported to Namibia at a rate of either fifteen percent or thirty percent, depending on the nature of the goods. The VAT is a huge burden on consumers when most renewable technologies are already comparably more expensive than fossil fuel products. Eliminating or reducing the VAT and import taxes on renewable energies would be a substantial step in making these technologies more affordable for Namibians. Recently, PV panels have been allowed to enter into Namibia free of customs.[117] However, taxes must only be reduced for quality products. In the eyes of many, an influx of cheap and unreliable solar technologies has harmed the credibility of renewable technologies. Some of the technologies imported to Namibia, Chinese PV panels in particular, have not been designed and tested for the intense Namibian sun.[118] Poor quality products reduce confidence in the technology as a whole, harming the industry.[119] In 2008, the National Technical Committee on Renewable Energy was established to monitor renewable energy products and services.[120] This committee could be used to

116. Interview with Werner Schultz, *supra* note 23.

117. Interview with Harald Schütt, *supra* note 28.

118. Interview with Werner Schultz, *supra* note 23.

119. Interview with Viktoria and Andreas Keding, *supra* note 30.

determine which products are of sufficient quality to qualify for tax breaks.

In addition to tax breaks, subsidies reducing the up-front costs of renewables would make investment in the energy sector more attractive.[121] Subsidies that support dirty fossil fuels must also be removed. Namibia must stop subsidizing coal power imported from South Africa, and the ECB must bring tariffs up to reflect market value as soon as possible. Similarly, the price of diesel and other fuels must reflect market values. Andreas from NaDEET explains that even though "solar hot water heaters are so ideal for Namibia, even people who can afford it say why should I buy one when the power is so cheap from the grid?"[122] If NamPower, the government, and the ECB work to eliminate fossil fuel subsidies, renewable energy will become more attractive in comparison.

3. Promote Innovation at NamPower

A decentralized energy system would benefit independent power producers ("IPPs") in Namibia. NamPower recently began to engage in discussions of renewable energy as a viable source of national power production. Some individuals at the government parastatal, including Amaambo and Jarrett at the Renewable Energy Desk, consider renewables an important component of electricity supply. However, NamPower remains committed to a centralized grid and fossil fuel based energy system and should be consistently encouraged to incorporate renewables into its energy supply portfolio. There are three primary ways in which NamPower and ECB can work creatively to facilitate renewable energy development in Namibia: through incorporating renewable energy sources into its own distribution portfolio, actively promoting the development of IPPs, and restructuring tariffs to promote renewable energy sources.

a. Incorporating Renewables into NamPower's Energy Portfolio

NamPower is currently in the process of experimenting with adding renewable energy sources to its energy production profile. Amaambo, head of the Renewable Energy Desk, explained that NamPower is

120. *See* Joseph S. Iita, Permanent Sec'y of Mines & Energy, Inaugural Remarks at the Official Public Presentation of the National Technical Committee on Renewable Energy (NTCRE) 2 (July 3, 2008), *available at* http://www.reeei.org.na/admin/data/uploads/PS%20Remarks%20on%20the%20ocassion%20of%20the%20inauration%20of%20the%20renewable%20energy%20technical%20committee.doc.

121. Interview with David A. Jarrett, *supra* note 22.

122. Interview with Viktoria and Andreas Keding, *supra* note 30.

investigating potential sites for large-scale wind farms near Luderitz and Walvis Bay with wind measurement stations. The company is also looking at the potential costs and benefits of concentrated solar tied into the grid.[123] However, Amaambo shares NamPower's concern that some forms of large-scale renewables are not reliable enough to power the national grid. This concern is reflected in the parastatal's criteria for assessing which power development path to undertake; NamPower looks to see if the source is predictable, concentrated, and inexpensive.[124]

Jarrett describes Namibia as suffering from a lack of long-term planning. For effective energy planning, he urges that "[t]here has to be a balance between all three: short, medium, and long term." When attempting to finance renewable energy projects, renewables are generally considered a long-term investment—capital intensive upfront, but a good investment in the long-term. However, funds spent on a long-term generation goal would mean sacrifice in the short term.[125]

Some renewable energy stakeholders argue that NamPower has strong incentives not to promote renewables, pointing out that NamPower benefits more if people are paying for energy from the grid."[126] Others presented a more cynical view: "[t]here is a very strong lobby for coal. It provides jobs and supports the mining industry, and the people selling it are very close to the government."[127] In addition, "some of our top politicians have a vested interest in some of the petroleum import and distribution companies in Namibia."[128]

NamPower must refocus its priorities on long-term solutions to Namibia's energy problems or risk putting Namibia's economy further at risk. While the Southern African energy crisis must be dealt with swiftly, any solution that doesn't involve renewables will merely shift the problem elsewhere, from a short-term energy supply problem to a long-term dependence on foreign sources of fossil fuels.

b. Promoting Independent Power Production

Many energy stakeholders believe that Namibia will only be able to incorporate renewable energy into the grid if a decentralized supply system is established. Roedern articulates that "[t]he solution is one hundred percent renewable . . . this only can be achieved with a decentralized energy system where all the companies and the monopolies

123. Interview with Lahja Amaambo, *supra* note 26.

124. *Id*.

125. Interview with David A. Jarrett, *supra* note 22.

126. Interview with Uazamo Kaura, *supra* note 90.

127. Interview with Antonia Baker, *supra* note 72.

128. Interview with Marina Coetzee, *supra* note 91.

are broken up."[129] A variety of factors are hindering the implementation of such a policy. Namibia's electricity sector is a strict monopoly, providing the national utility with incredible bargaining power when negotiating power purchase agreements.[130] Furthermore, NamPower operates under the single buyer function, which requires that all parties contributing to the country's generation capacity or using the transmission infrastructure make an agreement with the utility before feeding electricity into the national grid. Wienecke explains that consolidating this agreement is accompanied by high transaction costs.

There is a general perception from many stakeholders that the NamPower monopoly is not promoting the proliferation of IPPs on a good-faith basis. NamPower officials assure they are negotiating with potential IPPs in good faith and working to "convince or to encourage investors . . . to start introducing this type of large-scale [renewable energy] project to feed into the grid to sell [power] to the municipality or electrical authorities."[131] As a business, NamPower has incentives to encourage IPPs. Last year, Namibia's credit rating was affected due to lost ground from the "frequent utilization of costly thermal generation sources in the tight supply scenario that has emerged in the SADC countries."[132] Reducing reliance on imports would raise credit ratings and save operational costs by reducing reliance on expensive imported electricity.[133]

Namibia needs IPPs integrated into the energy sector to inject innovation into a generally stagnant system operated exclusively by NamPower. The government has recognized this need and made policy statements intended to attract IPPs to Namibia.[134] Despite this open invitation, IPP investment, particularly concerning clean energy projects, is absent in Namibia. Only in the last few years has legislation been passed to allow IPPs to start producing power in Namibia; now Namibia must work within the limits of NamPower monopoly to create a policy incentivizing IPP development.[135]

Recently, the ECB released an Independent Power Production Plan, "Guidelines for Aspiring New Generation Applicants," in an attempt to facilitate independent power production license applications. This plan has yet to be tested.[136] Currently, the MME uses the regulations

129. Interview with Conrad Roedem, *supra* note 36.

130. *See* VON OERTZEN, *supra* note 18, at 8.

131. Interview with Noddy Hipangelwa, *supra* note 81.

132. FITCH RATINGS, *supra* note 43, at 1

133. *Id.*

134. *See* Konjore's Statement, *supra* note 14.

135. Interview with Marina Coetzee, *supra* note 91.

136. *See* ECB GUIDELINES, *supra* note 47.

established by the ECB to control licensing decisions that determine whether an IPP may sell electricity.[137] Without this license, an independent party may not generate, transmit, distribute, supply, export, or import electricity.[138] Although the ECB has received numerous applications for generation licenses, as of August 2009, no IPP agreements had been entered into.

Marina Coetzee believes that "everybody is just waiting for someone else first to go through all of the teething problems . . . someone just has to make the breakthrough of starting to sell power to NamPower."[139] The managing director of NamPower, Paulinus Shilamba, has publicly announced the Board's approval of the draft power purchase agreement between NamPower, Aeolus Associated, and United Africa Group.[140] Shilamba announced to the media that the successful completion of this agreement will ". . . pave the way for the development of the first ever IPP in Namibia."[141] This would be a tremendously important, and necessary, step in the development of Namibia's renewable energy resources.

c. Increase Tariffs to Reflect Energy Costs in other Nations

Namibia's artificially low tariffs provide huge disincentives to potential renewable energy investors. IPPs will not start to invest in Namibia until tariffs become cost reflective. When investors compare the costs of conventional and renewable energy sources there is a distortion because conventional sources are highly subsidized.[142] Amongst Namibian stakeholders, it is generally accepted that tariffs must be raised to reflect the market price of electricity as soon as practicable. The historically cheap supply of energy from South Africa has allowed Namibia to maintain artificially low energy tariffs compared to other developing countries.

While NamPower has resisted higher purchase tariffs, made possible by using cheap hydroelectricity to subsidize expensive energy purchased on the spot market, the ECB is now working to incrementally raise Namibia's tariffs to reflect SADC market value. Last year, the ECB approved a fifteen percent tariff hike for NamPower. According to the ECB, this increase in rates was designed as a step to bring the tariffs up to a cost-reflective level by 2011 or 2012.[143] However, as illustrated

137. The Electricity Act § 17 (2000) (Namib.).

138. ECB GUIDELINES, *supra* note 46, at 3.

139. Interview with Marina Coetzee, *supra* note 91.

140. *IPP's Could Help With Security of Supply*, NAMPOWER'S ELECTRONIC NEWSLETTER, Jan. 2009, at 1.

141. *Id.*

142. Interview with Harald Schütt, *supra* note 28.

143. PLANNING POWER, *supra* note 20, at 13.

by the CEO of the ECB, NamPower still needs large increases to reach cost-reflectivity, which will take place over the next few years.[144] Roedern from Solar Age explains that the proposed fifteen percent increase over present inflation in tariffs annually "means about a twenty-five percent [total]" hike in current energy costs.[145]

Feed-in-tariffs would help subsidize the high upfront cost of renewable energy, making investment in IPPs and small systems more attractive.[146] This is one area where Namibia could benefit from following South Africa's example. South Africa's energy regulator, NASAU, just instituted a feed-in tariff with some of the most attractive tariff prices worldwide for both wind and concentrated solar power.[147] A Namibian renewable energy feed-in tariff could offer access to the grid for transporting electricity and a price sufficient to spur renewable IPP development. Feed-in tariffs may also incorporate standard offer contracts, allowing eligible IPPs to contract for extended periods of time (20 years, etc.) at a set purchase price per unit of energy generated. The rapid growth of the renewable energy sector would create jobs and has the potential to spur local manufacturing and innovation.

Amaambo remarked that NamPower has been working with the ECB on potential tariffs designed to incentivize the conversion to renewables.[148] Some of the new tariffs have been instituted already. The ECB created innovative time of use tariffs that have proven to be very effective in encouraging consumers to use less energy at peak usage times.[149] Together, the ECB and NamPower are even contemplating some form of an emissions tariff. While these steps by ECB are welcome, another complaint from stakeholders and potential investors is that the ECB and NamPower tend to calculate and plan future tariffs behind closed doors. Amaambo related that, although NamPower and the ECB do have projections on future tariffs, those documents are not disclosed to the public.[150] The fact that NamPower does not provide the public with access to information about the purchase price of electricity deters potential investors.[151]

To facilitate new investment, the ECB must stop delaying tariff increases. Although these increases might be detrimental to consumers in

144. PLANNING POWER, *supra* note 20, at 59.

145. Interview with Conrad Roedern, *supra* note 36.

146. *See* PLANNING POWER, *supra* note 20, at iii.

147. Interview with Conrad Roedern, *supra* note 36.

148. Interview with Lahja Amaambo, *supra* note 26.

149. *Namibia: Price of Electricity Up*, ALLAFRICA,COM, July 3, 2009, http://allafrica.com/stories/200907030674.html.

150. Interview with Lahja Amaambo, *supra* note 26.

151. Interview with Werner Schütt, *supra* note 28.

the short term, they will promote investment in IPPs in the long term, eventually passing lower costs from a diversified energy supply to consumers. Future predictions about tariff prices as well as the decision-making process in establishing the tariffs should be transparent to supply potential investors with necessary information to determine future costs.

d. Allow Net-Metering

Net-metering allows renewable energy generators to feed excess generation into the grid to bank electricity with the utility. When generation does not meet consumption rates banked electricity is withdrawn from the grid. Currently, small-scale producers, including those with Solar Home Systems, are not compensated for power they feed back into the grid, although running the electricity meter backwards towards zero is allowed. Instead, when a system exports more energy to the grid than it has used, the meter stops at zero. Mr. Roedern from Solar Age explains that this system is not in the best interests of the client: "[y]ou can feedback, but you're not getting money out of it."[152] For clients who feed into the grid, Roedern would like to see net metering. Banking electricity could be permitted against a customer's annual consumption. In Namibia, most new residential connections are prepaid metering to avoid defaults on electricity bills. Ideally, what Roedern and other solar providers would like to see is "that prepayment meters could be used with net-metering. You could still pay for your basic service, but could be credited [for excess generation fed into the grid]."[153]

4. Promote Education and Awareness of Renewable Energy

There is a need to continue educational efforts that emphasize the long-term benefits of renewables and prove that these technologies actually work. In addition, efforts to train technicians and consumers about the operation of renewable technologies must be strengthened. Finally, the myth that solar and other renewable technologies are inferior to their traditional counterparts must be debunked.

a. Bolster General Perceptions of Renewable Energy in Namibia

The level of awareness for renewable energies in Namibia varies depending on the topic and the group of people. Stakeholders agree that awareness has increased drastically in recent years but stress the need for continued educational campaigns.[154] In raising awareness, educators from all sectors have been working on effective ways to distribute basic information about renewables. When the MET released climate change

152. Interview with Conrad Roedern, *supra* note 36.

153. *Id*.

154. Interview with Noddy Hipangelwa, *supra* note 81.

booklets and a series of posters promoting climate change awareness, they translated and printed them in four different local languages for distribution during public educational activities.[155] The government has also incorporated limited discussion about renewable energy into the educational curriculum.[156]

Many stakeholders are engaged in campaigns to raise awareness about renewable energy. Solar Age, a private supplier of solar technologies, uses a radio hostess in the north to spread their renewable energy message.[157] The HRDC conducts presentations to raise awareness about green living.[158] NaDEET was designed specifically to teach children about renewable energy, the environment, and climate change. Aside from teaching children everything from how to conduct an environmental audit to how to calculate the carbon reductions from switching fuels, the center also develops educational materials for school children.[159]

One of the biggest hurdles educators face is convincing people that renewable energy technologies work. Coetzee explained, "people are intimidated by the technology. Seeing is believing."[160] While judging youth at the national science fair, Schütt pointed out that kids are taught about solar cookers in school and can request information on how to construct them. "A few years back, we said science fairs were becoming boring because every year you had a whole bunch of solar cookers."[161] Dr. Wienecke linked the recent theft of the HRDC solar panels and compact fluorescent light bulbs to Namibians starting to believe in the value of renewables.[162] However, education efforts concerning renewable energy must be strengthened and further supported by the national government to ensure that the benefits of renewable energy and the detriments of fossil fuels are understood.

b. Train System Owners and Local Technicians

Essential to the longevity of any renewable energy system are the skills required to maintain and develop the technology. Namibia's labor force still needs to be trained in installing, troubleshooting, and developing renewable technologies. Namibia's engineering skills base remains small and underdeveloped, rendering most large-scale

155. Konjore's Opening Remarks, *supra* note 11, at 9.
156. Interview with Viktoria and Andreas Keding, *supra* note 30.
157. Interview with Conrad Roedern, *supra* note 36.
158. Interview with Dr. Andreas Wienecke, *supra* note 115.
159. Interview with Viktoria and Andreas Keding, *supra* note 30.
160. Interview with Marina Coetzee, *supra* note 91.
161. Interview with Dr. Andreas Wienecke, *supra* note 115.
162. *Id.*

technology projects dependent on foreign experts.[163] Small-scale technologies also face difficulties due to a lack of trained technicians to install and maintain the technology. Namibia's engineers and electricians, as well as end users, must be trained and educated about the basic use and maintenance of renewable energy technologies. Otherwise, as Jarrett explains, those untrained in the use of their solar home systems will have to constantly seek support or risk damaging the technology. [164] Common misuses of systems, such as replacing fluorescent bulbs with incandescent bulbs, or charging a car battery with solar panels, can ruin expensive technologies.[165] Without knowledge of proper use and maintenance practices, renewable technologies will not survive.[166]

The MME is currently attempting to tackle this problem with a program designed to train solar technicians. MME's goal is to establish at least one, ideally two technicians, in each of Namibia's thirteen regions.[167] To accomplish this goal, MME has been traveling from region to region conducting training sessions.[168] Unfortunately, many of the technicians trained in this program have already migrated to Windhoek in search of better employment prospects.[169] In response to this trend, the MME has adopted a new strategy of training primarily those who already have successful businesses and an incentive to remain in the area. [170] In addition, some solar suppliers train their customers because it saves businesses maintenance costs.[171]

Aside from basic installation skills, there is a need for better preparatory education to improve technicians' troubleshooting skills. One of the major gripes of solar suppliers is that they must teach basic math and engineering skills to their workers because the school system has not prepared them adequately. "If you talk energy, you talk engineering, you talk science, you talk math, which is a bloody mess here . . . nobody will go into electrical engineering."[172]

Training efforts must be maintained and expanded to teach Namibians about renewable energy technologies. Although Namibia's education system cannot be instantly overhauled, adequate math and science classes should be available to ensure the foundational skills to

163. VON OERTZEN, *supra* note 18, at 2.
164. Interview with David A. Jarrett, *supra* note 22.
165. *Id.*
166. Interview with Marina Coetzee, *supra* note 91.
167. Interview with Uazamo Kaura, *supra* note 88.
168. Interview with Noddy Hipangelwa, *supra* note 81.
169. *Id.*
170. *Id.*
171. Interview with Viktoria and Andreas Keding, *supra* note 30.
172. Interview with Dr. Andreas Wienecke, *supra* note 115.

train the next generation of electricians and engineers. Renewable technology training programs should consider possible language barriers and target those invested in their local communities. Businesses should be encouraged to continue providing basic training for consumers and to "foolproof" renewable energy technologies to avoid maintenance costs and to preserve the reputation of their technologies.

5. Discredit the Fallacy of Grid-Power for All

In Namibia there is a shared notion that development means grid power and that renewable energy is an inferior substitute for a grid connection. Renewables are occasionally scorned by communities as substandard substitutions for the "Western" development path.[173] Stakeholders seem to agree that if communities had a choice they would always hook up to the grid because it is perceived as more advanced. Mrs. Kaura grew up in an off-grid rural area. She explained that for Namibia's rural population, "development means electricity, and electricity means power lines—it doesn't really mean solar. Even if people have solar panels, at the end of the day, they still would like a power line running to the house."[174] Mr. Hipangelwa from the MME Solar Homes Program describes a project close to Windhoek where MME electrified several villages with solar energy. The villages, which were seven kilometers away from the grid, were unhappy because the solar prevented them from grid access in the future. [175]

With these attitudes, Mr. Hipangelwa suggested that solar is only good as a primary means of electrification for remote areas, unlikely to receive future access to the grid. "Those communities are very appreciative of solar electrification efforts."[176] With rural electrification efforts, Mrs. Kaura believes that "people are happ[ier] with solar panels than having no electricity at all." [177] However, "[i]f you just gave me a solar panel for free, the mentality is [that] I still need [grid] electricity."[178]

For large-scale and small-scale renewable energy development to succeed in Namibia, these misperceptions must be vanquished. A promotional campaign equating these technologies to cutting-edge power production in the United States and Germany would dispel notions that solar home and off-grid electrification is a lesser form of development.

173. Interview with Harald Schütt, *supra* note 28.

174. Interview with Uazamo Kaura, *supra* note 88.

175. Interview with Noddy Hipangelwa, *supra* note 81.

176. *Id*.

177. Interview with Uazamo Kaura, *supra* note 88.

178. *Id*.

Whenever possible, aid agencies and government should also avoid technology "handouts" which convey the idea that solar technologies are not valuable.

6. Other Ways to Promote Renewable Energy in Namibia

a. Aggressively Combat the Theft of Renewable Energy Products

Perhaps one of the most tangible barriers to renewable energy development in Namibia is the one most commonly splashed across the pages of the Namibian newspapers: the theft of PV panels. In Namibia, theft is a major problem, especially in the north.[179] Werner Schultz tells about the installation of a solar water pump in Caprivi. Terrasol installed the pump to bring a tap to a village where women and children had been carrying water 12 kilometers daily. The project went flawlessly until locals recognized that solar panels were easy money and *sold* the solar panels before trying to claim another set from the German Development Service.[180] Theft of communally-owned PV panels is common, leading some to believe that the combination of charitable handouts and a lack of personal ownership over systems facilitates theft. Individual ownership has proven to be somewhat more successful. "If they have to buy something . . . it doesn't get stolen. But if it's handouts, if it's standing two kilometers away . . . then solar panel theft is a big problem."[181] Others attribute the high rate of theft to opportunism paired with Namibia's incredible poverty. Mr. Jarrett believes that theft is exacerbated by the remote placement of systems.[182]

On the bright side, almost everyone agrees that the surge of equipment theft reflects a growing awareness that renewable energy products are valuable and functional. Mr. Hipangelwa from MME explains that "through the awareness, we now have got problems of theft . . . People now know the importance of the solar panels. They know that this is a very important component—it's a generator, and out of that you can generate electricity."[183] Nonetheless, fear of theft has a real impact when solar technologies are a major lifetime investment for most Namibians.

To combat the problem of theft, the Namibian government must fully invest in the system of solar-panel tracking set up by some solar-installers. In addition, there should be increased penalties for the theft of these systems due to the negative impact these types of crimes have on

179. Interview with Dr. Andreas Wienecke, *supra* note 115.

180. Interview with Werner Schultz, *supra* note 23.

181. *Id*.

182. *Id*.

183. Interview with Noddy Hipangelwa, *supra* note 81.

an industry that is important for the future development of Namibia. There should be similar penalties for suppliers or businesses that purchase panels for resale without checking their status in the database or if the tracking mechanisms (such as serial numbers, etc.) have been removed or tampered with.

b. Promote Local Manufacturing of Renewable Energy Products

Namibia relies heavily upon imported manufactured goods. Local production of renewable energy technologies would provide jobs, skills training, and simultaneously make these products more affordable for Namibia's poorer population. When asked what would help facilitate the spread of renewables, Mr. Hipangelwa from MME suggested "[e]ncouragement of manufacturing of the products [in Namibia] . . . because you'd have jobs and you'd have infrastructure."[184] In his view, the country should manufacture "all the accents that are related to renewables [because] it provides energy security."[185]

Currently, local suppliers have difficulty manufacturing even the most basic products in Namibia. Werner Schultz explains that after he developed an efficient cook stove, Terrasol could not find a suitable place in Namibia to manufacture it. The capacity was simply unavailable. That said, a few programs have been established to manufacture basic technologies such as solar stoves.[186]

Namibia's lack of manufacturing capacity is a problem that reaches far beyond the issue of renewable energy development. However, the government could spur manufacturing in the country in general by promoting policies that encourage the expansion of both large-scale and small-scale renewable energy technologies and investing in the educational programs necessary to develop a work-force qualified to produce these types of products.

c. Work with Traditional Authorities to Address Land Tenancy Issues

Land ownership issues are a primary area of concern for potential renewable energy investors. Of special concern are laws that permit the government to expropriate land owned by citizens and foreign owners alike, even though these laws are largely unexercised.[187] A law allowing the government right of first refusal in private agricultural land sales raises transaction costs for investors by dragging out the time it takes to complete lease and purchase agreements. Finally, the legal interplay with land transactions and the constitutional rights of traditional authorities is

184. Interview with David A. Jarrett, *supra* note 22.

185. *Id*.

186. Interview with Noddy Hipangelwa, *supra* note 81.

187. Agricultural (Commercial) Land Reform Act § 14(2) (1995) (Namib.).

difficult for investors to navigate and can increase the number of parties in a land transaction.[188] In addition, Andreas explains that the price of land has been rising recently and that there are difficult issues associated with purchasing land from the government.[189] A combination of traditional law and Namibian Constitutional law makes land purchases "very complicated."[190]

Land tenancy issues have prevented investors from carrying out renewable energy projects in Namibia. Marina Coetzee explains that one group looking into biofuel production withdrew from Namibia after spending two years and roughly N$1 million working with local communities and completing an environmental impact assessment. After lawyers began drawing up individual contracts to plant Jatrophas Curcas trees on communal lands allocated to individual farmers, the company withdrew because they couldn't get final lease agreements for the factory.[191]

While politically perilous, the government should begin a dialogue with traditional authorities relating to renewable energy development on communal land or risk further marginalizing rural populations. The government should also offer reasonable land security assurances to reassure aspiring investors that their investments will be secure. An easily accessible guide explaining the process and legal issues associated with land transactions would allow potential investors to more accurately predict the procedural and legal restraints associated with renewable energy development in Namibia.

d. Promote Renewable Energy Projects that Account for Cultural Norms

For renewable energy to succeed in Namibia, it is essential that technologies be embraced by varied communities and cultures. Western technologies and models will not succeed unless they are adapted to the local conditions and cultures. Mr. Schütt explained that "European solutions for African problems usually don't work—you see that in the field of energy."[192] Namibians must be provided with options that can fulfill their wants and needs at an affordable price. If technologies are not culturally appropriate, they risk rejection. This is the lesson learned from solar stoves projects in certain regions where the project goals clashed with the culture of having a fire. Historically, fire also has been essential for providing light after sunset. Losing opportunities to

188. Interview with David A. Jarrett, *supra* note 22.

189. Interview with Dr. Andreas Wienecke, *supra* note 115.

190. Interview with Viktoria and Andreas Keding, *supra* note 30.

191. Interview with Marina Coetzee, *supra* note 91.

192. Interview with Harald Schütt, *supra* note 28.

socialize around the dinner fire was a substantial cultural cost to families cooking with solar stoves.[193]

Technologies successful in the private market are a prime example of "appropriate" local technologies. Solar home systems are growing in popularity, particularly with Namibia's middle and upper class, and are in constant demand. Viktoria from NaDEET relates, "[m]ost people get one panel, a battery, and a television. That's it."[194] Solar Age's Mr. Roedern explains that, "Africa resists development until something more sustainable comes, and then it gradually will develop. But you cannot develop someone from the outside."[195]

Cultural and social norms can also operate to hinder renewable energy development under certain circumstances. The ecological benefits of converting to renewables, such as reducing GHG emissions and preventing local pollution, are not yet incorporated as normative values in larger Namibian society. Viktoria explains that, "[p]eople in Namibia in general do not look at pollution as a problem.[196] Dr. Weineke from the HRDC explains that Namibians focus on immediate costs and benefits.[197] "There is no future. You must understand the African way of living."[198] The Kedings at NaDEET agree that "future thinking is not African thinking . . . people think about right now . . . With renewable energy you have to also think about the future benefits."[199]

Promoting renewable energy technologies that are incompatible with cultural practices and values is an uphill battle. Although societal practices change over time and new technologies are adapted, attempting to force this conversion is likely to be futile. Similarly, adopting a societal norm which places a substantial value on the ecological benefits of renewables is something that must occur naturally and cannot be forced. Until Namibian society begins to consider the positive ecological benefits renewables offer, these benefits will not be factored into the costs of renewable energy technologies. In the meanwhile, many individual energy supply purchasing decisions will continue to be made solely on the basis of cost. As a result, while education is important, renewable energy planners and policymakers in Namibia must be patient. They must take into account traditional lifestyles and sentiments, or risk leaving behind large swaths of Namibia's tremendously diverse population in the shift towards a clean energy future.

193. Interview with Viktoria and Andreas Keding, *supra* note 30.

194. *Id*.

195. Interview with Conrad Roedern, *supra* note 36.

196. Interview with Viktoria and Andreas Keding, *supra* note 30.

197. Interview with Dr. Andreas Wienecke, *supra* note 115.

198. Interview with Werner Schultz, *supra* note 23.

199. Interview with Viktoria and Andreas Keding, *supra* note 30.

7. Work to Reform the Clean Development Mechanism

The Kyoto Protocol of the United Nations Framework Convention on Climate Change ("Kyoto Protocol") was designed to be the foundation of an international framework to combat global warming through the reduction of greenhouse gas emissions.[200] To facilitate cost-effective reductions and involve developing nations in the climate change body, the agreement incorporated various flexibility mechanisms that countries could employ to meet their emission reduction commitments. The mechanism to create emission reductions in developing nations is the Clean Development Mechanism ("CDM").

The principal underlying the CDM is that all emissions, regardless of their source, contribute to global emissions levels, so emissions reductions should be achieved where they are most cost efficient. This understanding allows developed countries to achieve reductions by financing projects in developing countries, which generally cost the least. By utilizing the CDM, developing nations may participate in carbon reductions projects that ultimately lead to the generation of Certified Emissions Reductions ("CERs"), which can then be sold to countries with binding commitments to reduce emissions.[201] Ideally, developed countries benefit from the CDM by achieving reductions at a lower cost, while the support of financing and technology from developed countries allows developing countries to develop sustainably. For a country to be eligible to host a CDM project, the country must have ratified the Kyoto Protocol and have a CDM Designated National Authority ("DNA").

When the latest figures for Namibia's greenhouse gas emissions were released in 2000, Namibia was a net carbon sink, sequestering more carbon dioxide than it emitted.[202] This sequestration occurred largely because of land use changes and the proliferation of invader bush. Where emissions did occur, most came from agriculture (6,700 Gg) and energy (2,200 Gg).[203] Although historically low, Namibia's rapidly increasing use of fossil fuel-based energy and a growing need for local electricity generation is expected to increase Namibia's carbon balance in the years to come.[204]

Namibia ratified the Kyoto Protocol in 2003, and in 2007 established a DNA within the MET.[205] Uazamo Kaura is Namibia's

200. *See* Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 37 I.L.M 22.

201. *Id*.

202. VON OERTZEN, *supra* note 18, at 2.

203. *Id*.

204. *Id*.

205. Wezi Tjaronda, *Namibia: DNA and CDM to Facilitate Investments*, ALLAFRICA.COM, Aug. 9, 2007, http://allafrica.com/stories/200708090617.html.

temporary DNA, and describes her position as "quite new."[206] As of August 2009, Namibia had not yet established a CDM desk, despite having previously announced plans to do so in the Ministry of Trade and Industry ("MTI"). In addition, Namibia has yet to register a single CDM project. Representing Namibia at the Third World Climate Change Conference in September 2009, Selma Ashipala-Musavyi reported that:

> [In Namibia t]here has been modest reported progress and achievements especially with regard the Clean Development Mechanism (CDM) and Africa is still lagging behind in many aspects. Under the new Kyoto Protocol agreement, Namibia believes that there should be a simplification of CDM methodologies, and concentration of small scale CDM projects targeted for smaller economies. In the case of technology transfer, environmentally sound-technologies, suited to local conditions should be promoted. The removal of barriers to promote technology transfer including access to finance and a resolution on intellectual property rights is imperative.[207]

Mrs. Kaura has encountered numerous barriers to CDM projects in Namibia. Although Kaura has reviewed many projects, most of them are still currently at the start of the planning stage.[208] During the summer of 2009 Kaura estimated that Namibia had six projects in the CDM pipeline.[209] In addition, she had recently cleared two Project Idea Notes ("PINs"), one cement factory and one geothermal project.[210] However, during her interview, she did not seem overly optimistic that any of the projects in progress would succeed.[211] The CDM registration process is plagued by numerous barriers, including the complexity of the registration process, misconceptions about registration requirements, high costs of the registration process, difficulties in proving additionality, and an extremely low grid emissions factor.

Registering a CDM project is a long, drawn-out process, which can take substantial funds, institutional knowledge, and years to complete. For a small country, the CDM process itself is prohibitive because of the sheer number of steps and assessments that must be conducted. Kudakwashe Ndhlukula, Coordinator of the Renewable Energy &

206. Interview with Marina Coetzee, *supra* note 91.

207. Selma Ashipala – Musavyi, Permanent Representative of the Republic of Namibia to the UN, Statement Delivered on the Occasion of the Third World Climate Conference 5 (Sept. 4, 2009) *available at* http://www.wcc3.org/wcc3docs/pdf/HL_namibia.doc.

208. Interview with Uazamo Kaura, *supra* note 88.

209. *Id.*

210. Interview with Antonia Baker, *supra* note 72.

211. *Id.*

Energy Efficiency Institute, summarizes the situation, complaining that ". . . most of us . . . are quite overwhelmed with the process. [212] Mrs. Coetzee describes the CDM bureaucracy as "mindboggling" and explains that navigating this bureaucracy is very difficult for African countries.[213]

Furthermore, there are many misconceptions about the CDM process. Antonia Baker came to work at the Namibia Nature Foundation from the United Kingdom. In her opinion, without dissemination of educational material about CDM, it is no surprise that many projects have not even considered using CDM. [214] One of these misconceptions is that projects are not even eligible for CDM registration unless an industrialized country invests in a Namibian project. This misconception has led potential project developers in Namibia to disregard unilateral CDM projects under the belief that such projects would be ineligible for CDM registration. In reality, developing countries do have the option to implement unilateral projects that are planned and financed within the country. Such projects require no foreign direct investment and produce the same type of CERs as other CDM projects, which can then be sold to industrialized countries.

There is a dire need for education concerning the CDM. As a first step, the MET is in the process of developing a website with the Namibian CDM rules and regulations, which are not currently available online.[215] Aside from educational and bureaucratic barriers, the primary reason offered for Namibia's lack of CDM projects is the large upfront investments in the CDM registration process without any assurance that the project will eventually be credited with CERs. "CDM, at the moment, is beyond our reach. It's a catch-22 situation. You can only get CDM credits if you can prove the project wouldn't have worked without them, but you can't get credits for the project until you are already producing."[216]

Scale and cost of the CDM registration process also hobble potential CDM projects.[217] Mr. Roedern laid out the problem succinctly: "CDM costs, for our size, too much." By his estimates, by the time a project made it through the CDM registration step alone, the cost of registration would have already amounted to N$100 million.[218] Ms. Baker, of the

212. Interview with Kudakwashe Ndhlukula, MSc. Eng. (Renewable Energy), CEM Coordinator, Renewable Energy and Energy Efficiency Institute, in Windhoek, Namibia (July 16, 2009).

213. Interview with Marina Coetzee, *supra* note 91.

214. *Id.*

215. Interview with Uazamo Kaura, *supra* note 88.

216. Interview with Antonia Baker, *supra* note 72.

217. *Id.*

218. Interview with Conrad Roedern, *supra* note 36.

Namibia Nature Foundation, suggests that the CDM is only really viable for large-scale energy efficiency or energy production projects."[219] Ms. Kaura laments that large projects eligible for CDM credits are too big for Namibia to handle.[220] Most single projects in Namibia are far too small to justify the cost, and for owners of multiple small projects, bundling has proven far too inefficient.

The CDM rules also require that any reductions achieved as a result of the project are "additional" to reductions that would have been achieved in the absence of the project. Mrs. Coetzee describes this requirement as "the fly in the ointment of the CDM process."[221] Additionality is a difficult concept to prove, and the information required to prove it is expensive to attain. The additionality requirement is also perceived as penalizing environmentally-friendly policymaking because projects that result from these policies would not be additional.[222] For example, NamPower reduced Namibia's maximum demand from 449MW in 2007 to 430MW in 2008 through demand side management programs, including the mass distribution of CFL bulbs.[223] NamPower and the government worked together to implement this policy in order to reduce peak demand and expensive purchases on the spot market. Because these measures were cost-effective without CERs, the additionality requirement could not be satisfied. "NamPower, at the end of the day, does not get any CDM credits because they made it a *policy* to replace all the light bulbs."[224]

The grid emission factor, which is used to determine the carbon intensity of electricity produced on the grid, add to the difficulty of establishing CDM projects in Namibia. This emission factor is used to establish a baseline against which emission reductions are measured, ultimately determining the amount of carbon dioxide emissions offset when grid energy is displaced by a less-carbon intensive alternative. When calculating the grid emission factor, only the in-country carbon dioxide *sources* are assessed. Imported energy is not taken into account. Therefore, the carbon-intensive energy Namibia imports from South Africa, approximately fifty percent of Namibia's total energy consumption, is not factored into Namibia's grid emission factor when establishing CDM baselines.[225] This is a major barrier for renewable

219. Interview with Antonia Baker, *supra* note 72.

220. Interview with Uazamo Kaura, *supra* note 88.

221. Interview with Marina Coetzee, *supra* note 91.

222. Interview with Harald Schütt, *supra* note 28.

223. NamPower, Media Statement, *supra* note 70, at 2.

224. Interview with Uazamo Kaura, *supra* note 88.

225. Interview with Robert Schultz, Senior Project Manager, Energy Desk, Desert Research Foundation of Namibia, in Windhoek, Namibia (August 6, 2009).

energy projects designed to displace Namibia's reliance on energy imported from South Africa. Namibia's grid emissions factor is so low it creates difficulties in satisfying the additionality requirement when new renewable energy producers appear to be displacing hydroelectricity.

The Namibian government must take steps on its own to streamline the CDM process and reduce the costs of implementation for interested parties. However, more importantly, the government must address the barriers to CDM implementation in the international community, during meetings following the Copenhagen Climate Summit. In general, Namibia must work to (1) to strengthen the DNA, (2) activate the CDM office at the MTI, (3) find an effective way to compare emission reductions to a baseline study, (4) establish feed-in tariffs for renewable energy through the ECB, (5) incentivize public and private partnerships, (6) raise awareness and knowledge of the CDM process, and (7) address issues like additionality, verification, and project scale, which all increase the costs of CDM projects, by communicating with the CDM Secretariat and advocating for streamlined CDM procedures that are more in-line with the realities of project implementation in rural sub-Saharan Africa.[226] Namibia should also consider working with Voluntary Emission Reductions ("VERs") to gain experience in the carbon markets. Voluntary standards are generally more flexible than CDM requirements, and may allow different procedures, such as accounting for grid emission factors on a regional basis.

V. THE FULL SOLUTION: A CARBON-FREE, SMALL-SCALE, RURAL-FOCUSED ENERGY SYSTEM THAT MEETS THE NEEDS OF THE ENERGY POOR

While the construction of large-scale, grid-based renewable energy projects are important for Namibia's future development, the constraints of grid-based power must not be underestimated. An energy policy that, by design, fails to meet the needs of seventy percent of the Namibia population is unacceptable. To truly meet the needs of the energy poor, the Namibian government must devote at least as many resources to small-scale, off-grid electrification as it does to satisfying the needs of residents of Windhoek and large industrial energy users. The installation of a multibillion dollar generating station to provide electricity for a large new industrial user, like a uranium mine, has the potential to provide hundreds of jobs to select Namibians in one region. Making a similar large investment in small-scale energy technologies for use by the over 1

226. Interview with Noddy Hipangelwa, *supra* note 81.

million Namibians without access to grid electricity would have a positive effect on many more Namibians living in regions across the country.

Many agree that basic living conditions must be improved in Namibia's rural areas to staunch the flow of people to the informal settlements around Windhoek and other larger cities. There are complaints that the government's 2030 Vision is not actually targeting the needs and wants of the rural population. "Too many times people tell people what is good for them without finding out what they need."[227] "If we continue to provide systems that give people sub-standard living . . . [we are not] encouraging people to stay where they are and meet their needs."[228] It is important to provide every socio-economic class with adequate resources, including electrical energy.

The general consensus is that Namibians find small-scale PV home, school, and business systems attractive.[229] In off-grid areas, a PV system can provide access to information and help connect remote areas to the rest of the world. In addition to educational benefits, one of the key benefits of renewables in rural areas is that they provide business opportunities. A large part of the local solar supply sector is selling solar systems to charge cell phones or power hair clippers at salons.[230] Even selling the water generated by a solar-powered pump presents a business opportunity.

A. Governmental Efforts to Promote Small-Scale Renewable Energy

While government and private investment in small-scale renewable energy and off-grid rural electrification is tiny compared to the amount invested in obtaining grid-based energy supplies from fossil fuel sources, the government has taken some useful steps to deal with the rural electrification problem. "Rural electrification targets are well-defined, . . . [but] access to sufficient funding, systematic implementation, socio-demographic changes and developments, changing social upliftment priorities, and unplanned electrification activities remain the most important challenges."[231] The government must increase its support for programs that address the rural energy poor, including the Solar Revolving Fund and the Regional Energy Shops

227. Interview with David A. Jarrett, *supra* note 22.

228. *Id*.

229. Interview with Conrad Roedern, *supra* note 36.

230. *Id*.

231. PLANNING POWER, *supra* note 20, at 11.

Initiative. In addition, mini-grids, such as the one to be established in Tsumkwe, should be set up in every region of Namibia to educate the public about the benefits of renewable energy and streamline the process of constructing such systems. The government must build on the success of these innovative programs, which have a tremendous impact on the lives of individual Namibians.

1. The Off-Grid Master Plan and Solar Revolving Fund

Because of the cost, delay, and infeasibility of connecting many smaller isolated communities to the grid, the off-grid master plan was designed to electrify these communities through alternative means, namely through solar home systems or larger solar-hybrid systems.[232] The MME developed the plan in consultation with numerous stakeholders, including local authorities. Mr. Ndhlukula explains that the idea is to approach electrification in collaboration with the grid section to avoid

> the awkward situation when . . . a solar village, a few years down the line, [ends up with a] grid passing through the area. The master plan identifies for solar those areas that are not likely to be electrified in the next 20 years. Unfortunately, most of those slated to remain without grid access the longest are the poorest populations, the populations that in general cannot afford these systems.[233]

Since 1995, Namibia has had a solar revolving fund system designed to create a fund from which Namibians can borrow money for small-scale solar systems. Loans are available for solar home systems from MME, and also for solar cookers, solar water heaters, and solar water pumping. For solar home systems and solar water pumps, the fund will give loans up to N$55,000; loans up to N$25,000 are available for solar water heaters. Applicants can fill out applications in their rural area and suppliers will send them to the fund administrator in Windhoek. Administrators of the fund will then decide who receives loans on behalf of the MME.[234]

From the time of its creation, the solar revolving fund has been passed from one administrator to another. Poor management by select administrators in the past has created "a cynicism about the fund being badly handled."[235] In the past, one administrator even went bankrupt.[236] Most recently, the fund was taken over by the First National Bank

232. Interview with David A. Jarrett, *supra* note 22.

233. Interview with Dr. Andreas Wienecke, *supra* note 115.

234. Interview with Noddy Hipangelwa, *supra* note 81.

235. Interview with Antonia Baker, *supra* note 72.

236. Interview with Kudakwashe Ndhlukula, *supra* note 219.

("FNB").[237] FNB entered into an agreement with UNDP to provide N$6 million for administration and interest for the solar revolving fund. Loans were to be distributed at a rate of three percent over five years. In November 2009 the bank said it would no longer process new loan applications because of the difficulties it was having with applicants and solar installers.[238]

There is not enough money in the fund to go around. In August 2009, Mr. Hipangelwa estimated that during the fund's existence MME was only able to issue between 1,000 and 1,600 loans.[239] At that time the fund had a backlog of 1,000 applications; to grant each of those loans would amount to 20 million NamDollars.[240] "The solar revolving fund has been very successful, except the demand has completely outstripped the supply."[241] He explains that, "the contribution from the government, what they normally put into the scheme, is just peanuts, just a drop in the ocean, because the demand is so high."[242]

Along with a lack of funding, loans tend to be given to the customers that are the most likely to pay them back, generally prohibiting the rural poor population from accessing the fund. Mr. Roedern speculated that the initial stages of the fund were more effective because the fund discerned amongst customers to find "customers who need[ed] solar systems and who [could] pay for them." Werner Schultz explains that the fund was distributing larger loans to more stable borrowers, particularly those in larger-scale agriculture, who were preferred over more risky solar home system borrowers. Rural individuals, often sustenance farmers, had little upfront cash and sporadic incomes, generally prohibiting them from accessing loans. Werner Schultz complained that Terrasol "had customers wait two years to get their loans . . . because they [didn't] have a lot of money."[243]

It is undeniable that the fund has a considerable backlog, and will be unable to provide funds for Namibia's poor off-grid communities.[244] It is also evident from the number of applications submitted that the program could be tremendously successful if adequately supported by the government. While meeting the demand for solar home systems may be

237. *Id.*

238. Yanna Erasmus, *FNB Backs Out of Solar Funding*, THE NAMIBIAN, Nov. 18, 2009, *available at* http://www.namibian.com.na/index.php?id=28&tx_ttnews[tt_news]=61950&no_cache=1.

239. Interview with Noddy Hipangelwa, *supra* note 81.

240. *Id.*

241. Interview with Antonia Baker, *supra* note 72.

242. *Id.*

243. Interview with Werner Schultz, *supra* note 23.

244. PLANNING POWER, *supra* note 20, at 11.

expensive, this cost pales in comparison to the cost of constructing new large-scale generating stations and associated transmission capacity. For there to be energy justice in Namibia, the government must invest as much in rural residents as they do in urban residents. The solar revolving fund is an established mechanism that could allow the government to meet the energy needs of the rural poor at a comparatively small cost.

2. Solar Water Heater Program

One of the government's most successful renewable energy initiatives is a cabinet directive ordering the replacement of electric water heaters with solar water heaters.[245] Enacted in June 2007, the directive makes it compulsory to install solar water heaters in every government or state-owned building that is newly constructed or remodeled, and to replace electric heaters that have broken down.[246] Solar water heaters mitigate the usual peak electric consumption caused by electric water heaters, which saves NamPower and consumers money because electricity at peak energy hours is more expensive to generate than what it can be sold for.[247] The Namibian government should be applauded for taking this type of bold action.

3. Regional Energy Shops

MME is partnering with the Renewable Energy and Energy Efficiency Institute of the Polytechnic of Namibia ("REEEI") and local suppliers to establish energy shops in rural communities throughout each of Namibia's thirteen regions. Outside Namibia's larger urban areas, it is difficult to actually purchase renewable energy technologies, even if a person has the finances and desire to do so. To address this concern, in June of 2007, the government passed a cabinet directive to establish a series of off-grid energy shops, starting with one in every region. Upon completion of the project, there will be fifty-six energy shops in strategic locations around the country.[248]

Mr. Ndhlukula explains that Namibia needs these energy shops because Namibia's population is widely dispersed, making it difficult for people in rural areas to address technical problems or access renewable technology devices.[249] Energy shops will be based out of pre-existing shops run by locals and primarily stocked with smaller renewable energy components. Shops will also serve as information hubs for REEEI so that

245. Interview with Conrad Roedern, *supra* note 36.

246. Interview with Noddy Hipangelwa, *supra* note 81.

247. Interview with Conrad Roedern, *supra* note 36.

248. Interview with Noddy Hipangelwa, *supra* note 81.

249. Interview with Kudakwashe Ndhlukula, *supra* note 212.

policymakers will be able to use them to gather information. REEEI will collect yearly information on installations and sales to create a profile on renewable energy in Namibia.[250] For financing, these shops will have access to the solar revolving fund, as will the rural Namibians looking to access small loans to purchase renewable energy technologies. Public institutions are also expected to contribute grants for the shops, in lieu of supporting the grid electrification process.[251]

The "Energy Baskets" stocked at the Energy Shops will be tailored to the needs and conditions of each area. Mr. Ndhlukula explains that they will have different sizes of solar panels matched with the products, such as lightbulbs, that each basket is designed to power. He explains that "a customer can just come and say, ok, I need six lights . . . and to power a radio." The supplier will then give the customer his options for panels in terms of baskets A, B, or C. The first energy shops are expected to be up and running in August 2009.[252]

4. Tsumkwe Energy Project

Over 200 miles of unpaved road away from the highway, far from other development in the Otjozondjupa Region, lies Tsumkwe, which used to be known as "the last bastion before the border" during the Namibian border wars. Today it is known as Namibia's largest off-grid settlement, and a beacon of hope for Namibia's renewable energy sector.[253] Tsumkwe is on the road to becoming electrified by southern Africa's largest hybrid system. Designed and implemented by a coalition of the DRFN, NamPower, and the Otjozondjupa Regional Council, the Tsumkwe Energy Project is creating a mini-grid powered by a solar-diesel hybrid electricity generating station that will generate 130 KW upon its completion in 2011.[254] Mr. Jarrett was one of the people implementing the Tsumkwe Project. He explains that once the PV is up, the generator will be used only when necessary. As designed, the system could power a town of about 700 locals, roughly 800 boarding school students, a radio station, two telecom transmitters, and a TV transmitter. However, since the initiation of the project, plans for a brand-new courthouse, requiring more than half of the planned capacity of the project, have been approved.[255] Despite this hurdle, if the Tsumkwe

250. *Id.*

251. *Id.*

252. *Id.*

253. Interview with David A. Jarrett, *supra* note 22.

254. Desert Research Found. of Namibia, Tsumkwe Energy Project, http://www.drfn.org.na/htm/energy_desk/energy_tsumkwe_energy.htm (last visited Feb. 28, 2010).

255. Interview with David A. Jarrett, *supra* note 22.

project is successful, it will provide a blueprint for the development of additional distributed energy projects in Namibia's rural areas.[256]

B. Namibian NGO and Private Sector Approaches

Namibian's NGOs and the private sector have worked to address many important issues, including education concerning renewable energy, climate change, and the establishment of profitable markets for small-scale renewable energy products. Donors and the Namibian government must continue to support grassroots efforts to educate the public, especially children, about the benefits of renewable energy. Environmental curriculum concerning renewable energy and climate change, like that developed by NaDEET, must be taught in schools across the country. Research like that conducted by the NNF, DRFN, and similar organizations must be supported by the government and donors. In addition, the government must provide incentives that allow small renewable energy to succeed. The government, donors, and investors must work to scale up these innovative initiatives and integrate them into a national strategy to address the needs of the rural poor.

1. Namib Desert Environmental Education Trust

One of Namibia's most unique renewable energy projects is the Namib Desert Environmental Education Trust ("NaDEET"), an educational center located just south of the NamibRand Nature Reserve. Founded by Viktoria Keding and her husband Andreas, NaDEET is on a mission "to empower Namibians to look forward to a sustainable future." The NaDEET center teaches visiting students about four focus areas: energy, water, waste, and biodiversity. Embracing a "practice what you preach" philosophy towards sustainable living, almost all of the NaDEET center's energy is generated from the sun of the Namib Desert. Mrs. Keding explains:

> We have solar energy, we use solar water heaters, we also have direct solar energy, which is through using solar ovens. In the mornings, when there's no sun, we do use a fuel efficient stove, but we use recycled paper to burn in those stoves. . . at the NaDEET center, under ideal conditions, unless something goes wrong, the only resource of fossil fuel that we use is our vehicles.[257]

Every year, the center educates around 700 children from all over Namibia. At the center, children engage in various experiments to learn how renewable energy works. NaDEET uses the Namib Desert as a

256. *Id.*

257. Interview with Viktoria and Andreas Keding, *supra* note 30.

classroom, linking the natural environment with renewable energy and sustainable living in general. "We use the Namib Desert, and the animals that live here support the foundation that nature has been doing this all along.[258]

2. Namibia Nature Foundation

Namibia Nature Foundation ("NNF") is working with the Ministry of Agriculture and farmers around Namibia to create a project that integrates invader bush into the nation's energy portfolio. Invader bush is an ecological nuisance, but a promising source of energy. Antonia Baker, Climate Change Project Coordinator for the NNF, explains, "in Namibia, we have a lot of encroaching bush plant. They cover large areas of land, soak up all the water, ruin the land for everything else, and turn it into desert. You can't farm on it." Her philosophy is that "if they can't get rid of it, might as well use it." NNF is currently investigating options for converting bush into biofuel, biodiesel, and biochar. "We have a couple of small-scale charcoal schemes. It would be community work, where [we] provide the training, and the stoves, and they sell the charcoal to the large companies." Another benefit of charcoal production is that it could be used as a fertilizer, Antonia explains. "Namibia has very dry sandy soil, and when you add a small amount of biochar, it increases the water retention, which increases the fertility of the land. It's not a fertilizer itself, but it's a catalyst, it helps use all the available nutrition."[259]

3. Valombola Solar Stove Project

In 1997, Mr. Schütt trained five women from the Valombola Vocational training center in Ongwadiva to start the Valombola Solar Stove project. The program was designed to combat deforestation, employ local woman, and reduce the wood-gathering workload of women and children by selling solar ovens. Women were employed and trained to construct the ovens and empowered as local entrepreneurs. The two women who currently run the project make two types of stoves: a "chicken-sized stove" that costs N$600 and a "goat-sized oven" which costs N$1,000. The women build about sixty stoves per year at the training center, with almost all Namibian materials. The women also attend trade shows and do cooking demonstrations, baking food samples so skeptics can try the food for themselves.[260] The project has become a local model for empowering entrepreneurs and Mr. Schütt has plans to

258. *Id*.

259. Interview with Antonia Baker, *supra* note 72.

260. Interview with Solar Stove Project in Ongwediva, Namibia (July 2009).

expand, including the development of a commercial bread-baking device.[261]

4. Solar Age

Solar Age was established in 1989, and since then has earned a reputation as one of Namibia's most successful and trustworthy solar providers. Conrad Roedern, an Electrical Engineer from Germany, is the Managing Director and founder of the company. He created the company because he was passionate about bringing modern energy services to Namibia's rural areas and reducing Namibia's reliance on imported fuel sources. Today, the original store in Windhoek employs twelve people, and Solar Age has opened a second branch in Ondangwa to cater to the northern population and Angolans.[262]

Solar Age installs and maintains solar home systems, solar water geysers, and solar water pumps, specializing in PV and hybrid energy systems for rural areas. Among the company's many accomplishments is setting the standard for the Namibian home power program, and the electrification of more than 100 rural schools, clinics, and police stations with solar technologies. Perhaps more important than these accomplishments are the policies Solar Age abides by to contribute to sustainable development in Namibia. Solar Age has a policy that includes goals such as helping to mitigate climate change, encouraging policymakers to adopt a sustainable energy path, and offering skills training and employment to previously disadvantaged people, all while satisfying the energy needs of clients from a large swath of Namibia's population.[263]

5. Desert Research Foundation of Namibia

Desert Research Foundation of Namibia ("DRFN") has a vision to enhance decision-making in Namibia in support of sustainable development. According to Robert Schultz, DRFN's Energy Desk Senior Project Manager, renewable technologies play a central role in this vision. DRFN believes that innovative projects designed to solve Namibia's water, land, and energy problems are essential to achieving DRFN's sustainability goals. The Energy Desk is focused on three primary projects: the Tsumkwe project (discussed above), a bush to

261. *See Solar Stove Project*, SME BULLETIN, Aug.-Sept., 2007, at 3, *available at* http://www.kashona.com/images/august-septemeber.pdf.

262. Interview with Conrad Roedern, *supra* note 36.

263. *Id.*

electric power plant effort, and a small-scale renewable technology project.[264]

DRFN has created a project called Combating Bush Encroachment for Namibia's Development to convert invader bush into electricity. This project uses a process of harvesting bush from commercial farms and then extracting gas using wood gasification. As Robert Schultz explains, the wood gas is then synthesized and run through a generator to produce electricity, which can then be fed into the national grid or used to serve the needs of a commercial farm. This farm-based production model is ideal to facilitate decentralized development. Schultz explains that because the average size of a commercial farm in Namibia is about 4,000 hectares (just under 10,000 acres), each individual farm would be able to power a plant using its own bush resources by harvesting and re-growing bush on a rotational basis. DRFN is also working to establish a large invader bush power plant which is estimated to consume between 300 and 700 hectares (approximately 740- 1,730 acres) annually. If DRFN's plan is successful, the plant will become the first IPP in the country.[265]

Another project DRFN has created is a small-scale project called Visions. Visions is designed to institute creative ways to use small solar PV technologies for income generation and entrepreneurial development in rural areas. The Visions program creates systems that are able to provide services such as charging cell phones, cutting hair, and charging electric lanterns. In August 2009, DRFN was even considering adding solar box cookers for the baking of bread and wood efficient stoves to cook the meat sold by food vendors by the side of the road. Although Visions appears remarkably similar to the MME's rural electrification packages, there are important differences. Each package is sold at around N$10,000, a slightly more reasonable price than other available packages. Visions packages are also tailored to promoting economic endeavors. As Mr. Schultz explains, "the idea behind the [DRFN] project is to prove that Namibians can earn an income by using solar systems." Schultz believes this new perspective will add value to renewables in the eyes of Namibians. [266]

6. Elephant Energy

Elephant Energy is a non-profit organization based in the United States and Namibia (see www.elephantenergy.org).[267] Its mission is to

264. Interview with Robert Schultz, *supra* note 225.

265. *Id*.

266. *Id*.

267. Elephant Energy, About Us, http://www.elephantenergy.org/About_Us.html (last visited Feb. 28, 2010).

promote rural development and nature conservation in Africa through the dissemination of appropriate and affordable renewable energy technologies. Specifically, Elephant Energy works hand-in-hand with community-run nature conservancies in the Caprivi Region of Namibia to provide small-scale renewable energy products to rural communities. In Caprivi, many people also rely on costly paraffin candles for lighting and must spend disproportionate amounts of their income on batteries in order to enjoy simple luxuries like radio service. Rural Caprivi residents also face the problem of charging their cell phones without access to electricity.

Elephant Energy's first pilot program in Namibia, the Caprivi Solar Light Project, began in August 2008 with the distribution of 50 solar-powered lights to all registered conservancies in the region. Due to the tremendous interest in the solar-powered lights by community members, Elephant Energy initiated an expanded pilot project in June 2009. The expanded project aims to address the lack of much-needed energy in Caprivi by partnering with conservancies to distribute solar-powered lights. For the initial phase of the Caprivi Solar Light Project, Elephant Energy chose to partner with two of these conservancies, Sobbe Conservancy and Wuparo Conservancy. These conservancies were chosen based on initial scoping meetings conducted in each conservancy area, the degree of interest and capacity demonstrated by conservancy managers and residents, and recommendations from local non-governmental organizations, notably Integrated Rural Development and Nature Conservation.

Each conservancy was used to pilot a different model for distributing solar torches (flashlights). Both models were market-based, requiring the purchase of solar torches rather than a donation. However, in both cases, the cost of the torches was subsidized to ensure affordability based on anecdotal pricing data. Torches were sold for N$50 (approximately US$6.50) even though each torch actually costs approximately N$170 (approximately US $22.20) including shipping costs to Namibia. Additionally, detailed baseline energy surveys were conducted to sample for energy use, energy needs, and the ability to pay for energy products. Focus group interviews were later organized to ground truth survey results and collect additional qualitative data. Finally, a monitoring program was established at each conservancy to collect ongoing information about torch use and product performance.

Elephant Energy distributed nearly 1,000 solar-powered lights to communities in the Caprivi Region in 2009. Notably, participants who received a torch reported that they had since stopped using candles, and that they were using the torches every day for reading, studying, cooking, and bathing. People reported using the torches mostly for indoor lighting, but also used them for walking at night and avoiding elephants and

snakes. They expected to use the torches even more to protect their fields from elephant damage during the growing season. Elephant Energy plans to expand the Caprivi Solar Light Project and work to provide additional small-scale energy products to conservancy residents in the future, such as efficient cook stoves, cell phone chargers, and other lighting products.

VI. CONCLUSION

Namibia has taken promising steps to meet the clean energy needs of all of its citizens. However, the government, civil society, and the private sector must now evaluate and build upon this good work. The first step towards climate and energy justice in Namibia is recognizing that large-scale renewable energy can meet the needs of much of Namibia's population, reducing costs over time, and decreasing dependence on foreign sources of energy. Large-scale, grid-based, fossil-fuel energy production is unacceptable, even in the short term. Namibia has tremendous renewable resources and the technology to harness these resources is now available and cost effective. While barriers exist, they can be overcome. For large-scale renewables, political will is required to allow energy innovation to occur. NamPower and ECB must be willing to adapt to changing times, policies incentivizing large-scale renewables must be implemented, and old, dirty technologies must be retired. Namibians must also invest in education relating to renewables, work to integrate new technologies into the country's diverse cultural landscape, and work to establish local manufacturing of renewable energy products. The government and civil society must also address other issues such as theft of renewable energy products and property rights. Finally, Namibians must press the international community to restructure the CDM to allow small developing countries the opportunity to benefit from carbon finance.

Namibians must also recognize that the large-scale, fossil fuel-based energy systems of the past will never serve to meet the needs of the energy poor. For most of Namibia's rural population, the grid will never come. The Namibian government, civil society, and private sector have taken the first steps to deal with this dilemma and prevent the type of energy injustice that still persists today, even in the United States. Initiatives like the Solar Revolving Fund and Energy Shops must be fully funded and expanded, education related to renewables must be available throughout the country, and programs to market and distribute small-scale renewable energy products must be supported. Namibia is ready to promote energy and climate justice for all. It is time to put out the fire and turn on the sun.

Engaging Women's Voices for Energy Justice

Beth Osnes, Ph.D.*

I. STATEMENT OF PURPOSE

Theater has the potential to directly impact poor womens' lives by including their voices in energy development projects. For the past four years, I have been touring North America and various parts of the world using theater as a tool to empower mothers to voice their concerns. In the last year I applied this tool to engage mothers in appropriate energy development projects, such as fuel-efficient cook stoves. Mothers do most of the cooking in various cultures around the world, so they are the primary users of cook stoves in energy development projects. Although it is a commonly held belief that the poor have the right to participate in their own development, how to engage them in the process remains a largely unresolved question. One answer is participatory Theater for Development. This type of theater seeks to include the voices of poor women in development projects, as these projects often have profound impacts on them. This strategy for engaging the poor has particular advantages in some areas. For example, in areas where the poor do not speak the dominant language—such as in Guatemala, where the Mayan Highland women only speak indigenous languages like Ixil—mostly nonverbal theater skits minimize translation misunderstandings. These skits enable illiterate women to author their own lives and to play out various scenarios to experiment with likely outcomes. Development practitioners use theater as a vehicle through which poor people can tell their own stories, present issues, and address real problems.[1] In particular, it is important to include womens' voices in development decisions that may drastically impact their lives. Including women makes

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1. JULIE MCCARTHY, ENACTING PARTICIPATORY DEVELOPMENT: THEATER-BASED TECHNIQUES 108 (2004).

for more successful development projects, and on a basic level is also just. Indeed, the Millennium Agenda, developed by world leaders at the United Nations Millennium Summit in 2000, states that equality for women in all areas of development is not simply a method for accelerating human development: it is also morally right.[2]

II. BACKGROUND

I first met Lakshman Guruswamy, a University of Colorado ("CU") Law School professor and the director of the Center for Energy and Environmental Security ("CEES"), at a meeting for the Center for Asian Studies on the CU campus. Professor Guruswamy described the energy justice work he was doing in his homeland, Sri Lanka, involving energy-efficient cook stoves. I was drawn to this issue immediately because I am a cofounder of Mothers Acting Up ("MAU"), a movement to mobilize mothers to act on behalf of the world's children.[3] Clearly, the cookstove issue involves mothers and has an enormous impact on children. Open fires burning solid fuels (wood, dung, crop wastes, or, in some areas, coal) in poorly ventilated indoor areas cause high levels of indoor air pollution and seriously affect women and their children.[4] It is estimated that there are 1.5 million premature deaths annually associated with exposure to air pollution.[5] Every day, millions more suffer from difficulty breathing, stinging eyes, and chronic respiratory disease.[6] Furthermore, several studies link indoor air pollution to childhood pneumonia; over 2 million children under age five die each year from pneumonia.[7]

After subsequent meetings with Professor Guruswamy and the CEES staff, I decided to add a program for energy justice to the

2. THE UNITED NATIONS CHILDREN'S FUND (UNICEF), THE STATE OF THE WORLD'S CHILDREN 2007: WOMEN AND CHILDREN, THE DOUBLE DIVIDEND OF GENDER EQUALITY 2 (Patricia Moccia et al. eds., 2006).

3. *See* www.mothersactingup.org (last visited Mach 13, 2010).

4. *See* N. Bruce, R. Perez-Padilla & R. Albalak, *Indoor Air Pollution in Developing Countries: A Major Environmental and Public Health Challenge*, 78 (9) BULL. WORLD HEALTH ORG. 1078–92 (2000).

5. Jessica Granderson et al., *Fuel Use and Sensing Analysis of Improved Woodburning Cookstoves in the Guatemalan Highlands*, 33(2) BIOMASS & BIOENERGY 306 (2009).

6. EVA REHFUESS, FUEL FOR LIFE: HOUSEHOLD ENERGY AND HEALTH 4 (WORLD HEALTH ORG. 2006), *available at* http://www.who.int/indoorair/publications/fuelforlife/en (last visited March 13, 2010).

7. Mukesh Dherani et al., *Indoor Air Pollution from Unprocessed Solid Fuel Use and Pneumonia Risk in Children Aged Under Five Years: A Systematic Review and Meta-Analysis*, 86 BULL. WORLD HEALTH ORG. 390, 390 (2008).

international locations for my already established Mother Tour. The Mother Tour is a program of MAU and the Philanthropiece Foundation[8] that uses theater as a tool to create a global community of mothers moving from concern to action on behalf of the world's children.[9] In all the locations the Mother Tour visits, the MAU Vocal Empowerment Workshop provides mothers with the skills, practice, and confidence they need to use their voices and act on their concerns. In April and July of 2009, I traveled to communities in Panama and Guatemala to implement a pilot program that uses theater to engage the voices of the energy oppressed poor, especially mothers, in cook stove development projects.

III. GENERAL DESCRIPTION OF PARTICIPATORY THEATER FOR DEVELOPMENT

Societies have long used theater to question and unsettle existing structures and customs, and theater is a highly political form of expression. According to Yolanda Flores in *The Drama of Gender*, "[t]he potential for upsetting the social status quo resides in the genre's ability to function as an image of the world and a generator of new images;"[10] Theater for Development practitioners use theater in precisely this way. These practitioners engage communities to create new images of how these communities could be in the future. Theater for Development has many names, and professionals in a variety of disciplines apply the practice. Those working in public health often refer to these techniques as Behavior Change Communication.[11] Those in fields such as geography refer to it as Theater-Based Participatory Development.[12] Theater practitioners refer to it as Theater of the Oppressed, Theater for Social Change, or Theater for Development. Recently, these terms have come under the umbrella phrase "Applied Theater."[13] All of these techniques use theater to engage marginalized people, most often in nontraditional performance spaces, to transform their own lives.

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8. *See* Philanthropiece.com, Building Healthy and Sustainable Communities Through Community Empowerment, http://www.philanthropiece.org/home2.html_(last visited March 13, 2010).

9. *See* www.mothersactingup.org/mother-tour/ (last visited March 13, 2010).

10. YOLANDA FLORES, THE DRAMA OF GENDER: FEMINIST THEATER BY WOMEN OF THE AMERICAS 13 (2000).

11. *See* John Hopkins Bloomberg School of Public Health, *Tools for Behavior Change Communication*, 16 INFO REPORTS 1 (Jan. 2008), *available at* http://info.k4health.org/pr/online.shtml.

12. *See* MCCARTHY, *supra* note 1.

13. Majid Rahnema, *Participation*, *in* THE APPLIED THEATER READER 141–47 (Tim Prentki & Sheila Preston eds., 2009).

Theater for Development is historically rooted in Liberation Theology, which formally emerged during the 1960s and 1970s in Latin America. Among the most notable of the publications addressing this topic was Gustavo Gutiérrez's *A Theology of Liberation*, written to bring justice to the poor and oppressed. Gutiérrez, who is often referred to as the father of Liberation Theology,[14] posited that poverty is not a necessary reality but rather the result of human injustice and sin:

> . . . [T]he poor are the result of the system within which the rest of us live and for which we are responsible. The poor live on the margins of *our* social and cultural world, where they are oppressed, exploited, and have the fruits of their labor snatched away, so that their very humanity is degraded. That many are poor is not a matter of chance, but the inevitable result of sinful structures.[15]

Gutiérrez concluded that because the causes of poverty are political, political action is necessary to remedy poverty. Paulo Freire took these ideas and applied them to pedagogy for liberation.[16] Augusto Boal drew upon Freire's work to use theater as a dialogue and an opportunity to act out social change. He created Forum Theater, which revolutionized theater for social change. Forum Theater transforms passive spectators in to agents of change, or "spect-actors." Anyone present can interrupt the action, replace an actor, and change the direction of the action:

> In forum theater no idea is imposed: the audience, the people, have the opportunity to try out all their ideas, to rehearse all the possibilities, and to verify them in practice, that is, in theatrical practice . . . . It is not the place of the theater to show the correct path, but only to offer the means by which all possible paths may be examined.[17]

This Article advances this field by identifying effective strategies unique to using theater as a tool to engage communities in appropriate sustainable energy development projects, such as using fuel-efficient cook stoves.

IV. THEATER FOR ENERGY JUSTICE IN PANAMA

In April of 2009, I traveled to Comarca Ngabe in Central Panama, a community of indigenous Ngabe people located just off the Carretera Interamerican Route One between the small towns of Juay and San Felix.

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14. ROBERT MCAFEE BROWN & GUSTAVO GUTIÉRREZ: AN INTRODUCTION TO LIBERATION THEOLOGY 1 (1990).

15. *Id.* at 32.

16. *See* PAULO FREIRE, PEDAGOGY OF THE OPPRESSED (2000).

17. AUGUSTO BOAL, THEATER OF THE OPPRESSED 139 (1985).

Families in Comarca Ngabe live in simple, single room houses with palm frond roofs and dirt floors. Most families do not have running water or electricity. The women and girls wear brightly colored traditional dresses with edges decorated by small hand-sewn squares of fabric that create intricate patterns. Mick Ginapp, a former student of mine who was serving in the Peace Corps there, invited me to the community. He was collaborating with Blissworks, a local nongovernmental organization ("NGO"), to bring energy development in the form of fuel-efficient cook stoves to interested families in the area. Mick had received training for building the stoves and Blissworks had agreed to supply the materials. Families that wanted a stove were expected to pay a portion of the stove's cost and participate in building them. I came to the community to do the MAU Vocal Empowerment Workshop for mothers and to use theater to introduce cook stoves to people who had no knowledge or experience with this relatively new energy technology.

A. MAU Vocal Empowerment Workshop

Two of the female leaders of the community who ran a handicraft cooperative hosted the MAU Vocal Empowerment Workshop. The workshop's usual format is as follows. To begin, while utilizing tools that actors use to make their voices stronger and more expressive, I teach mothers to experience the power of their embodied voices. More specifically, I focus on relaxation, full breath, and making authentic contact. I then encourage the mothers to each use their voices to express their deepest concerns to the group. Next, I challenge each mother to use her voice to act on her concerns. We all rehearse this action—actually playing out the action in the workshop—and work together to devise solutions to any obstacles that present themselves. Either I, as facilitator, or any participant in the workshop can stop the action, ask for feedback or suggestions, take the place of someone acting, and replay any part of the action still needing a solution. Through the process, participants in the workshop empower themselves and each other to use their voices to speak up about their needs and their children's needs, and to realize that they can take action to fulfill these needs.

In this specific workshop, about twenty-five women, a few men, and dozens of children gathered under a community structure with a metal roof. The village was poor, except for the tribal chiefs, so most of the challenges that the participants expressed in the workshop were related to poverty. One woman, who appeared to be in her forties, had a hard time making eye contact during the vocal exercises, giggled a lot, and resisted participating in almost every way. When it was her turn to express her concerns, she said she did not have enough money to buy food for her family. In response, I asked the group how they thought she

could make some money to provide for her family, which included small children. One woman replied that she could make some kind of handicraft and sell it at the cooperative. An older woman in the periphery, who was crocheting a small purse, offered the woman a finished purse she could use for the skit. The two women hosting the workshop, who ran the cooperative, played themselves in the skit. Uncomfortable and giggling uncontrollably, the woman asked them if they would sell her wares. She tried to convince them halfheartedly of the quality of her work. The women from the cooperative played along beautifully, showing scant interest in her work because she was not making eye contact or taking the exercise seriously (more out of embarrassment and lack of self-confidence than malice).

I stopped the action and asked the group what they thought of the woman's "performance." The participants quickly provided an astute critique, enforcing the seriousness of this "play." They told her to make direct eye contact and speak with a full voice without giggling. We asked her to do it again, and she did remarkably better, making real attempts to get the women from the cooperative to look at her work. Though at first glance it may seem punitive that the women made her repeat the skit, ultimately it was a very caring action. They refused to let her believe that it was ridiculous for her to use her voice to improve life for herself and her children. To address other concerns expressed at the workshop, we acted out asking the tribal chief and local government officials for better schools and more access to medications that were prohibitively expensive. The group worked together to devise solutions to the obstacles and used their voices to act on their concerns.

B. Theater for Energy Justice

The day after the vocal empowerment workshop, many of the same people attended the theater introducing the cook stove technology. We served a meal after the event to encourage attendance; about twenty-five women, twenty men, and many children were present. The goal was to determine which community members wanted to receive a Lorena-style cook stove—made with adobe with a pipe for the chimney and a mold for forming the inner burn chamber and outer stove—from Blissworks. We presented information about the cook stoves and encouraged a discussion among community members about the benefits and costs of a cook stove so that they could make an informed decision.

In preparation for this workshop, I gathered information from several sources. In a World Theater course that I taught at CU during the fall 2008 semester, my students and I constructed skits that might be used to introduce cook stoves to communities. After receiving a presentation on energy justice and sustainable and appropriate energy

technology from a CEES staff member, my students and I researched the factors that would influence cook stove use. We dedicated several class periods to practicing skits, during which we improvised scenes based on set goals and objectives, and began scripting based on that work. We created two complimentary skits entitled "Life Without a Cook Stove" and "Life With a Cook Stove." I used these as a basic framework in the energy justice portion but adjusted them to render them more appropriate. Before the workshop I conducted interviews with Mick, other Peace Corps volunteers, and the regional director—who had resided in this area for several years—for the purpose of determining the likely benefits and costs of a cook stove for families in the area. I also worked with children at the completion of the MAU Vocal Empowerment Workshop the previous day and received feedback from the community members still present.

After gathering information for this workshop we created a list of the stoves' likely benefits to this community. Because life expectancy was traditionally low in this community (and has only recently begun to rise), we knew we would not get much traction when speaking of health risks. Instead, we represented decreased smoke inhalation from indoor air pollution as a solution to an annoyance. In addition, the cook stoves' fast cooking time, due to hotter temperatures and multiple burners, was decidedly a benefit because it gave the women more time to pursue other activities, perhaps including income generation. Another benefit, which I had not anticipated, was that the cook stoves were viewed by the community as a status symbol, because they are made out of adobe and therefore viewed as permanent; in contrast, most homes in the area are made only of wood and palm fronds. Some benefits our research lead us to anticipate turned out to be inaccurate for the community. For example, our research indicated that women were often harassed and assaulted while away from their homes collecting firewood for open fires. However, in this area of Panama, wood was plentiful and families had so many children that wood collecting was the children's job, not the mothers'. Despite this local difference, having less firewood to collect did turn out to be a benefit because collecting firewood had put children at risk of incurring serious injuries.

We also identified some potential pitfalls to distributing cook stoves. The much-loved smoky flavor previously present in the community's food—the result of cooking over an open fire—would be missing. Changing centuries-old cooking methods could be another hurdle; adjusting to a hotter flame and multiple burners would be necessary. Finally, families would have to find the money to buy the stoves. I was, however, assured that the stoves' cost was within families' reach if they used their welfare money to buy them instead of other things, such as alcohol.

After Mick introduced the objective of the gathering and me as his former professor, here to help the community achieve their objectives through theater, I began by repeating some of the vocal and physical warm-up exercises we had completed the day before at the MAU Vocal Empowerment Workshop. I explained that today, everyone was a participant so everyone needed to warm-up. Though to them I was just a strange tall woman, the participants good-heartedly indulged my requests for them to let in full breaths and swing their arms; all except an elderly blind man participated. I reminded them all that we were doing this to start a conversation about cook stoves to see if the stoves were a good match for their families. Thus prepared, we began the first of the workshop's skits.

1. Old Ones Skit

Some children, who I had worked with the previous day, performed the first skit. We had decided that even though low life expectancies discouraged community members from improving their own health, recent increases in access to medical care and the resultant longer life expectancies might change these attitudes. Thus, the children performed a humorous skit acting like very old people, walking down the road coughing excessively. A young boy acting as himself interrupted them and asked: "Why are you so old? Why haven't you died yet, Old Ones?" The "old" children responded: "Better health care. We live longer." The child asked: "Old Ones, why do you cough so much?" They responded: "All that smoke from the open fire. It got in us and stayed." The child sympathized: "Too bad, Old Ones." They responded: "Do what you can to help the young ones so they don't have this problem." The child assured them: "Okay, I will." And the scene was over.

2. Life Without a Cook Stove Skit

As it was not feasible to rehearse the cook stove skit before this gathering, I asked volunteers from the crowd to portray various characters. All the action described below was directed and performed on the spot without rehearsal, which added to the humor and excitement of the event. A woman I had befriended, Lupe, agreed to portray the Mother. Lupe's own daughter easily portrayed the Daughter (she was only about three years old) as she would not let go of her mother's leg and followed her into the open performance space. About ten children portrayed the House by holding hands around the Mother, identifying one child as the Door. The Mother pretended to start a fire in her home to cook. Once she completed this task, other children portrayed Smoke Demons and waved grey scarves in the Mother and the Daughter's faces making them both cough. The House was instructed to keep the Smoke

Demons inside its walls and prevent them from escaping. As you might imagine, given the age of our actors, the scene became very physical and delighted the entire crowd. Then, a man in the audience portraying the Doctor knocked on the Door. The Mother opened the Door by unclasping the hands of two children and let him in. He shook his head in disapproval and said: "Too much smoke will make you sick." And then, looking at the amount of food she was cooking for dinner, he added: "Not much food." She responded: "I take all my time cooking and cannot keep a garden or earn more money for enough food." The doctor left just as the Father was coming home. He coughed as he entered, looked at the pot with dinner in it, and said: "Only this much food?" Stepping into the scene, I asked all the performers to freeze.

At this point, we engaged in a question and answer period. I asked why the Father was sad. People responded that he was disappointed that his dinner was so small and that his wife looked troubled. I asked why there was so little food and the audience responded that the family was poor. I asked why everyone was coughing and what those demons were and the crowd answered that the smoke was the demon and it was making them cough. When I asked why the Smoke Demons could not escape, people said that the House trapped them inside. Finally, I asked what the Doctor thought of this situation. Several people responded: "Not so good" and "Too much smoke."

3. Life With a Cook Stove Skit

We began the next scene with the same basic setting. The children portraying the House stayed in place, as did the Mother and the Daughter: everyone else cleared the performing space. This time a box in the center of the room represented a cook stove. The Mother started a fire inside the cook stove using a very small amount of wood. Only one small Smoke Demon appeared with a smaller grey scarf that she waved in the Mother and Daughter's faces. A woman portraying a Neighbor (likely an actual neighbor) knocked on the door and was let in by the Mother who said excitedly: "Come and see my new stove." The Neighbor, amazed, said: "Oh, you got a gas stove! But it is very expensive to buy gas. How will you afford it?" The Mother corrected her: "No, it is a cook stove, no gas, still wood like always, only less. Also it is solid, permanent, and faster at cooking." "What's this?" asked the Neighbor, indicating the chimney coming up from the stove. The Mother proudly gestured to it: "This is the chimney. See how the smoke goes up it?" as a man in the crowd lifted the small child portraying the Smoke Demon out of the house as if through the chimney. "See? All the smoke goes away," added the Mother. The Doctor's knock on the door interrupted their discussion. He was warmly welcomed through the Door by the Mother. The Doctor

proceeded to check the Mother and the Daughter's lungs using a stethoscope and announced: "Very healthy and strong. Good work. I'll be going now." After he left, the Mother sat down with the Neighbor to show her all the handicrafts she had been making: "Look at this crocheted purse and these dish towels I have crocheted edges on." The neighbor was very impressed and asked: "How do you have time for all of this?" The mother responded: "Now that my cook stove cooks so much faster, I have time to make some money from home. Also, the kids help with the little ones more now that they do not have to collect so much firewood." At that, the Father came home, greeted the Mother and the Neighbor, looked at the food on the stove, and said: "Lots of food, great! I'm hungry." Again, I stepped into the scene and asked the actors to freeze.

Again, we engaged in a discussion about everything that had been presented through a series of questions, the first being why the Father was so happy. People responded that his family seemed content and there was plenty of food. When we asked why there was more food, people responded that it was probably from the extra money the Mother was making. Then, I asked how they thought the Mother had more time for doing handicrafts and they responded that the kids helped more around the house and that it took less time to cook. We asked what they thought the Doctor thought of this visit, and they said he was pleased because the family was healthy this time. When asked what the Neighbor thought of the new stove, everyone agreed she was very impressed and probably wanted one herself. And finally when asked where the Smoke Demon went, someone answered that it went out of the House through the chimney. Although this discussion may seem elementary and obvious, the process actively communicated the benefits of this new energy technology to the community and confirmed that they understood the information.

The actors had been frozen in place during this entire process, so I announced that this scene was not quite finished. In the continued scene, the Neighbor said good-bye and left. The Mother got the pot of food off the stove and served the Father, the Daughter, and herself. The Father took one bite and said: "Wait. This tastes different, no smoky flavor." "Yes, I know," responded Mother, "the Doctor says that's good. Can we get used to this?" A knock on the Door followed; the person collecting installments for the stove appeared. The Father mused as he got the money: "Here you go, but now we don't have money left to go to the bar tonight." This remark caused a big laugh among the crowd as the older blind man in attendance owned the local bar and brewed the local liquor himself. Again, I froze the scene and announced time for more questions and answers.

This discussion was markedly different than the ones before.

Community members asked the questions, such as how many payments would be due, what their frequency would be, and how long they would last. Some of the women talked about the food flavor and the cooking techniques that would certainly change if they got a stove. Some of the men wanted to know exactly how the stoves were made. Mick used a chalk board to draw the stove and demonstrate how it worked. This portion of the discussion lasted almost an hour. Children were playing; my five-year-old daughter shared her crayons and paper with the other children to keep some of them busy during the adult discussion. Meanwhile, a meal was being cooked on an open fire beside the very rustic shelter we were in. About an hour later, we enjoyed lentils and rice served on banana leaf "plates" and ate mangos, still hot from the sun, fresh from local trees. Before leaving, community members were asked to sign up on a sheet of paper if they were interested in coming to the next meeting. A free meal would not be served, but they could make further plans to receive a cook stove. About eight families signed up to continue the process. Mick mentioned that this was a good initial number and that other families would probably become interested after they had seen the stoves in someone else's home. He also noted that the families who had signed up were informal leaders in the community who tended to be more proactive in improving their situations.

V. CONCLUSION

As women, overwhelmingly mothers, are the users of fuel-efficient cook stoves, it is imperative to get their input at each stage of implementing the stoves' use. Because these poor mothers are historically doubly oppressed by poverty and gender inequity, their voices must be strengthened to ensure meaningful discussions about energy development projects. Though centuries of oppression cannot be remedied in one three-hour workshop, these women can strengthen their voices, increase their confidence, and learn basic tools to effectively communicate. Even though the cook stove skits did not directly privilege the participation of the women, the total design of the project, including the MAU Vocal Empowerment Workshop, strives to elevate women to an equal position to men in the community. Although cook stoves most directly impact women, the men in the community must also take interest in cook stoves because the stoves require expending families' financial resources. In order for this development project to succeed the men must agree to make a financial commitment. If the men are not involved in the decisionmaking process, they are unlikely to sacrifice other pleasures for the sake of technology they perceive as primarily benefiting women and children. By including the men in the process, they come to understand

that there are benefits for them as well, such as increased income, more food, and less frequent injuries to children collecting firewood. The men are also more likely to help build the stoves when they fully understand the benefits.

After participating in the MAU Vocal Empowerment Workshop and the discussion about cook stoves prompted through theatrical skits, community members begin to see themselves in a new light. During the skits they are no longer passive recipients of a predetermined reality, but are actors capable of scripting their own lives based on their self-identified concerns and through a process of critical analysis. Although the practice is merely theatrical in nature, because participants portray themselves or roles similar to their own, the resulting insights and discoveries are directly relevant and applicable to their lives. Furthermore, drama's action is based on the particular challenges the community faces. Theater allows a community to play out a situation's variables and assess certain choices' feasibility and effects before the community members expend effort and resources. The process also exposes unanticipated obstacles and attitudes that may require attention before progress can be made.

Based on this experience in Panama, and a subsequent trip to Guatemala in July of 2009 for a similar project, I recommend preparing possible skits or approaches before traveling to a site, but I also recommend remaining flexible while working with the community to change any part of the theatrical presentation to be culturally appropriate and relevant. An old theater adage states that you can only truly improvise when you are prepared. My experience with the rather timid populations in Latin America has left me extremely grateful that I had prepared a framework from which to deviate, rather than arriving on location with nothing prepared where the community members, unfamiliar with this process, would be looking to me for guidance.

It is important to tailor the skit's elements to the local community. Research findings and recommendations from NGO workers and volunteers in the area can be inaccurate. For example, in Chajul, Guatemala, where I conducted a similar project with my colleague, Jason Bisping, a woman working with our host NGO in Chajul told us that young girls were responsible for collecting biomass and that they often engaged in risky behavior during this unsupervised time. On site, community members communicated to us that men collected most of the firewood, and that the only women who collected firewood were widowed women without sons. This example illustrates the necessity of working closely with community members themselves to create the situations that will be included in theatrical presentations. If all the elements in the skits are accurate, the community will engage in a useful discussion.

As we move forward in development projects for energy justice, we must be mindful of the structure of these projects. Does it replicate the top down, dominator structures that create the oppression that perpetuates poverty and makes such projects necessary? As stated in *Ella Baker & The Black Freedom Movement*, "anytime you continue to carry on the same kind of organization that you say you are fighting against, you can't prove to me that you have made any change in your thinking."[18] Truly affecting change requires changing our thinking, changing how decisions are made, and changing how projects are designed and implemented to ensure that everyone's voices are included at each stage. Any work towards justice requires dismantling the hierarchies that ideologically and structurally enforce injustice. By intentionally creating situations in which the voices of the energy oppressed poor are encouraged to discuss and critique the energy solutions being introduced into their lives, we can achieve a greater level of energy justice. Special attention to the voices of women is integral to achieving gender equity in community dialogue. Participatory Theater for Development can improve gender equality in expression and serve as an effective and dynamic tool for engaging entire communities in their own energy development projects.

18. BARBARA RANSBY, ELLA BAKER & THE BLACK FREEDOM MOVEMENT: A RADICAL DEMOCRATIC VISION 369 (2003).

Financing Energy Access on the Edge of the World

Alex Pederson*

I. INTRODUCTION

Dinner by candlelight sounds romantic; surgery by candlelight does not. Getting away from your Blackberry sounds relaxing; getting away from a hurricane of which you had no notice does not. Leaving the city to build a fire while camping sounds exciting; spending five hours per day fetching firewood and biomass for cooking does not. While basic human rights come in many varieties, access to energy is increasingly considered to be the key that facilitates achieving most of these rights. In recent years, many technological and financial innovations have been created to increase access to energy for the billions of people at the "bottom of the pyramid." Even with these advances, many remote communities face a current—and future—life without electricity. Remote communities turn to the non-governmental organization ("NGO") sector for electricity services because they are too far from the grid to hope for grid extension, unable to entice even social entrepreneurs because the community lacks a functioning economy, and located in a developing country without a central government able to fund remote electrification projects. For these communities to recognize the full benefits that an electricity system can provide, including support for education, health and sanitation, domestic activities, and productive uses, the scope of

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these projects must be ambitious enough to cross the "tipping point" of energy production and provide a critical mass sufficient to support all of the foundational applications of an energy ecosystem.

Energy justice includes service for people living in hard to reach and inconvenient locations. Frequently, the NGO sector is left to address this challenge. To ensure long-term success, in addition to the installation of locally appropriate technological solutions, implementing organizations must develop community institutional and technical capacity to manage and maintain the electricity systems. Cutting against this goal are a number of limitations, some inherent to funding in the NGO sector, others that pertain to operating in remote locations, and still others that accompany energy projects. Energy projects in remote locations can yield tremendous benefits for recipient communities, but must be approached appropriately, both from a project execution perspective and a funding perspective. Donors funding projects in remote areas must struggle with the philosophical conflict between providing deep, mature services to some rather than spreading shallow services to as many people as possible. Below, I share a few observations and suggestions deriving from my experience developing renewable energy projects in Nicaragua.

My take on energy justice is colored by my experience working for blueEnergy, an NGO that develops energy services in remote communities on the Atlantic coast of Nicaragua. The communities we serve lack roads and are accessible only by a two to five hour boat ride from the nearest city, Bluefields. These communities are multiethnic and multilingual,[1] have single-digit literacy rates, no currency-based economy to speak of, and generally have very limited experience with government or community organization. Fundamentally, the blueEnergy team believes that people living in remote and sparsely populated areas deserve electricity services despite the cost associated with working in these areas.

1. The Atlantic coast population consists of six ethnic groups—Mayangna (Sumu), Rama, Miskitu, Creole, Mestizo, and Black Carib—that speak four languages. The Autonomous Regions of Nicaragua's Caribbean Coast, York-URACCAN, http://www.yorku.ca/cerlac/URACCAN/Coast.html (last visited Mar. 23, 2010).

II. CONTEXT

A. The Need for Rural Electrification

Access to electricity is increasingly recognized as a basic human right,[2] and is identified as a precondition for modern economic development.[3] The need for greater access to energy and electricity is extreme: 1.6 billion people lack access to electricity[4] and 2.5 billion people use biomass for their daily cooking and heating needs.[5] The vast number of people lacking electricity, eighty percent or 1.3 billion people, live in rural areas.[6] Rural residents turn to biomass in the absence of electricity at a tremendous rate, with eighty-three percent of rural households using biomass as their primary fuel for cooking, compared to twenty-three percent for urban households.[7] The use of biomass is dangerous, causing 1.3 million premature deaths a year[8] and inhibiting the ability of women to seek education and develop micro enterprises.[9]

The benefits of electricity services have been widely documented.[10] Electricity, along with communication and transportation, is a baseline requirement for most development goals. Electricity facilitates the use of communication devices and is a cornerstone of services related to heath and sanitation, education, home services, and productive uses.[11] Viewed through the scope of what energy justice means and how best to achieve

2. *See e.g.*, Stephen Tully, *The Human Right to Access Electricity*, 19 ELECTRICITY J. 3, 30-39 (Apr. 2006).

3. *See* UN DEV. PROGRAMME, WORLD ENERGY ASSESSMENT: OVERVIEW 2004 UPDATE 21 (2004), *available at* http://www.energyandenvironment.undp.org/undp/indexAction.cfm?module=Library&action=GetFile&DocumentAttachmentID=1010 (last visited Mar. 23, 2010) [hereinafter WORLD ENERGY ASSESSMENT].

4. INT'L ENERGY AGENCY, WORLD ENERGY OUTLOOK 2006 47 (2006), *available at* http://www.iea.org/textbase/nppdf/free/2006/weo2006.pdf (last visited Mar. 23, 2010).

5. *Id*. at 46.

6. *Id*. at 157.

7. *Id*. at 422.

8. *Id*. at 419.

9. *Id*. at 428. *See also* JOY CLANCY & LUCY REDEBY, ELECTRICITY IN HOUSEHOLDS AND MICRO-ENTERPRISES 2 (Intermediate Technology Publications Ltd 2000).

10. *See e.g.*, WORLD ENERGY ASSESSMENT, *supra* note 3, at 21.

11. For example powering water pumps, fodder choppers, threshers, grinders, and dryers, increasing irrigation for agriculture, and providing drive shaft power and lighting needed for various types of industry. R. ANIL CABRAAL, DOUGLAS BARNES, AND SACHIN AGARWAL, PRODUCTIVE USES OF ENERGY FOR RURAL DEVELOPMENT, at 119, *available at*, http://www.itpi.co.in/Resources/Renewable_energy/Productive%20use%20of%20renewable%20energy%201005.pdf, (last visited Apr. 13, 2010).

this goal, the relationship between being born in a remote and sparsely populated area and living without electricity services is troubling.

B. Energy Options for Remote Communities: Beyond Grid Extension

Electricity access is of particular concern for people living in remote, sparsely populated areas. In this context, remote or isolated refer to communities that lack reliable and regular transportation infrastructure and are too far from an existing electricity grid for grid extension to be a viable option. These communities frequently lack a currency-based economy. They also often have low literacy rates and no trained medical professionals. Compounding matters, the lack of energy services may dissuade doctors and teachers from working there. This situation creates a vicious cycle leading to an absence of basic services that is hard to break. Electricity access in these communities allows for lighting at night and communications devices. Even if minimal, the marginal benefit of initial energy access is higher in remote areas than in urban or peri-urban areas where community members can utilize energy available in their vicinity. The high marginal benefit from early stage electricity access mitigates the high cost required to operate in remote communities, helping to justify the projects.

In addition to energy access, proximity to a population center and population density have other significant ramifications. Below are a few examples highlighting how proximity to a population center affects communities:

Urban (Managua): Profit-driven organizations thrive. Many types of service providers are available, allowing specialization.

Peri-urban (Outskirts of Managua, surrounding communities): Population density and access to cities allow project expense payback. Service providers are available.

Rural (Matagalpa Highlands): Roads connect the region to Managua and other cities. There is regular access to population centers by bus and other transportation options. Access to the electricity grid is available to those with the ability to pay.

Remote or isolated (Set Net Point): There are no jobs, no service providers, and there is no functioning economy. Projects started there intend to develop basic services and economic opportunities.[12]

12. *See generally* Posting of Mathias Craig, The Third Ring, to *Generating blueEnergy*, http://www.socialedge.org/blogs/generating-blueenergy (Dec. 7, 2009) (last visited Apr. 5, 2010).

For people living in a developed area, electricity access means the right to use a highly reliable, nearly unlimited supply of electricity that is continually available. This supply of electricity generally comes from a large, centralized electricity grid. Grids are managed by a public or private company which handles generation, transmission, distribution, and administration of electricity services. Massive generation resources feed the grid and utilize economies of scale throughout their lifecycle, from construction to ongoing operation. The economies of scale also keep the cost of grid-generated electricity relatively low when compared to decentralized remote generation.

Access to the grid is significantly impacted by customer proximity to the grid, distance to a main road, community size, number of community members able to afford energy services, amount of energy the community will use, number and size of existing infrastructure facilities, and political status of the community.[13] Remote communities frequently fail on all of these measures. That being the case, they have little to no hope of grid extension, leaving decentralized generation as the only option for electricity services.

C. Electricity Applications

The difference between living with electricity services and without is extreme. The World Bank describes the benefits of energy services as follows:

> **The poor need energy** for cooking, lighting, heating, refrigeration, communication, transportation and information services.
>
> **Income growth** - Most economic activity would be impossible without energy, even the small and medium-scale enterprises that are the main source of new jobs for the poor. Energy services enhance productivity and boost incomes. Thus the kind of economic growth that creates jobs and raises incomes depends on greater and more efficient use of energy.
>
> **Health** - In health clinics, electricity makes it possible to refrigerate vaccines, operate medical equipment and provide lighting after sunset. Clean fuels that replace traditional biomass fuels reduce indoor and urban air pollution harmful to the health of millions.
>
> **Education** - Electric lighting in homes enables adults and children to read after dark. TV and radio accessible through electricity bring information, entertainment and the modern world to those who were previously isolated.[14]

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13. CLANCY & REDEBY, *supra* note 9, at 23.

14. WORLD BANK, WORLD BANK GROUP BRIEF: SUSTAINABLE ENERGY 1 (2006),

Few debate the benefits of electricity services, but the questions of how to bring electricity services to those who do not have them, and how to prioritize projects, remain. An important concept that underlies the success of any remote energy project is that merely providing equipment is not sufficient; rather, the equipment must be paired with training for communities, consumers, and the technicians who will keep the equipment running.

1. Levels of Energy Access

The benefits derived from access to energy vary depending on the available generation capacity. The power rating of a light (twenty-five watts) is much lower than that of a rice cooker (300 watts) that, in turn, is lower than that of a grinder (3000 watts).[15] These ratings illustrate that the amount of energy needed for electric devices varies significantly. Different devices comprise energy ecosystems based upon their type, number, duration, and energy intensity. A project that supplies lighting for a community center is very different than a project that provides lighting and cooking devices to thirty families, powers a cell phone recharging center for a 200 person community, or powers an ice maker to preserve fish caught by the community fishing cooperative. Conceptually, energy services come in different levels:

	Devices	Applications
Level 1	Portable LED lights	Limited lighting in home and/or community buildings and for traveling or working at night.
Level 2	Home solar system and/or home fixed LED solar system	Provides lighting in home and allows charging of small electric devices (e.g., cell phones). Can power a radio or television.
Level 3	Community charging station	Powers lighting and small electric devices at schools, medical centers, or community centers and provides charging for portable batteries used for home lighting and small devices. Can power small refrigerators or other productive use devices.
Level 4	Mini-grid	Powers home lighting, small

available at http://siteresources.worldbank.org/EXTENERGY/Resources/336805-1148481921459/WorldBankGroupBriefonSustainableEnergy.pdf (last visited Mar. 23, 2010).

15. YACOB MULUGETTA ET AL., ENERGY FOR RURAL LIVELIHOODS 15 (2005).

	electric devices, and community buildings. Provides sufficient generation for productive use devices.

While certain applications scale up easily, others increase as a step function and require substantial increases in generation to reach the next step. Adding to a Level 1 system to reach more beneficiaries is relatively easy; moving from Level 1 to Level 4 is more technically challenging and costly. That being said, devices available at Level 1 are complementary to Level 4 systems. The Level 1 devices reduce the demand on the mini-grid system and extend electricity access to more beneficiaries. While Level 1 systems are helpful to remote communities, these systems are not generally sufficient to spur economic growth. Donors seeking to enable economic development should aspire to reach Level 3 or Level 4.

2. Choosing energy solutions for remote communities

Choosing locally appropriate technology is a concept for which many people and organizations in the development sector voice support. However, it is a complex issue that deserves greater treatment. Below are a few major considerations that should be addressed when selecting an energy technology:

Capital cost. The up-front capital cost of an energy system is a major limitation for communities with limited cash, but it can be the easiest aspect of the energy system to finance because many donors are excited about paying for hardware given directly to beneficiaries. From many donors' perspectives, such a purchase creates direct benefit for community members. Diesel generators offer relatively modest capital costs for off-grid communities whereas solar, wind, and micro hydro are relatively expensive on the front end. Focusing too heavily on the up-front capital costs of a technology may distract from important life cycle considerations of fuel, maintenance, and repair costs.

Fuel and operation characteristics. The ongoing costs and maintenance associated with an energy system can vary dramatically depending on the technology selected. Generators require fuel on a regular basis. Fuel can be very expensive, and exposes communities to fluctuations in the oil markets. Solar and micro hydro require limited ongoing investment, but wind frequently requires maintenance and repair over the lifecycle of the system. Further, solar, wind, and micro hydro require specific

resources that are available in certain locations and may fluctuate daily and seasonally.

Supply chain. Access to fuel and parts can be the difference between operating an energy system regularly for years and experiencing consistent system failure and shortened system life. Communities operating in remote locations generally have limited supply chains.

Community cohesion and technical skill. Systems that are more technically challenging require higher levels of community cohesion to manage the asset and higher levels of local technical skill to keep the system running in the absence of trained technicians.

Community ability to pay. Certain technologies are more appropriate for communities that are able to pay for capital up front, while others are more appropriate for communities that amortize the cost of a system over years. For communities with little ability to pay at any point due to little to no economic activity, a system with low fuel cost and low maintenance cost is most appropriate unless an alternative source of funding that can subsidize system costs is secured.

Community uses. A community should evaluate its energy demand, to include total watt-hours, intensity of demand over time, and tolerance of blackouts, when deciding on an energy technology.

III. BLUEENERGY: REACHING REMOTE COMMUNITIES

It is widely accepted that access to electricity and other modern energy sources is a necessary condition for modern development. In many parts of the world, energy services are not available. On the Atlantic coast of Nicaragua, twenty percent of the population has access to electricity.[16] Those without energy are left isolated and literally in the dark.

Without energy, populations are locked out of modern education, health, and communication services, building blocks for self-determined economic development. blueEnergy's energy solution addresses a critical need in a challenging context: isolated locales with no roads, rugged terrain, multi-ethnic populations (meaning that world views can differ dramatically from one village to the next), a lack of formal education (indicating that people often cannot read or write), and a natural

16. Christian E. Casillas, Wind Generation: A Step Toward Energy Independence on the Atlantic Coast of Nicaragua 1 (May 16, 2008) (unpublished M.S. thesis, University of California, Berkeley) (on file with author).

environment in which heat, humidity, and salinity constantly degrade infrastructure, and lightning and hurricanes can wipe away one's work in an instant.

A. The Technology

blueEnergy delivers its energy system in remote communities using hybrid wind and solar technology. It manufactures its wind turbines locally to build the capacity and infrastructure needed to sustain the energy systems beyond installation, and to create local jobs where they are desperately needed. The energy systems act as community battery charging stations that power schools, community centers, and health clinics. The systems also charge private home batteries carried to the center. The fees collected from private battery charging are invested into a community energy fund and help finance operation and maintenance costs. The home energy end-use systems are privately owned and are financed through Kiva.org and a local micro-finance partner, ADEPHCA.

B. The Approach

An innovative approach is needed in remote areas, because top-down energy development is not working for the world's isolated poor. In general, central governments in poor countries do not have the resources to deliver energy services to all citizens using the standard method of grid extension. Moreover, the market cannot attract private companies and the population does not have the technical capacity to operate and maintain a high-tech, foreign energy system.

blueEnergy is more than an energy company. blueEnergy views energy service from a holistic perspective, where energy is part of an integrated approach that must be used to achieve successful results and have a positive social impact. Issues such as extensive community participation, intensive and ongoing capacity building, appropriate financing mechanisms, and energy linkage to productive uses are critical components of this eco-system approach.

A complete ecosystem-level solution is complex and resource intensive, but necessary for success. blueEnergy's long-term goal is to focus on energy solutions within a network of partners working together to deliver a total solution. However, blueEnergy works in challenging environments where many of the necessary components of the ecosystem often do not exist. To address this shortcoming, blueEnergy facilitates other elements of the total solution while strengthening existing partnerships and building new ones to reach its long-term energy-focus

objective. blueEnergy achieves this by leveraging international and national partnerships to attract high-caliber volunteers, employees, and consultants from around the world to the Atlantic coast of Nicaragua. blueEnergy then fosters a participatory environment where experts, local technicians, and community members work together to share knowledge and experience, thereby improving the capabilities of the local population and partner institutions, as well as its own internal operating capacity.

In this context, blueEnergy's holistic approach delivers the lowest lifecycle-cost energy solution and links it to improvements in the quality of life of its beneficiaries.

IV. FINANCING ENERGY SYSTEMS FOR REMOTE COMMUNITIES

A. Grant Financing Differs from For-Profit Financing

Grid extension is not an option for most remote communities, which frequently lack the financial resources necessary to pay for the capital and operational costs associated with electrification projects. Grant or donor-financed nonprofits completing energy projects differ significantly from for-profit entities performing similar work. While a corporation has shareholders who can receive payouts from dividends and can profit from the sale of appreciated stock, "investors" in a nonprofit organization receive no monetary return on their investment. This fundamental difference changes the nature of investments in grant-financed energy projects, such as the way in which project performance will be measured and the manner by which donors seek to control the organization that is developing the project. The following sections describe how donor control affects energy project development and how funding biases result in certain types of projects receiving funding while others do not.

B. Type of Investment and Implications for Project Funding

While investors in for-profit organizations hope to see a healthy return on their investment, nonprofit organizations may not have shareholders that receive dividends or other proceeds. Because taking on debt is very risky for NGOs that lack predictable revenue streams, and they may have limited assets to use as collateral, debt financing frequently is not appropriate. Consequently, nonprofit organizations have

less access to capital. Instead, they generally turn toward alternate forms of financing.

1. Earned income

Earned income for nonprofit funding is currently very popular in the donor community but differs from grant funding in the important respect that organization revenues must exceed expenses. While this model works well in certain contexts, it is problematic when working with communities that lack an adequate ability to pay for goods and services. These characteristics have generally deterred for-profit companies and utilities from providing energy services to remote communities in the first place. For this model to work in the context of energy services, community customers must have discretionary income to pay for energy tariffs; however, the lack of discretionary income is frequently the reason off-grid communities have limited access to energy. In effect, lack of energy services inhibits development of economic opportunities that would allow community members to pay for energy services. This cycle prevents for-profit entities from providing energy services and undercuts nonprofit entities' ability to derive earned revenue from them.

While the concept of earned income may not be appropriate in all contexts and at all stages of development, it does play an important role in blueEnergy's model in the long term. The communities in which blueEnergy works do not currently have functioning economies, and their members have limited access to cash. blueEnergy relies on outside sources for initial hardware investments and will likely rely on similar sources for years to come to cover ongoing system costs. Further, because these communities do not have functioning economies, it will take years of sensitization for community members to be able to operate a tariff structure in the communities. blueEnergy recognizes that it will take a great deal of time and effort to arrive at the point where community members will be comfortable with the concept of paying for services. Going forward, blueEnergy will slowly implement tariffs to pay for systems maintenance and upgrades so that communities can pay for them, rather than as a means to fund other program services. This is a long-term approach toward system sustainability that incorporates earned income to help support other program services.

2. In-kind support

In-kind support includes donation of goods or services, rather than cash. The most common examples include volunteer labor or donated computers. While tremendously beneficial to nonprofit organizations, volunteer labor comes with much higher personnel turnover than paid labor. To adequately manage this level of staff churn, NGOs must invest

significantly in internal structures and processes. This increases an organization's overhead, a result that donors frown upon. Securing an adequate supply of donated hardware, whether it is solar panels or copper wire, is also tremendously challenging. In-kind support generally must be viewed as supplemental to a supply of operating and capital cash.

3. Investment income

Investment income requires a supply of cash for investment and is therefore available to few nonprofits.

4. Cash donations: grants, restricted donations, and unrestricted donations

blueEnergy could not operate without cash. We must pay the salaries of local technicians who manufacture wind turbines and install solar panels for the community beneficiaries. The company needs a steady flow of cash to fund boat rentals for regular trips to educate community energy system operators, and to conduct maintenance to repair turbines. The source of our operating and capital budget varies, but one major distinction affects how the money is used: whether the funds are restricted or not.

When blueEnergy receives a donation, whether in-kind or cash, it must determine how or if it is restricted. A restriction applies to time or use. A time restriction could mandate that donated funds are used within the 2010 calendar year or that the money is left alone until the 2020 calendar year. Similarly, a donor placing a use restriction on funds could require that the funds be used only to purchase solar panels or that no more than twenty percent of the funds be used to pay salaries. In contrast, blueEnergy may use unrestricted funds as we see fit, using our managerial discretion to maximize beneficiary impact.

While specific restrictions vary from one donor to another, and government grants tend to come with more restrictions than those from foundations and nonprofits, all donor restrictions modify how blueEnergy conducts its business and the degree of control its managers exercise in fulfilling the organization's mission. Whereas a for-profit corporation may spend funds virtually in any legal way it sees fit as long as it makes a sufficient profit for shareholders, nonprofit managers must operate within funding restrictions that at times expose conflicting philosophical and practical approaches to providing energy services.

C. Existing Biases

The intersection of NGO project financing and development of sustainable electrification projects tests funding and development

assumptions as well as biases that exist in the donor community. Some of these biases are seen throughout the NGO sector, and others become critical when applied to electrification projects because of the complexity and timeline they entail. Overcoming these biases is key for the development community to enable energy projects that will be successful in bringing energy services to remote communities. These services must be oriented toward long-term success to make the cost associated development effort worthwhile.

Bias Type	**Example**	**Effect**
Time	Limited pre-project start-up funding	Requires developer to fundraise to cover the costs associated with preparing project proposals and feasibility assessments
		Can harm project planning and implementation
	Single-year orientation/ Limited follow-on costs	Requires simplified technical solutions
		Presents significant challenges to developing sufficient generation resources to reach the "Tipping Point"
		Presents challenges to long-term community capacity building and directly threatens long-term viability of energy systems
Ends	Many people served	Conflicts with serving remote communities with limited population density—some of the most needy communities that also offer a high marginal impact derived from new energy services
Means	Training programs that are completed quickly	Results in inadequate training on necessary components of the energy delivery model (maintenance, energy efficiency, battery care, etc.)

Values community capital equipment at the expense of executing organization's institutional capital	Limits executing organization's ability to develop a platform capable of supporting long-term community capacity building
Values purchasing physical items, such as computers or vehicles, at the expense of paying staff salaries	Impairs ability of executing organization to hire and retain core staff
Values consultants rather than staff	Impairs the ability of the executing organization to develop core staff—staff who are necessary to achieve long-term solutions

V. CONCEPTS FOR THE FUTURE

A. Time

1. Development funding

Energy projects are technically complex and require a significant level of coordination among community members and many levels of government. Many donors ask for fully conceptualized project proposals with supporting data before approving any funding. These projects, when done properly, will include a feasibility study to review the technical aspects of the project and an analysis that ensures the project aligns with the goals of the constituent community and the other interested parties. Preparing a project presentation is very labor intensive and requires that significant resources be devoted to the endeavor. To promote high quality projects, project donors should embrace adequate funding for project development and pre-project feasibility studies.

2. Facilitating appropriate organizational change

Tackling energy projects from a holistic perspective is a significant undertaking and can strain the resources of even healthy organizations.

This approach goes beyond purchasing and installing equipment; it includes supplemental work with communities to ensure proper training of community operators to maintain the equipment, community institutional capacity building to ensure the community will be able to optimally manage the energy asset, and customer training to develop customer concepts of safe and efficient use of the energy resource. When applying the philosophy that developing local technical competence is necessary to maintain these complicated systems over the long term, executing organizations need a significant amount of time to locate, hire, and train technicians. Donors should embrace this localized form of development because these activities supplement the technical and organizational knowledge base in the communities. This results in residual effects throughout the communities.

3. Maintenance and follow-up / community capacity building

Small-scale energy systems can be relatively simple, but larger systems capable of enabling economic growth and the distribution networks increase complexity, maintenance, and follow-up. Many donors seek one to two year projects that include the purchase and installation of a technological solution, avoiding projects that require long-term funding. For even simple technology to work in developing communities, the organization providing the technology must work closely with the beneficiary to perform necessary training and education allowing the beneficiary to use the technology as well as possible. When blueEnergy delivers solar powered flashlights, it trains beneficiaries on issues such as how long the light will last on a standard charge, factors that affect charges, and how to ensure optimal battery life. When blueEnergy installs a hybrid wind and solar energy system, the training is much more extensive. In both cases blueEnergy must be available for maintenance and follow-up work, whether to replace a broken bulb on the flashlight or to repair the charge controller on the energy system, until community operators can address these technical challenges. That process may take years, depending upon the community and the technology.

On a higher level, many rural communities have not managed complicated community resources like an energy system and do not have technicians who can assess and fix technical failures related to energy systems. Simplifying energy systems as much as possible improves community adoption and decreases the failures associated with the system. Any energy system that will approach the tipping point will include a degree of technical complexity; management of it will include policy issues such as setting tariffs, ensuring appropriate access to the resource, ensuring system reliability, establishing an adequate fund for

future maintenance and upgrades, developing safety measures, and dealing with delinquent payments. Building the community capacity necessary to deal with these issues and presenting suggestions for how to handle them takes a great deal of time. In communities where these concepts are foreign, the undertaking will require a commitment longer than a year or two. Funding this type of long-term approach will result in fewer abandoned and broken-down projects left to rust in the name of providing services to new and exciting communities.

B. Ends

1. Population density

Donors commit money to solving the world's greatest challenges and want to make the biggest impact possible. It is tempting for donors evaluating the impact of their donations to focus on the number of people they reach. Counting the number of heads "touched" is quantifiable and aligns with the gut reaction that more is better. This approach often runs counter to two important concepts: quality and/or depth of impact. These factors cover the price of the number of heads impacted, as well as the remote locales in which people live, which will inherently drive up the cost to impact each person. Therefore, people in these areas may be denied basic services. Energy justice includes energy access for those living in sparsely populated and hard to reach areas.

The conflict between depth and breadth of coverage applies to development work everywhere. In a world of scarce resources, more people will receive a little or fewer people will receive a bit more. This concept is very important for energy services because of the base capacity requirements that energy-dependent economic opportunities require. For various applications, communities will not be able to use a particular productive use unless generation exceeds a given level, otherwise known as the tipping point.

The following table approximates the energy usage of some basic equipment in a hypothetical village:

	Equipment	Power Demand (Watts)	Time in use (Hours)	Daily energy use (Watts/hr)
Work room	3 Sewing machines	80	6	1440
	2 Fans	60	8	960
	5 Filament lamp bulbs	75	8	3000

Office	Computer	200	8	1600
Kitchen	Kettle	1500	0.5	300
	Refrigerator	300	24 (intermittent)	1500
	2-ring cooker	2000	1	2000
	Hot water cylinder	3000	2	6000

At 16,800 watt-hours (approximately 17 kWh) per day, this bare collection of equipment requires a significant amount of energy that would cost roughly $33,600[17] for hardware in the United States, excluding the battery backup system, and significantly more on the Atlantic coast of Nicaragua due to the shipping and logistical costs. Comparing this to a solar energy system that produces ten watts of generation, or roughly fifty watts per day, the difference in the scope of the solution becomes clear. Restating an earlier point, entry-level energy services (Level 1) are very important, but perform significantly different purposes than solutions that aspire to move communities to the energy tipping point.

The second concern related to focusing on the number of heads is particularly relevant to communities in remote areas with low population densities. Generally, the easiest way for a community to gain access to electricity is through grid extension. Grid extension in areas close to an existing grid is relatively cheap, as distance and terrain are the major factors controlling the cost of grid extension. The farther a community is from an existing grid, the more expensive grid extension becomes. When a utility calculates the value of extending the grid to a hard to reach area, the number of potential customers or beneficiaries is a major consideration. Consequently, communities that are hard to reach and sparsely populated will generally be denied access to the grid. As discussed above, this has major implications for the development of education, health and sanitation, and economic opportunities in these communities. For remote and isolated communities, grid extension is generally not an option. If the communities are sparsely populated and potential investors or donors use the number of heads touched as a key metric for choosing energy projects, these communities will likely miss out on decentralized generation projects as well.

blueEnergy's philosophy is that even remote, sparsely populated communities have a right to energy services. While working in

17. Assuming $10 per watt of solar and five sun hours per day of functional solar collection.

communities outside of a major city like Managua may allow a project to reach more people at a lower price, applying the "number of heads" metric will leave communities like those on the Atlantic coast without energy services.

2. Community jumping

Focusing on the "number of heads" supports the phenomenon of community jumping. This is moving from one community to the next, supplying a surface-level dose of technology, but failing to develop the local technical capacity to maintain these systems or the community governance capacity to work with a community energy asset. Multi-year investments in developing single communities can result in deeper energy access than reaching as many communities as possible. Deeper energy service is necessary to reach the "tipping point" that facilitates many productive uses. Despite the appeal of funding projects in "new" communities, blueEnergy encourages donors to fund long-term investments in fewer communities so that the energy services in these communities will attain a maximum impact over their life cycle.

C. Means

1. Community capacity building—training and development

Training members of developing communities to understand and care for an energy system takes more than a two-hour session. It requires significant and consistent training.[18] This is the difference between simply installing equipment and providing a full service, holistic solution that fully engages the beneficiary community. It is helpful to separate the ability of a community to supervise and manage an asset like energy services from the community's ability to perform the technical work necessary to maintain the system from a mechanical point of view. Organizations like Practical Action have developed excellent resources that address the challenges involved with rural electrification projects, but NGOs executing projects need to tailor these materials for the local context in which the project takes place and to develop new materials as needed.

a. Community institutional capacity

Managing community assets is tricky. Managing technically complex community assets that implicate many basic human services is, for lack of a better term, super-tricky. Large-scale energy services are generally either owned by government or private entities and heavily

18. *See* WORLD ENERGY ASSESSMENT, *supra* note 3, at 70.

regulated. Because electricity is used ubiquitously (for lighting, heating, cooling, cooking, cleaning, health care services, commerce, etc.), many governments strive to ensure that access to energy will be equitably distributed, the quality of that service will be adequately maintained, and the price of that service will be reasonable. Government restrictions instituting rigorous steps that utilities must take before cutting off residential and commercial electric services are in place because this service has grown into a necessity for everyday life.

Remote communities have limited experience with governmental functions and may be unfamiliar with the planning and operation necessary to maintain a functioning asset like an energy system. In this case, communities require significant support in the form of training and suggestion on best practices. blueEnergy has provided support by conducting workshops on how to hold effective meetings, how to come to and record group decisions, and how to execute decisions. blueEnergy works with communities and recommends that communities form energy commissions that oversee the community energy assets. Regardless of the structure of community organization, communities need to make important decisions regarding their energy assets. There will be different questions for different assets.

Energy governance. Will there be a body that oversees the energy services in the community, and if so, what will the structure of that body be (election/appointment of members, rights and obligations of members, terms)?

Access. Who gets access, what access is guaranteed, when can access be denied or withdrawn?

Quantity and quality. What limitations will be made regarding the amount of energy consumers may use and what guarantees will be made regarding the amount of energy that will be supplied?

Safety regulations. What regulations will be in place to ensure safety related to energy usage, regulations both on the energy provider (e.g., generation, distributions, and maintenance regulations) and on the consumer (e.g., wiring codes)?

Tariffs. What will the price of service be, and how may price modification occur?

Energy development vision. If energy is a key component of community development (economic, educational, health and sanitation), what level of energy supply will be necessary to achieve this vision?

A community body serves as a reasonable place to centralize energy consumer education efforts. As the World Bank notes, many electricity

consumers use energy services for basic lighting but fail to fully utilize the service.[19] Consumer training should also apply to safe and efficient use of electricity, highlighting ways consumers can use energy both effectively and efficiently.

There is significant room for development of best practices for small-scale energy commission development. While certain practices can be borrowed from large-scale utility applications, others must be modified for the local context. Adjusting for differences among nationalities, ethnicities, and local customs is imperative for the success of energy development.

b. Consumer training

Consumer training in rural environments is critical to maximizing the impact of scarce energy resources. Training should include basic concepts of energy efficiency and safety, but should also highlight potential energy uses. For a rural furniture maker who has never used power tools before, training should include a description and demonstration of the ways that power tools could improve his business. This type of interaction brings the technology to a real level and heightens the interaction between the consumer and the resource. It also improves consumers' interest in taking the steps necessary to keep the energy resource functioning properly.

c. Technical capacity

While community institutional capacity pertains to the softer side of managing the energy system, technical capacity applies to keeping the system running. After installation, energy systems require maintenance, repair, and upgrades as well as the training of local technicians to ensure safe and successful adoption and use. The more complicated the technology employed, the better trained the technicians need to be. Remote communities may not have any technicians trained to troubleshoot, repair, or perform basic maintenance on energy systems. The farther a community is from trained technicians, the more important it is for donors to factor in local technical capacity building into a project.

Even relatively simple energy systems require ongoing maintenance to ensure proper and safe use. This follow-up slows the process of installing a technology and moving on to the next community. However, dedication to making each system successful in the long-term supports the degree to which an energy system benefits a community, which

19. *See* INDEPENDENT EVALUATION GROUP, WORLD BANK, THE WELFARE IMPACT OF RURAL ELECTRIFICATION: A REASSESSMENT OF THE COSTS AND BENEFITS 27 (2008), *available at* http://siteresources.worldbank.org/EXTRURELECT/Resources/full_doc.pdf (last visited Mar. 23, 2010).

should be the ultimate goal. Rather than leaving equipment to rust due to disrepair or neglect, working with beneficiaries to use the equipment as effectively as possible improves the impact of the money spent on the equipment.

To address the need to develop local technicians capable of working with an energy system, blueEnergy manufactures its turbines locally. This process ensures that local individuals understand the mechanics of the turbine (if you can build it, you can repair it) and that an adequate supply chain exists to make necessary materials available locally. Regardless of where a technology is manufactured, building local technical capacity is imperative to the success of energy technology. An energy system that suffers significant downtime because technicians must come from the closest population center imposes the need for backup systems and undermines community adoption of the technology.

The residual benefit of local training is that mechanical training can be applied to uses outside of energy systems. Building a base of technically adept people is very beneficial to any community. A person who learns how to repair a turbine can apply that skill to fixing a water pump. A person who learns how to frame a roof mount for a solar panel installation can apply the lessons learned to building stronger structures that can better withstand high winds. As the community utilizes mechanical devices to enhance economic opportunities, it is imperative that the community also has a supply of technicians who can keep these devices functioning.

d. Cross-applicability of rural electrification development materials

The considerations and support mechanisms involved in remote electrification can improve the use of decentralized generation in a number of contexts. Decentralized generation is becoming popular with environmentally conscious people in developed areas who want to be free from a coal or nuclear-powered grid, companies and utilities that want to diversify their generation sources, governments concerned about the terrorism implications of relying on a central grid, and institutions using decentralized generation for natural disaster relief. As better policies and management mechanisms are developed in one decentralized generation context, the lessons learned can be applied in the other contexts as well. Further, the technical training and regulatory techniques developed through the use of decentralized generation can be leveraged across decentralized generation contexts.

2. Funding for productive and non-productive use equipment

While it may seem counterintuitive, funding equipment used for entertainment may substantially increase the success of an energy system

in a remote community by enhancing social cohesion. This applies even if the energy supply is limited. Prioritizing "more important" services like education or heath, for example, should necessarily occur. If a community does not use and appreciate an energy system, the community will not invest effort maintaining and repairing the system. Certain communities also lack the social cohesion needed to manage and maintain an electricity system. Many off-grid communities have no electrical devices. Donors can support community interest in energy systems by facilitating purchase of equipment that provides productive and non-productive uses. Communities that use equipment that runs on electricity will devote efforts toward making sure those systems function, and those efforts will extend the lifespan of the energy system.

Funding equipment related to education, health and sanitation, and productive uses is relatively easy to support. However, many communities place a premium on entertainment-related equipment, which is much less popular in the donor community. While televisions and radios may seem like a waste of scarce resources, consuming budgets and energy, these items play a significant role in drawing communities together in areas where no other entertainment devices exist. Additionally, entertainment devices like radios can perform the important role of conveying news, educational programs, and natural disaster warnings. Further, devices that serve as a bridge to other cultures can help communities feel less isolated. These devices play a critical role in creating community interest in maintaining their energy systems.

3. Institutional capital

In addition to investing in community hardware and institutional capacity building, investment in institutional capital for the organizations that perform the training and follow-up needed to support the energy system is critical to energy system success. Most NGOs face perpetual shortages of funding for operational equipment, personnel, training, and research and development. This condition has been well documented and is rampant throughout the NGO sector.

As applied to developing energy systems, this situation is devastating. Energy system development requires a long-term approach. Organizations supporting communities that are new to working with energy systems need adequate tools, literally and figuratively, to make this technology successful. For organizations developing energy equipment maintenance manuals and community energy commission development manuals, adequate computer equipment and office space is imperative. Creating a curriculum for remote energy system use and care is new in many areas. This curriculum is the backbone of a successful energy system from a technical level. The same goes for developing the

policy framework for local energy commissions. Along the same lines, for executing organizations to appropriately learn from the lessons other organizations have learned, the executing organization needs appropriate information technology.

Certain donors prioritize equipment installed in beneficiary communities and discourage investment in institutional capital for organizations supporting these systems. Allowing overhead, salary, and administrative expenses leads to more efficient product delivery, more transparency, and stronger long-term results. I suggest shifting the focus from restricted spending categories to the results obtained from dollars invested. Donor fascination with overhead ratios and "direct" investment misses the nuance of how imperative robust technology support services are to the ongoing use of equipment.

4. Consultants v. Staff

Similar to investing in institutional capacity, a specific focus on institutional human resources is needed. At certain times, adding technical expertise to an organization's team can be tremendously helpful. When focusing on core staff that will be working on a project long-term, funding consultants rather than permanent staff has many profound implications. One implication of hiring consultants is that a consultant will be temporary and will work on a project for the short-term. This situation strongly colors the organization's relationship with local members of beneficiary communities, its development of internal systems and institutional knowledge, and its long-term vision.

When working in remote communities developing trust-based relationships, a deep understanding of local culture, local operating norms, and levels of community member comprehension are critical. Remote communities may be mistrustful of the motives and dedication of unfamiliar outsiders. For communities that see aid agencies come and go, community members may be leery of new attempts to provide new technology that require a significant amount of work on the part of community members to maintain. Relationships and trust in these areas are generally granted to people, not organizations. Cycling new consultants through the community degrades trust and understanding and undermines an organization's ability to complete projects that rely heavily on trust and commitment, like forming an energy commission.

On an institutional level, intake and training for new staff is greatly taxing and orientation can take a significant period of time. Adjusting to operational idiosyncrasies takes time and decreases the effectiveness of staff new to an organization. Performing the ramp up and handoff accompanying a high-turnover workforce is tremendously burdensome and exacerbates the financial and institutional situation for lean

organizations. On a higher level, the churning process threatens long-term institutional goals as well. Introducing new staff members to the organization's culture and development philosophy is very important when long-term vision is key to these systems. While consultants are helpful, adequately funding core staff is necessary for long-term project growth and continuity.

D. Control and Reporting

A significant difference between for-profit and donor-funded project development is the degree of budgetary control demanded by the funding entity. While shareholders in for-profit entities have the right to elect the entity's board of directors and approve certain major actions, shareholders generally do not approve the operating budget or gain line-item control of spending. In contrast, it is quite common for donors making restricted grants to specify how the grant should be used, indicating overhead limits, and restricting spending that is not deemed to be "direct impact." The result of this restriction is that the management of the entity executing the grant must balance its judgment of how it can maximize impact for beneficiaries with the limits imposed by donors. In the face of changing circumstances, management is generally expected to request a budget modification from the donor if spending will diverge in any category by a specified amount. From a managerial perspective, this approach is very challenging, especially when working in challenging developing environments. The approval process can take months, and the person or committee granting approval may be very far removed from the context in which the project occurs. At the very least, organizations asking for review of budget variance should be available to approve requests in a timely manner to avoid the gridlock caused by review delays.

Donor focus on up-front due diligence of executing organizations can help to shift donor emphasis from line item budget review to a results-oriented approach. This relationship is similar to the way shareholders elect a board of directors based upon expected results (e.g., expected dividends and share price). Because funding energy projects is a long-term undertaking, conducting adequate diligence on executing organizations is imperative, but the degree of diligence on the front end should result in a higher degree of trust in the management team and therefore, more focus on results and more discretion for management to make effective, informed management decisions.

Another approach used by certain donors is to exchange funding for board representation. This type of relationship gives the donor a voice and insight into the issues the organization faces, both keeping the donor informed of the executing organization's operations and allowing

management the leeway to operate dynamically. An alternative to this structure would be a project advisory committee. Approval of project progress would be evaluated by informed representatives who would be in a position to make timely decisions.

VI. CONCLUSION

Bringing electricity services to remote communities is one of the world's largest challenges because of technical complexity and the number of people who need access to electricity services. Energy systems sufficient to cross the "tipping point" necessary for communities to develop economic opportunities are complex and require a technical solution, plus training and development for community managers, consumers, and technicians who will keep the systems functioning. Because these systems are different than many other philanthropic undertakings, donors who finance these systems must re-evaluate their traditional biases in order to promote systems that will function long-term and work as effectively as possible to improve lives in the isolated regions of the world. Effective electrification solutions require hardware to be coupled with significant community system building, consumer education and individual technical training. Fundamentally, effective solutions require more than purchasing and installing energy equipment; they require a long-term commitment to building an ecosystem in which beneficiary communities aspire, and are able, to take active roles in making the systems a foundational component of a community development vision. The challenge is large, but the reward is well worth the effort.

Beyond Public Reason on Energy Justice: Solidarity and Catholic Social Teaching

José Ambrozic*

I. INTRODUCTION

The concept of justice in the social teaching of the Catholic Church can enhance the understanding of energy justice and prompt action to reach it. Religious traditions that are not fundamentalist but that engage in reasonable argument[1] should be included in ethical social reasoning. They can contribute a unique wisdom based on centuries of reasoned arguments. More importantly, given the shortfalls of political liberalism which is currently the most common form of ethical social reasoning and political organization in western societies, religious traditions can make meaningful contributions to ethical discussions.

Catholic thought on social issues is grounded in Sacred Scripture, which, with the Jewish tradition, has shaped its conception of individuals and society for thousands of years. Catholic thought on social issues defends the life and dignity of the human person because of its transcendent nature; it defends the rights implied in that dignity, but also the living conditions that are consistent with it. It affirms that the dignity of individuals implies a transcendent and spiritual purpose that has valuable meaning and that a key part of that purpose is self-giving for the good, life, and dignity of others. Human persons achieve fulfillment when they are aligned with that purpose.[2]

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1. Fundamentalist traditions rely on literal interpretation, unlike traditions such as Catholicism, which I will argue relies on both faith and reasonable argument. Rawls' concept of political liberalism requires reasonable argument for ethical reasoning.

2. Webster's New World College Dictionary defines "fulfill oneself" as "to realize completely one's ambitions, potentialities, etc. It defines "realize" as make real, bring

What role can faith have in helping us identify the obligations of energy justice and in providing us the moral energy necessary to undertake whatever challenges are implied in heeding those obligations? If the social teaching of the Catholic Church acquires its space in the public square, it will recognize the dignity of every human person and the obligation of solidarity we all have towards each other. This includes the equitable sharing of environmental resources and assisting others proportionally to their needs and our ability to do so. Given that a lack of adequate sources of energy undermines one third of the world's population's health and development, we have an urgent duty to employ our resources to alleviate that situation permanently.

This Article has the following sequence. Section II develops the concept of justice and its limitations in political liberalism, which is the most relevant political context for this discussion. Sections III and IV deal with the contribution of faith, and particularly Catholic social thought, to overcoming these limitations by providing a more comprehensive approach to justice and the human person. Section V addresses how these contributions inform thoughts about energy justice.

II. THE PREMISES AND LIMITS OF POLITICAL LIBERALISM

Through history, different political systems have provided frameworks for societal organization that have allowed people to thrive and make impressive political, economic, and cultural achievements. However, this Article will focus on democracy and the public philosophy of political liberalism as they comprise the most widely accepted political system in modern western societies. One of political liberalism's most recognized theorists is John Rawls. His general argument is that of reasonable pluralism, a system in which citizens realize that they cannot reach agreement, or even approach mutual understanding, on the basis of their irreconcilable comprehensive doctrines. Therefore, citizens consider what kinds of reasons they may reasonably give to one another when fundamental political questions are at stake.[3] The political conception of

into being. I will use it more narrowly as making real or achieving the fullness of being, realizing the more substantive potentialities of the human person. I have also chosen to use the term "human person" instead of "individual" in most occasions to convey the uniqueness of the spiritual and relational nature of each human being, while individual refers to a single, not divisible member or unit of a group or species. Person derives from the Greek "prosopon" which referred to theater masks but has a long theological and philosophical tradition identified with spiritual, rational beings having conscience and free will and with a social disposition.

3. JOHN RAWLS, *The Idea of Public Reason Revisited*, *in* THE LAW OF PEOPLES WITH

the person as a free and independent self[4] is "implicit in the public political culture of a democratic society."[5] It requires "the state as . . . a framework of rights that is neutral among ends. To base rights on some conception of the good would impose on some the values of others and so fail to respect each person's capacity to choose his or her own ends."[6] "Since people's moral and religious convictions are unlikely to converge, it is more reasonable to seek agreement on principles of justice that are neutral with respect to those controversies."[7] Hence, according to political liberalism, democracy is the neutral framework that gives everybody an equal opportunity to engage in reasonable arguments and protects the rights of people to pursue their ends and their own conception of the good. However, political liberalism does not really define a neutral space; it is a paradigm[8] that includes its own conception of individuals and their ends.

Political liberalism is flawed in at least three important ways. First, it establishes justice as independent from the good and from truth. Justice, according to political liberalism, is not what is due to each person, but is what their competing preferences negotiate in a fair and due process. It is procedural rather than substantive. Second, political liberalism is a compromise; a social contract that is limited by the common rule of what everyone will reasonably accept. This could be a reasonable approach that allows people with different views to agree on a political system. However, it leaves out key parts of the lives of people and of society and does not usually recognize its limits and allow other agents to provide for other dimensions of the common good. Third, political liberalism does not acknowledge that it is ideologically charged. It purports to be a value-free and practical model that allows people to negotiate within a fair and ordered social space, but it is ideologically biased and because it does not recognize this bias, it does not allow for the fair negotiation it purports.

"THE IDEA OF PUBLIC REASON REVISITED" 131-32 (1999) [hereinafter *Public Reason*].

4. The free will of the person discussed here. However, Rawls makes it the fundamental trait of the person, not to be hindered by any constraint or duty. What I question is his notion of a *free and independent self* without any duties or moral considerations related to anything or anyone beyond himself, such as God, family, or society.

5. MICHAEL J. SANDEL, LIBERALISM AND THE LIMITS OF JUSTICE 193 (1998) (quoting JOHN RAWLS, POLITICAL LIBERALISM 13).

6. *Id.* at 187.

7. *Id.* at 189.

8. *See* THOMAS S. KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS (2d ed. 1970) (discussing the advantages and shortcomings of paradigms).

Why must we set aside our moral and religious convictions when engaging in the political space?[9] Political liberalism replies that this is required for political purposes,[10] deeming moral or religious purposes as private and having no relevance in the public space.[11] To be allowed in the public space, our convictions must be stripped from any claim of truth or moral authority and must be expressed as mere preferences that have no value beyond that.[12] Rawls claims this is required by the special nature of modern democratic societies.[13] If modern democratic societies require such a rupture of our personal identities, this model of society requires urgent overhaul.

Political liberalism's premise, reasonable compromise, is not meant to cover many important parts of the life of people and society. The political system should recognize its limits and allow other institutions and initiatives to provide for other dimensions of the common good.[14] Similarly, democracy and majority rule are limited in their capacity to achieve outcomes that are just or right.[15] Justice cannot remain meaningful without any connection to truth and good,[16] but Rawls reduces the good to fairness and to ensuring the stability of the political system. Catholic leaders argue that democracy also needs religion and virtue to function properly, as George Washington's farewell address

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9. *Id*. at, 191.

10. *Id*. at 191-92."The reason we should think about justice from the standpoint of persons who abstract from their ends is not that this procedure expresses our nature as free and independent selves given prior to our ends. Rather, this way of thinking about justice is warranted by the fact that, for *political* purposes, though not necessarily for all moral purposes, we should think of ourselves as free and independent citizens, unclaimed by prior duties or obligations." As debatable as this statement is, Sandel is merely trying to reproduce Rawls's position, with which he does not agree.

11. Most Rev. Charles J. Chaput, O.F.M. Cap Archbishop of Denver, Religious Tolerance and the Common Good, Talk delivered at the Path to Peace Foundation Seminar: Catholic Students and the Common Good: Building a Better World (May 22, 2007), *available at* http://www.archden.org/images/ArchbishopCorner/Addresses/religioustolerance_may22_07.pdf [hereinafter Tolerance and Common Good].

12. SANDEL, *supra* note 5, at 192-93, (quoting JOHN RAWLS, POLITICAL LIBERALISM 30, 33).

13. *Id*. at 193.

14. *Public Reason*, *supra* note 3, at 154 n. 52."Thus, political liberalism agrees with David Hollenbach, S.J., when he writes: 'Not the least important of [the transformation brought about by Aquinas] was his insistence that the political life of a people is not the highest realization of the good of which they are capable–an insight that lies at the root of constitutional theories of limited government.'"

15. RAWLS, A THEORY OF JUSTICE 313 (Harvard University Press 1999) (1971).

16. Pope Benedict XVI, Lecture by the Holy Father Benedict XVI at the University of Rome: La Sapienza (Jan. 17, 2008), *available at* http://www.vatican.va/holy_father/benedict_xvi/speeches/2008/january/documents/hf_benxvi_spe_20080117_la-sapienza_en.htm [hereinafter Lecture at the University of Rome].

proclaimed: "[o]f all the dispositions and habits which lead to political prosperity, religion and morality are indispensable supports [and] virtue or morality is a necessary spring of popular government."[17] The tendency, however, is to disregard virtue and values and to proscribe them from the public space,[18] particularly religiously grounded values.[19]

III. ROMAN CATHOLIC SOCIAL THOUGHT

Political liberalism limits the reasons that can be used[20] for public reasoning by excluding reasons stemming from comprehensive doctrines and assumes that all will agree on reasons based on liberal conceptions.[21] However, religious traditions that are not fundamentalist but engage in reasonable argument should be involved in ethical social reasoning because they represent the values of many, contribute the wealth of centuries of discourse, and provide the moral energy to engage people in the works of justice.[22] The Roman Catholic tradition relies on reasoned inquiry to approach the truth and the good,[23] which is consistent with public reason, the difference being that Catholicism is guided by the concern for the truth and the good.[24] Pope Benedict XVI argues that human rights have an objective foundation in the truth of God; this natural law has a property called "equity," meaning giving each person his or her rights.[25]

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17. Most Rev. Charles J. Chaput, O.F.M. Cap Archbishop of Denver, The Canterbury Award: Acceptance Remarks (May 7, 2009), *available at* http://www.archden.org/index.cfm/ID/2019.

18. Tolerance and Common Good, *supra* note 11; George Washington, Farewell Address 20 (Sept. 19, 1796)), *available at* http://gwpapers.virginia.edu/documents/farewell/transcript.html.

19. Most Rev. Charles J. Chaput, O.F.M. Cap Archbishop of Denver, 1st Annual Orange County Prayer Breakfast: Seeing Clearly (Dec. 7, 2006), *available at* http://www.archden.org/images/ArchbishopCorner/seeingclearlyprayerbreakfast12.07.06.pdf. [hereinafter Prayer Breakfast].

20. *Public Reason*, *supra* note 3, at 139 n. 21.

21. *Id*. at 165-66.

22. Lecture at the University of Rome, *supra* note 16 (discussing Rawls's support for the value of faith traditions).

23. *Id*.

24. *Id*.

25. Pope Benedict XVI, John of Salisbury: Natural Law must inspire Positive Law, Catechesis (Dec. 16, 2009), *available at* http://www.vatican.va/holy_father/benedict_xvi/audiences/2009/documents/hf_ben-xvi_aud_20091216_en.html. According to Pope Benedict XVI, the central thesis of the *Policraticus* is that there exists "an objective and immutable truth, the origin of which is in God, a truth accessible to human reason and which concerns practical and social activities. This is a natural law from which human legislation, and political and religious authorities, must draw inspiration in order to

A. Faith and Justice

Justice is a weighty concept. It implies rectitude, fairness, giving what is due or merited,[26] and is the measure of what is right. When justice is not present, we are compelled to affirmatively act to bring it about, and to effect change with urgency and dedication. Acting in the name of justice is a serious responsibility. It is even more so when done in the name of a great number of people. We must ensure that authentic justice is served and that this is done effectively.

Justice as rectitude or righteousness requires a norm or a standard of judgment to operate. The Old Testament equates justice with goodness and perfection as established by God's law and the just person with the saint. Sacred Scripture's standard of judgment goes beyond fairness and lays down the conditions necessary to achieve the good. It is summarized in loving God with all your heart, soul, mind, and strength and loving your neighbor as you love yourself.[27] Germain Grisez and Russell Shaw state that when striving for the good, we might have to go beyond fairness by forgoing our own good and providing for the good of others[28] and even set aside just claims and employ mercy as the ultimate value.[29]

This conception of justice recognizes that all creatures have a right to the good and all should strive to make the good available to all. This is at the core of the Judeo-Christian tradition, which has shaped the idea of justice in western culture. Human activity should be oriented to that end.[30] We can expect that the good will necessarily include justice. "The Golden Rule," found in the Gospel, states: "[d]o unto others as you would have them do unto you."[31] The Golden Rule demands fairness or impartiality "while requiring an attitude of solidarity toward others and readiness to carry it out in appropriate deeds."[32] Although some insist that the good is implied in fairness, an explicit reference to the good in fairness should be retained.

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promote the common good."

26. Pope Benedict XVI, Message of his Holiness Benedict XVI for Lent 2010 (Oct. 30, 2009), *available at* http://www.vatican.va/holy_father/benedict_xvi/messages/lent/documents/hf_ben-xvi_mes_20091030_lent-2010_en.html.

27. *Matthew* 22:37-40.

28. GERMAIN GRISEZ & RUSSELL SHAW, FULFILLMENT IN CHRIST 322-23 (1991).

29. *Id*. at 310-11.

30. Pope Paul VI, Pastoral Constitution on the Church in the Modern World (Dec. 7, 1965), *available at* http://www.vatican.va/archive/hist_councils/ii_vatican_council/documents/vat-ii_cons_19651207_gaudium-et-spes_en.html.

31. *Luke* 6:31; *Matthew* 7:12.

32. GRISEZ & SHAW, *supra* note 28, at 82.

B. The Contribution of Comprehensive Religious Traditions

Rawls recognizes the need for personal moral commitment to sustain civic agreements[33] and allows faith traditions to enrich civic discussion as long as they do it through political arguments.[34] Rawls argues that faith traditions can participate in public reason[35] and that there is value in each of us publicly "declar[ing] our own comprehensive doctrine" while other "citizens . . . are reassured, and this strengthens the ties of civic friendship."[36]

Political liberalism allows Catholic expressions of the common good in political space as long as they are expressed as political values.[37] It is necessary to include faith traditions in public political discourse to fill the lacuna left by political liberalism and to provide a more complete account of individuals and society so that we can achieve a more integral approach to what justice implies. Catholic social thought can contribute to these discussions, including the discussion about energy justice.

C. The Dignity of the Human Person

Faith within the western tradition defends the dignity of human persons and their right to what is true and good. Catholic social ethics is based on the nature of the human person.[38] Human persons, modeled in the image and likeness of God, who is love, have love at the core of their identity and vocation. The human person is only fulfilled in love. Only the human person can rise above instinct, self-preservation, and self-interest. Only the human person can choose to love, to sacrifice for the good of others, to suffer, and even to die for the love and the benefit of others. The human person shares this capacity of conscious and free self-denial for love and for the good of others with the divine. This vocation, as well as openness to love and to the encounter with God, oneself, others, and creation, are the sources of the unbounded genius, richness, and depth of which any human person is capable. That is our glory and dignity. That is why every human person is an irreplaceable treasure, worthy of love, respect, and care. The image of the divine is in every person.

Recognizing that presence, which to Catholics is the foundation of the dignity of every human person, lay and religious missionaries and

33. *Public Reason*, *supra* note 3, at 152-53.

34. *Id*. at 152.

35. *Id*. at 145.

36. *Id*. at 155.

37. *Id*. at 142.

38. *See supra* note 2 for the use of the term "human person."

volunteers have been energized to preach and educate about the dignity of individuals and to give aid for the sake of that dignity worldwide.[39] The Catholic Church supports human rights as part of the dignity of the human person and gives them a solid foundation and a moral persuasion.[40] To the Church, justice is to give each person what is due to his or her full reality.[41] Theories of the market and of society based on the concept of a social contract and on self-interest explain some of these dynamics, but reducing human experience to these concepts is overly simplistic. Justice demands that we acknowledge the fullness of the truth and reality of every human person, not merely his or her political dimensions. This includes material needs, among them certainly adequate energy resources. The more critical the need for energy is to the well-being and development of the human person, the greater our duty is to supply that need.

D. Nature and Human Nature

There is a harmony and consistency in nature that reveals an underlying order of causes and ends.[42] The consistency reveals law and the harmony reveals not random disorder but purpose and ends. Science was made possible by Catholic thought,[43] but modern science broke away from the Catholic reverence for God's gift of nature. Science identifies the laws of nature, but is blind to the harmony and purpose revealed in nature. Modern science creates an adversarial relationship with nature in which we extract its secrets by force to put them to the service of humankind. There is no mystery to admire. Nature has to be subdued so that it can be exploited, supporting the conviction that human rationality is smarter and more efficient than nature. From this attitude, we can trace the abuse of the environment.[44]

E. The Nature of the Human Person Fulfilled in Duty and Mission

Faith can provide a more holistic approach to human nature and to nature itself than political liberalism.

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39. Pope John Paul II, Centessimus Annus (May 5, 1991) at ¶ 57, *available at* http://www.vatican.va/holy_father/john_paul_ii/encyclicals/documents/hf_jp-ii_enc_01051991_centesimus-annus_en.html [hereinafter Centessimus Annus].

40. LUIS FERNANDO FIGARI, DIGNIDAD Y DERECHOS HUMANOS 23 (1991).

41. The whole of their reality: physical, moral, social, spiritual.

42. ERNEST L. FORTIN, HUMAN RIGHTS, VIRTUE, AND THE COMMON GOOD: UNTIMELY MEDITATIONS IN RELIGION AND POLITICS 116 (J. Brian Benestad ed., 1996).

43. *Id.* at 122.

44. *Id.* at 124-26.

> one of the most obvious weaknesses of present-day civilization lies in an inadequate view of man . . [ours is] the age of the forms of humanism and . . . paradoxically also the age of man's deepest anxiety about his identity and his destiny . . . the age of human values trampled on as never before . . . '[h]ow is this paradox explained? . . . atheistic humanism'. It is the drama of man being deprived of an essential dimension of his being, namely, his search for the infinite, and thus faced with having his being reduced in the worst way . . . man is God's image and cannot be reduced to a mere portion of nature or a nameless element in the human city . . . . This complete truth about the human being constitutes the foundation of the Church's social teaching and the basis also of true liberation.[45]

In other words, human freedom in liberalism deceitfully traps humans in selfish materialism.

> [T]he Church's social doctrine, by its concern for man . . . 'belongs to the field . . . of moral theology . . . . The theological dimension is needed . . . in contrast both to the 'atheistic' solution, which deprives man of one of his basic dimensions, namely the spiritual one, and to permissive and consumerist solutions, which under various pretexts seek to convince man that he is free from every law and from God himself, thus imprisoning him within a selfishness which ultimately harms both him and others.'[46]

The Christian vision of humans sees freedom as the capacity for commitment to others and the potential for transcending our own selves in love for God and others. In Catholic teaching, the duty to love and work for justice is not an undesirable burden but an opportunity for fulfillment in love, our true nature. The duties to work for the common good,[47] for justice, and to help those less fortunate exist both at the

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45. Pope John Paul II, Address of His Holiness John Paul II in Puebla, Mexico, (Jan. 28, 1979) ¶ I.9, *available at* http://www.vatican.va/holy_father/john_paul_ii/speeches/1979/january/documents/hf_jp-ii_spe_19790128_messico-puebla-episc-latam_en.html [hereinafter Address in Puebla]; *see also* Pope John Paul II, Reconciliation and Penance (Dec. 2, 1984), ¶ 2, *available at* http://www.vatican.va/holy_father/john_paul_ii/apost_exhortations/documents/hf_jp-ii_exh_02121984_reconciliatio-et-paenitentia_en.html.

46. Centessimus Annus, *supra* note 39, at ¶ 55.

47. Pope Benedict XVI, Caritas In Veritate (June 29, 2004) at ¶7, *available at* http://www.vatican.va/holy_father/benedict_xvi/encyclicals/documents/hf_ben-xvi_enc_20090629_caritas-in-veritate_en.html [hereinafter Caritas In Veritate]. (Defining the common good: "[t]o love someone is to desire that person's good and to take effective steps to secure it. Besides the good of the individual, there is a good that is linked to living in society: the common good. It is the good of 'all of us,' made up of individuals, families and intermediate groups who together constitute society. It is a good that is sought not for its own sake, but for the people who belong to the social community and who can only really and effectively pursue their good within it. To desire the

personal and societal levels. Those who have the capacity in time, skills, or resources have a stronger duty to do so.[48]

> Love for others, and in the first place love for the poor, in whom the Church sees Christ himself, is made concrete in the *promotion of justice*. Justice will never be fully attained unless people see in the poor person, who is asking for help in order to survive, not an annoyance or a burden, but an opportunity for showing kindness and a chance for greater enrichment . . . [It is] helping entire peoples which are presently excluded or marginalized to enter into the sphere of economic and human development. For this to happen . . . it requires above all a change of life-styles, of models of production and consumption, and of the established structures of power which today govern societies . . . . '[G]lobalization' . . . this increasing internationalization of the economy, ought to be accompanied by effective international agencies which will oversee and direct the economy to the common good.[49]

F. Self Giving Love and Development

True love is concerned with the whole human person. As we face the trials of many peoples, we become aware of the need to share what we possess,[50] but also of the need to support the development of those most in need, development that considers the whole person.

> [T]o attain a life worthy of man, it is not possible to limit oneself to *having more*; one must aspire to *being more* . . . it is the language of the experience, of the suffering, of the hope of modern humanity. It is necessary, in international life, to call upon ethical principles, the demands of justice, the primary commandment which is that of love. Primacy must be given to what is moral, to what is spiritual, to what springs from the full truth concerning man.[51]

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common good and strive towards it *is a requirement of justice and charity*. To take a stand for the common good is on the one hand to be solicitous for, and on the other hand to avail oneself of, that complex of institutions that give structure to the life of society, juridically, civilly, politically and culturally, making it the *pólis*, or 'city.' The more we strive to secure a common good corresponding to the real needs of our neighbours [sic], the more effectively we love them. Every Christian is called to practise [sic] this charity, in a manner corresponding to his vocation and according to the degree of influence he wields in the *pólis*. This is the institutional path—we might also call it the political path—of charity.") (emphasis in original) .

48. GRISEZ & SHAW, *supra* note 28, at 180.

49. Centessimus Annus, *supra* note 39, at ¶ 58 (emphasis in original).

50. Address in Puebla, *supra* note 45, at ¶ III.4.

51. *Id*. (emphasis in original) (internal citations omitted).

This "development . . . cannot be restricted to economic growth alone. To be authentic, it must be well rounded; it must foster the development of each man and of the whole man . . . . What counts for us is man—each individual man, each human group, and humanity as a whole."[52]

As energy has a fundamental role in the development of peoples, it is a key issue to be addressed as an urgent expression of the concern and solidarity that arises from our Christian vocation to love.

IV. ENERGY JUSTICE

Energy is a resource we draw from the environment but, as it is used, it also affects and shapes our environment. Speaking about human ecology, Pope John Paul II advocated that the environments of humans should enable them to develop and be fulfilled in healthy ways. These environments should provide for basic needs. A social environment should not be physically or morally toxic and should allow freedom of conscience to seek truth and the freedom to love and be loved. Justice requires this human ecology; each person should have the environment he or she needs to thrive. From this perspective, it is unjust and inhumane that there are billions who do not have their basics needs met, such as access to water, food, energy, and education, which would allow them to live with dignity. It is also unjust and inhumane that millions who have more resources are unwilling to share with those in need. It demeans their own dignity to neglect or deny their vocation to love and to fail to serve and give generously to those in need when they can. When so-called developed societies deny their peoples' duty to virtue and duty to help those in need in the name of freedom, they betray their human nature and frustrate their own fulfillment.

A. The Environment

According to Catholic thought, the environment, or creation, is the habitat God made for us and its preservation is critical to the peace and prosperity of humankind. Humankind's inhumanity has caused

> the neglect—if not downright misuse—of the earth and the natural goods that God has given us. For this reason, it is imperative that mankind renew and strengthen 'that covenant between human beings

52. Pope Paul VI, Populorum Progressio, (Mar. 26, 1967) at ¶ 14, *available at* http://www.vatican.va/holy_father/paul_vi/encyclicals/documents/hf_p-vi_enc_26031967_populorum_en.html.

> and the environment, which should mirror the creative love of God.'[53]

There is a close connection between humankind and the environment.

> [I]ntegral human development is closely linked to the obligations which flow from *man's relationship with the natural environment*. The environment must be seen as God's gift to all people, and the use we make of it entails a shared responsibility for all humanity, especially the poor and future generations . . . . [W]henever nature, and human beings in particular, are seen merely as products of chance or an evolutionary determinism, our overall sense of responsibility wanes. On the other hand, seeing creation as God's gift to humanity helps us understand our vocation and worth as human beings.[54]

In the four decades since Paul VI, recent popes have expressed concern for environmental issues. "There is a growing awareness that world peace is threatened . . . by a lack of due respect for nature.' [Pope John Paul II] added that '*ecological awareness*, rather than being downplayed, needs to be helped to develop and mature, and find fitting expression in concrete programmes [sic] and initiatives.'"[55] The problems and the solutions are not technical but moral. The ecological crisis "is closely linked to the notion of development itself and our understanding of man in his relationship to others and to the rest of creation" and requires from us

> a *profound, long-term review of our model of development*, one which would take into consideration the meaning of the economy and its goals with an eye to correcting its malfunctions and misapplications. The ecological health of the planet calls for this, but it is also demanded by the cultural and moral crisis of humanity whose symptoms have for some time been evident in every part of the world. Humanity needs a *profound cultural renewal*; it needs to *rediscover those values which can serve as the solid basis* for building a brighter future for all. Our present crises—be they economic, food-related, environmental or social—are ultimately also

53. Pope Benedict XVI, Message of his Holiness Pope Benedict XVI for the Celebration of the World Day of Peace (Jan. 1, 2010) at ¶ 1 (quoting Benedict XVI, Message for the 2008 World Day of Peace, at ¶ 7), *available at* http://www.vatican.va/holy_father/benedict_xvi/messages/peace/documents/hf_ben-xvi_mes_20091208_xliii-world-day-peace_en.html [hereinafter World Day of Peace Message]. This document is the most complete, comprehensive, and summarized position that the Catholic Church has issued on the environment, which is why I will quote it extensively.

54. *Id*. at ¶ 2 (emphasis in original).

55. *Id*. at ¶ 3 (emphasis in original).

> moral crises, and all of them are interrelated. They require us to rethink the path which we are travelling together.[56]

Again, the challenge is not so much the transfer of surplus funds, but "a lifestyle marked by sobriety and solidarity."[57]

According to Catholic thought, sin is at the root of the rupture between human activity and creation. This rupture is shown in the instrumental logic we find in modern science and politics that seeks to dominate nature, rather than respect it.[58] The benefits of natural resources cannot be solely reserved to those who first claim them.

> God has destined the earth and everything it contains for all peoples and nations. The goods of creation belong to humanity as a whole. Yet the current pace of environmental exploitation is seriously endangering the supply of certain natural resources not only for the present generation, but above all for generations yet to come.[59]

Responsibility that goes beyond our personal interests is required. Concern for the needs of future generations is important, but so too is concern for those most in need in our generation around the world. Solidarity and common responsibility need to be embraced.

> '[T]he international community has an urgent duty to find institutional means of regulating the exploitation of non-renewable resources, involving poor countries in the process, in order to plan together for the future.' *The ecological crisis shows the urgency of a solidarity which embraces time and space* . . . among the causes of the present ecological crisis is the historical responsibility of the industrialized countries. Yet the less developed countries, and emerging countries in particular, are not exempt from their own responsibilities . . . This would be accomplished more easily if self-interest played a lesser role in the granting of aid and the sharing of knowledge and cleaner technologies.[60]

The Catholic Church is deeply invested in this responsibility towards creation, to all its resources, meant to be shared by all, and to reminding humankind that it needs to assume its responsibility towards the environment. "The degradation of nature is closely linked to the cultural models shaping human coexistence: consequently, 'when 'human ecology' is respected within society, environmental ecology also benefits.'"[61] But the Church knows it cannot save the environment alone,

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56. *Id*. at ¶ 5 (emphasis in original).
57. *Id*.
58. *Id*. at ¶ 6.
59. *Id*. at ¶ 7 (internal citations omitted).
60. *Id*. at ¶ 8 (emphasis in original) (internal citations omitted).
61. *Id*. at ¶ 12.

thus it appeals to everyone,[62] including leaders and all humans of good will.

> May this be clear to world leaders and to those at every level who are concerned for the future of humanity: the protection of creation and peacemaking are profoundly linked! . . . [A]ll men and women may take to heart the urgent appeal: *If you want to cultivate peace, protect creation*.[63]

B. Energy

Every human being has a need and a right to food, drinkable water, basic instruction, basic health care, and the energy necessary for development. The environment is God's gift to everyone, and when we use it we have a responsibility towards the poor, future generations, and humanity as a whole. In his recent document *Charity in Truth*, Pope Benedict XVI states that there is a pressing moral need for renewed solidarity so that countries lacking energy resources can have access to them. This will require a shift in mentality and new lifestyles in which the quest for the common good should determine consumer choices. "[T]he quest for truth, beauty, goodness, and communion with others for the sake of common growth are the factors which determine consumer choices, savings, and investments."[64] Violations of solidarity harm the environment and environmental damage upsets relations in society.

This is particularly urgent in energy issues; there are between 2 billion and 2.5 billion people who rely on harmful biomass-fueled fire as their sole source of energy for cooking, lighting, and heating. This not only brings a terrible toll of death and sickness, but also is poorly suited for meeting the energy needs required for development, thus condemning huge populations to remain in poverty and depriving them of proper healthcare, education, and the capacity to integrate themselves into the wider international community.[65]

> The fact that some States, power groups, and companies hoard non-renewable energy resources represents a grave obstacle to development in poor countries. Those countries lack the economic means either to gain access to existing sources of non-renewable energy or to finance research into new alternatives . . . . The international community has an urgent duty to find institutional means of regulating the exploitation of non-renewable resources,

62. *Id*. at ¶ 11 (emphasis in original).

63. *Id*. at ¶ 14 (emphasis in original).

64. Caritas In Veritate, *supra* note 47, at ¶ 51.

65. Lakshman Guruswamy, The Need for Energy Justice (Oct. 23, 2009) (on file with *Colo. J. Int'l Envt.l L. & Pol'y*).

> involving poor countries in the process, in order to plan together for the future . . . The fate of those countries cannot be left in the hands of whoever is first to claim the spoils, or whoever is able to prevail over the rest. Here we are dealing with major issues; if they are to be faced adequately, then everyone must responsibly recognize the impact they will have on future generations, particularly on the many young people in the poorer nations, who 'ask to assume their active part in the construction of a better world.'[66]

More recently, the Pope urged people to change their lifestyles, to focus on solidarity and on the human person, and to encourage research on environmentally-sound energy sources. He portrayed the environmental crisis as a historic opportunity for a new model of development where the virtues of prudence and charity in truth should play a more prominent role.[67] We are compelled to provide adequate energy sources to peoples in need as it is a required step towards their development. "Energy is a prerequisite to sustainable development and to addressing issues of poverty, hunger, education, gender equality, child and maternal health, sanitation, and environmental protection."[68] Energy resources must not only be provided, but also justly distributed and compensated. Appropriate sustainable energy technologies ("ASETs") "which fall within the cultural, technological, and financial reach and grasp of the rural and urban [energy oppressed poor ("EOP") and the] . . . dissemination and distribution of ASETs to the EOP" are necessary.[69] Individuals and nations have an urgent duty to achieve these goals.

C. Integral Human Development

Human persons have a transcendental calling to develop and fulfill themselves[70] both personally and in relation to those around them. This is integral in regards to the whole of human persons[71] and their world.[72] Humans are called to develop and fulfill themselves by cooperating with God's work in creation. "*Technology in this sense is a response to God's command to till and keep the land* that he has entrusted to humanity, and it must serve to reinforce the covenant between human beings and the environment, a covenant that should mirror God's creative love."[73]

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66. Caritas In Veritate, *supra* note 47, at ¶ 49 (internal citations omitted).

67. World Day of Peace Message, *supra* note 53, at ¶ 9.

68. *See* Guruswamy, *supra* note 65.

69. *Id.*

70. Caritas In Veritate, *supra* note 47, at ¶ 16.

71. *Id*. at ¶ 18.

72. *Id*. at ¶ 2.

73. World Day of Peace Message, *supra* note 53, at ¶ 10 (emphasis in original); *compare* Caritas In Veritate, *supra* note 47, at ¶ 14 ("The idea of a world without

Vision and the capacity to integrate harmoniously different dimensions of knowledge and disciplines are necessary for integral development.[74] The condition of integral development also underlines that imbalances and inequalities, as well as other weaknesses and injustices in development, tend to damage the whole system.[75] Energy, in this context, is a key issue to be given proper attention. Integral development also requires widespread solidarity and a serious commitment to the environment.[76]

Contributing money and technology is insufficient to fulfill the duty of solidarity. Personal involvement, care, and concern are also needed, both for the sake of those who give and those who receive. Love for others and the moral duty to assist them are necessary expressions of our humanity.[77] Love is not at odds with knowledge or effectiveness in service. They complement each other.[78]

> [T]he vision of development as a vocation brings with it the *central place of charity within that development* . . . . Reason, by itself, is capable of grasping the equality between men and of giving stability to their civic coexistence, but it cannot establish fraternity. This originates in a transcendent vocation from God the Father, who loved us first, teaching us through the Son what fraternal charity is.[79]

The secular approach, which excludes faith from public political discourse is unjust because it denies people their identity, deprives them

development indicates a lack of trust in man and in God. It is therefore a serious mistake to undervalue human capacity to exercise control over the deviations of development or to overlook the fact that man is constitutionally oriented towards 'being more.'") (internal citations omitted).

74. *Id*. at ¶ 31.

75. *Id*. at ¶ 32.

76. World Day of Peace Message, *supra* note 53, at ¶ 10.

77. Caritas In Veritate, *supra* note 47, at ¶ 13.

78. *Id*. at ¶ 30.

79. *Id*. at ¶ 19 (emphasis in original); ("Paul VI, in his Encyclical Letter *Populorum Progressio*, pointed out that the causes of underdevelopment are not primarily of the material order. He invited us to search for them in other dimensions of the human person: first of all, in the will, which often neglects the duties of solidarity; secondly in thinking, which does not always give proper direction to the will. Hence, in the pursuit of development, there is a need for 'the deep thought and reflection of wise men in search of a new humanism which will enable modern man to find himself anew.' But that is not all. Underdevelopment has an even more important cause than lack of deep thought: it is 'the lack of brotherhood among individuals and peoples.' Will it ever be possible to obtain this brotherhood by human effort alone? As society becomes ever more globalized, it makes us neighbours [sic] but does not make us brothers.") (internal citations omitted).

of human and spiritual resources[80] and of a strong force and motivation for solidarity and generosity in working for the common good.[81]

V. CONCLUSION

Political liberalism as a model for ethical public reasoning and political organization is seriously incomplete as it ignores the moral and spiritual aspects of the human person. Justice reduced to fairness impoverishes public space and does not protect what humans value and cherish. Justice loses its connection to the good, to what is moral and spiritual, and to truth. Consequently, it leaves little motivation to build a better society and to work for justice. Faith traditions can engage in reasonable ethical reasoning by contributing centuries of wisdom and reflection on the human person, social relations, duties, justice, and all else that is relevant to the fulfillment of the human person. They provide moral conscience, values, spiritual depth, and the compelling force and energy that can only stem from commitments to God.

Faith traditions, particularly Catholic social thought, provide a complete and ordered view of the human person, social relations, and duties. The recognition of the nature of humans as children of God, called by God to have relationships of love with Him and fellow humans, and to give themselves in love for the good of others, inspires people to rise up to this divine calling and give the best of themselves. Recognizing the divine in each person also moves us to strive for defending the life and dignity of every human person. This is not an optional duty; no one can neglect it without hurting and demeaning their own selves.

Each human person has the calling to give his or her life for the service and good of others. True justice requires that, according to their means and capacities, all people have the duty to work in transforming the social order and public institutions so that they are oriented towards fulfilling the common good and to ensure that all people are able to receive what they need to live with dignity. This implies an active concern for the environment, efforts for integral and sustainable development, and assisting those in most need. Given that adequate energy is a prerequisite for sustainable development and necessary for basic health, the efforts of people and institutions, through their resources and personal commitments, should strive to ensure that adequate energy resources and appropriate technologies are made available to those who lack them.

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80. Prayer Breakfast, *supra* note 19.

81. Caritas In Veritate, *supra* note 47, at ¶ 29.

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Notes & Comments

Can Climate Change Constitute a Taking? The Endangered Species Act and Greenhouse Gas Regulation

Ethan Mooar*

ABSTRACT

This Note examines the possibility of using the Endangered Species Act ("ESA") to force governmental action on climate change and greenhouse gas emissions. It begins with an overview of the ESA's statutory and regulatory framework and provides a brief discussion of its theoretical and policy justifications that are most relevant to this problem. It then analyzes the case law on takings, focusing on the meanings of "harm" and "harass" and the attendant problems of causation, imminence, and certainty. This Note also considers the special case of regulatory failure, examining instances where refusal to issue regulations, or the issuance of inadequate regulations, has or has not been found to take protected species. It concludes with an application of the ESA's takings framework to the U. S. Department of the Interior's recent decision to list the polar bear as threatened because of climate change's detrimental effects on the species and its habitat. This is a jumping off point to examine the plausibility and desirability of using an ESA challenge to force action on greenhouse gas emissions. While it is possible to make a legitimate argument for such a use of the ESA, it is admittedly a stretch and not necessarily the best strategy. Climate change is a far broader threat, with diffuse sources and myriad actors, than those typically contemplated by the ESA. The ESA is a powerful tool for

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protecting certain species in specific areas from particular actions. Even if a court accepted the "climate change as taking" argument, the ESA may prove to be too blunt a tool to deal effectively with this threat.

I. INTRODUCTION

On May 14, 2008, the U. S. Department of the Interior announced that it would accept the recommendation of the U. S. Fish and Wildlife Service ("FWS") to list the polar bear as a threatened species under the Endangered Species Act ("ESA").[1] At the same time, Secretary of the Interior Dirk Kempthorne stated that, while he was "compelled" by the ESA to list the polar bear as threatened due to habitat loss from receding sea ice, he would be "taking administrative and regulatory action to make certain that the ESA isn't abused to make global warming policies."[2] He also stated that using the ESA to make national climate change and greenhouse gas policy decisions would be "wholly inappropriate" and that the listing decision "should not open the door to the use of the ESA to regulate greenhouse gas emissions from automobiles, power plants, and other sources."[3]

Secretary Kempthorne has essentially stated that while the ESA may require him to list the polar bear as a threatened species, that listing should not be used as a backdoor method or justification for regulating greenhouse gas emissions or addressing climate change more generally. The question this Note seeks to address is whether requiring such regulation would even be a plausible use of the ESA. To phrase it differently: does the ESA provide an adequate or even workable framework for addressing this kind of indirect, climate-based threat to endangered species? Climate change is not easily attributed to one particular source, let alone a particular actor, a problem that runs directly into the troubled area of takings law[4] under the ESA, with its assorted nuances of timing, causation, and specificity of harm. There are unsettled questions about how direct a link there must be between an action and harm to a protected species, whether that harm must be to an individual animal or the population generally, how imminent that harm must be,

1. Press Release, U. S. Dep't of the Interior, Secretary Kempthorne Announces Decision to Protect Polar Bears under Endangered Species Act (May 14, 2008), *available at* http://www.doi.gov/news/08_News_Releases/080514a.html.

2. *Id.*

3. *Id.* The Obama administration subsequently adopted this position. *See* Andrew C. Revkin, *U.S. Curbs Use of Species Act in Protecting Polar Bear*, N.Y. TIMES, May 9, 2009, at A13.

4. Note that "takings" under the ESA are conceptually and legally distinct from "takings" under the Fifth Amendment of the United States Constitution.

and how attenuated the causal chain may be. All of these questions arise in traditional takings litigation and would certainly be even more complicated in the context of climate change.

II. OVERVIEW OF THE ENDANGERED SPECIES ACT

A. Statutory and Regulatory Background

Congress enacted the ESA in 1973 with the expressed purposes of "provid[ing] a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved [and] to provide a program for the conservation of such endangered species and threatened species."[5] As the Supreme Court has noted, the ESA is "the most comprehensive legislation for the preservation of endangered species ever enacted by any nation."[6] Among its various regulatory directives, definitions, and cause of action provisions, the ESA also includes a section entitled "Prohibited Acts" ("Section 9") which proscribes the import, sale, possession, transport, and take of any protected species by "any person subject to the jurisdiction of the United States."[7]

A look at the definitions section of the ESA brings the true scope of Section 9 into focus. The term "person" is defined broadly to include any real person, any corporation, any government or government agent at any level, and "any other entity subject to the jurisdiction of the United States."[8] This definition merely demonstrates the types of parties the ESA covers. The real breadth of Section 9 lies in the definition of "take," which the ESA defines as "to harass, harm, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."[9]

While most of the prohibited actions are relatively straightforward, "harm" and "harass" have been further defined by agency regulation. In the context of the ESA, "harass" means "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering."[10] "Harm" focuses more narrowly on the potential effect on individual animals and consists of an "act which actually kills

5. 16 U.S.C. § 1531(b) (2006).
6. Tenn. Valley Auth. v. Hill, 437 U.S. 153, 180 (1978).
7. 16 U.S.C. § 1538(a).
8. 16 U.S.C. § 1532(13).
9. 16 U.S.C. § 1532(19).
10. 50 C.F.R. § 17.3 (2008).

or injures wildlife" including "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering."[11] Needless to say, both of these definitions have led to substantial litigation and controversy in determining the extent of protections afforded by the ESA and the potential for liability among a wide range of parties.

This sweeping definition of "take," including the expansive regulatory definitions of "harm" and "harass," has been approved by the Supreme Court, which noted that "Congress intended 'take' to apply broadly" and that the Senate report on the original ESA asserted that "'[t]ake' is defined . . . in the broadest possible manner to include every conceivable way in which a person can 'take' or attempt to 'take' any fish or wildlife."[12] While it is not at all clear that Congress conceived of such broad problems as global climate change as threats to species when it enacted the ESA, and it is therefore debatable whether greenhouse gas emitters or regulatory agencies were meant to be potential "takers" of endangered species, this would not be an entirely unfounded reading of the statute and associated case law, it would certainly be a controversial one. After a brief overview of the ESA and a discussion of several theories about takings, this Note will examine some of the most problematic areas of takings case law to develop a framework within which to address this question. It will then determine whether the ESA would be a viable tool for confronting climate change and, if so, whether such action would be advisable.

B. Theoretical Underpinnings

One question about the ESA that arises frequently, while consistently evading a satisfactory answer, is why society should prioritize saving endangered species in the first place.[13] Professor Oliver Houck argues that the ESA's broad regulatory power, reaching both public and private actors, results from a desire to protect species not as "surrogates" for nature, as critics often charge, but as "miners' canaries," revealing information about the health of the earth and the ecosystems upon which all of us depend.[14] This is not simply an idle

11. *Id.*

12. Babbitt v. Sweet Home Chapter of Cmtys for a Great Or., 515 U.S. 687, 704 (1995) (citing S. Rep. No. 93-307, at 7 (1973)).

13. *See* Oliver A. Houck, *Why Do We Protect Endangered Species, and What Does That Say About Whether Restrictions on Private Property to Protect Them Constitute "Takings"?*, 80 IOWA L. REV. 297 (1995).

14. *Id.* at 299, 300-01.

inquiry into wilderness theory; rather, Professor Houck emphasizes the importance of understanding the purposes of the ESA to defending its restrictions against Fifth Amendment takings claims.[15] While his arguments are at times novel, they are also persuasive and prescient with respect to some of the current developments in the area.

Professor Houck also provides a solid legal and historical justification for the ability of government to regulate private actors strictly when it comes to wildlife management.[16] Essentially, the historical role of the state was as the guardian in trust of the public resource of wildlife.[17] As Houck notes, there is a long history of U.S. courts upholding limitations on private actions that affect wildlife, but most of these court decisions concern actions that occur, at least in part, on public lands.[18] A more significant problem occurs when the ESA is used to regulate actions on privately held land. Two-thirds of the United States' territory is privately owned and the majority of protected species occupy private lands.[19] While the Supreme Court has addressed this issue in *Sweet Home Chapter of Communities for a Great Oregon v. Babbitt* (discussed *infra*) it has left open the question of whether private actions could be regulated if they do not directly modify habitat or otherwise cause harm to listed species.

One potential justification for allowing the ESA to extensively regulate such private actions on private land involves re-conceptualizing the nature of the Act itself. Rather than viewing it as a means of protecting species for their own inherent value, laudable as such a purpose may be, Professor Houck advocates viewing the ESA as a public welfare statute, as sensitive species are "baseline indicators of the health of the earth."[20] He argues that the ESA is essentially an "Earth Pollution Act," a view that predicts the current challenges posed by climate change to ideas of traditional ESA protection.[21]

This new view of the ESA may be necessary if its reach is to extend to more attenuated causal chains. Indeed, causation is often the central question as to whether an action constitutes a "take" of an endangered species. What the proper standard for causation should be is the subject of much debate, particularly regarding the role of proximate cause in ESA cases.[22] As Professor Federico Cheever has noted, considering that

15. *Id.* at 301-02.
16. *Id.* at 308-09.
17. *Id.* at 317.
18. *Id.* at 312, 314.
19. *Id.* at 319.
20. *Id.* at 322.
21. *Id.* at 328.
22. Federico Cheever & Michael Balster, *The Take Prohibition in Section 9 of the*

the policy goal of the ESA is to conserve species, any injury likely to substantially impact a species' long-term survival should be considered a proximate cause of harm.[23] To do otherwise would either radically reshape the idea of proximate cause or, alternatively, gut the ESA's purpose entirely.

Much of the controversy has stemmed from the word "actually" in the definition of harm under the ESA and from the subsequent causation questions it raises.[24] Beyond what it means for an action to "actually harm" an individual, there is the further question of how that requirement fits into the broader framework of the ESA, which is designed to preserve species and not just individuals.[25] When examining a Section 9 taking claim using a proximate cause framework, it is necessary to wrestle with this individual versus species distinction—a task that, as appellate cases demonstrate, proves difficult and capable of yielding inconsistent results. Even when the individual versus species analysis has been resolved, questions of removal in time, place, likelihood of harm, and length of the causal chain remain.

There are other causation analyses possible in a Section 9 taking case. Concepts of but-for causation appear frequently in the case law, generally allowing a broad scope of protection, both in time and imminence, as well as the type of causal chain involved.[26] Some of these chains have included the special cases of regulatory failure and inadequacy.[27] Overall, following the *Sweet Home* decision, ESA cases have focused more on applying tort concepts to taking cases while, as Professor Cheever laments, ignoring the effect they have on the overall purpose of the Act.[28]

Professor James Rasband has conducted a detailed examination of proximate cause as it applies to ESA taking cases, and while his discussion focuses on harm caused by multiple appropriators drawing from the same stream, the principles he lays out can be applied to other situations where multiple actors cause habitat modification.[29] When

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Endangered Species Act: Contradictions, Ugly Ducklings, and Conservation of Species, 34 ENVTL. L. 363, 381-82 (2004).

23. *Id.*

24. *Id.* at 365, 369, 372.

25. *Id.* at 372.

26. *Id.* at 378.

27. *Id.* at 384. These are "special cases" because the agency is not *physically* causing the taking but is engaged in regulatory actions that allow or enable others to take protected species, making it a but-for cause.

28. *Id.* at 385.

29. James R. Rasband, *Priority, Probability, and Proximate Cause: Lessons from Tort Law About Imposing ESA Responsibility for Wildlife Harm on Water Users and Other Joint Habitat Modifiers*, 33 ENVTL. L. 595, 595-96 (2003).

several actors could potentially be the source of harm, it is difficult to determine which, if any, of them is the but-for or the proximate cause of harm.[30] This is particularly difficult in water law, where individual appropriators may not divert enough water on their own to cause harm, but do so collectively.[31] When this is the case, the question arises as to whether the underlying legal framework should influence the assignment of liability and what scheme should be imposed: joint and several, proportionally and several, by priority, or some other method.[32] Examining greenhouse gas emissions as a potential means of taking protected species raises many of the same issues. Multiple actors might not individually emit enough to effect a significant change, but when releases are aggregated, the effects can be far more substantial. Professor Rasband's insights into this causation problem are therefore quite valuable in determining the potential of the ESA to cover actions that may contribute to climate change.

Professor Rasband explains that the central concern of potential habitat modifiers is "when and what sort of habitat modification would amount to a prohibited take."[33] As courts appeared to expand the interpretation of "take," challenges arose to the definition of "harm," with plaintiffs seeking to require proof that the modification injured or killed identifiable animals.[34] Although the Supreme Court upheld the definition of "take" in *Sweet Home* (*infra*) Professor Rasband notes that, because it was a facial challenge, the Court "did not need to address more perplexing causation and allocation questions," stating only that there were limits to the scope of "harm" while declining to define them with specificity.[35] The majority did mention "ordinary requirements of proximate causation and foreseeability" in a footnote, but only Justice O'Connor went further in exploring the idea in her concurrence.[36] While proximate cause and foreseeability are both common and familiar legal concepts, their interpretation and application vary widely across time, place, and fact pattern.[37]

Professor Rasband identifies many of the same causation issues already mentioned, including those of timing, imminence, and past versus future harm, in determining whether particular animals have

30. *Id.* at 597, 599.
31. *Id.*
32. *Id.* at 599-600.
33. *Id.* at 603.
34. *Id.* at 604.
35. *Id.* at 605.
36. *Id.* at 606-07.
37. *Id.* at 606.

suffered "actual injury."[38] To this framework Professor Rasband adds consideration of background risk and increased risk. He points out that plaintiffs have a substantial causation problem when the requirement is that a specific individual be harmed.[39] Yet, expanding the focus from the individual level to the population level allows biologists to assess the impact of a proposed modification and determine its net effect on the species.[40] While this would not provide specific examples of injured animals, it would support an assertion that a certain number of individuals would be harmed, even if that harm would go undocumented.[41]

This increased population risk view has difficulties, however, as it is not always possible to trace an increase in risk to a particular modification.[42] Professor Rasband notes that tort law is still addressing the notion of "increased risk" as actionable and advocates caution in using it too broadly in ESA contexts.[43] He instead recommends using it in cases where modifications would affect the habitat of the entire population rather than the habitat of a few individuals.[44]

Taking a different approach to causation, Kenneth Plante and Andrew Baumann emphasize that under the definitions and case law "[h]arm to the species need not be a specific goal of the violator, only the factual result of his activity," implying a but-for or cause-in-fact standard.[45] They note that, although in some cases there is only one actor or action threatening a species, many species are threatened by multiple habitat modifiers, sometimes simultaneously, and that in such situations it can be difficult to prove a taking by a particular actor.[46] To address this point, Plante and Baumann emphasize the idea of a "critical link" that ties the modification to the "actual injury to the species."[47] While they do not precisely define what constitutes a "critical link," Plante and Baumann suggest two methods employed in a number of highly influential ESA taking cases, namely that an activity will have a negative impact on a protected species or, alternatively, that it will prevent the

38. *Id.* at 616.

39. *Id.* at 614.

40. *Id.*

41. *Id.*

42. *Id.* at 615.

43. *Id.*

44. *Id.* at 615-16.

45. Kenneth J. Plante & Andrew J. Baumann, *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon: Preserving the "Critical Link" Between Habitat Modification and the "Taking" of an Endangered Species*, 20 NOVA L. REV. 747, 756 (1996).

46. *Id.* at 763.

47. *Id.* at 772.

species from recovering.[48] Though superficially a more concrete standard than "proximate cause," the "critical link" approach also can prove problematic and be caught up in many of the same issues of timing and individual versus species harm, particularly when attempting to satisfy the "actual harm" requirement.[49]

Despite these problems, Plante and Baumann find the "critical link" approach far more desirable than proximate cause, particularly with respect to the individual versus species harm issue. To them, allowing actions that damage a species but do not produce an injury to any identifiable individuals clearly violates the policy goals of the ESA.[50] Expanding on this idea, it is difficult to see how there could not be a "critical link" between activities that modify the habitat of a protected species and harm to individual members of that species. The opposite approach to the "actual harm" element of a taking would create an absurd burden on plaintiffs, requiring them to find physical examples of what logic dictates must be occurring. In some cases, this would be possible, while in others, where causal chains may be longer or the effects indirect, it would be a high bar to meet.

The element of "foreseeability" is also an important policy determination, as it could give some sense of potential liability to habitat modifiers.[51] Yet Plante and Baumann caution against relying too heavily on tort concepts in evaluating Section 9 taking cases, since the ESA is not about torts against individual animals or even species, but about restrictions on land use that could impact protected species.[52] They also point out that the regulatory definitions have rejected tort concepts and impose a cause-in-fact standard, placing special emphasis on the distinction between "mere habitat modification" and "habitat modification resulting in a prohibited impact on the listed species."[53] While this approach does not entirely dispense with all the causation issues or negate the contributions tort concepts may make to taking law, it does provide an analytical tool that is more consistent with the intent of the ESA and with the species level protections provided by other sections of the Act.

48. *Id.* at 773.
49. *Id.* at 775.
50. *Id.* at 815.
51. *Id.* at 818.
52. *Id.*
53. *Id.* at 818-19.

III. SECTION 9 TAKINGS CASE LAW

A. Foundations: Palila *and* Sweet Home

One of the most important lines of Section 9 cases traces the battle between a small Hawaiian finch, its supporters, and the Hawaii Department of Land and Natural Resources ("DLNR"). While never reaching the Supreme Court, the *Palila* cases are immensely influential and are key to understanding this area of ESA law.[54] In *Palila v. Hawaii Department of Land and Natural Resources* ("*Palila I*"), the DLNR was sued for allowing feral sheep and goats to persist in and damage critical habitat of the palila (*Loxoides bailleui*), an endangered species of honeycreeper.[55] It was undisputed that the sheep and goats were destroying essential palila habitat as well as preventing the recovery of the mamane forest on which the species depends.[56] District Court Judge Samuel King concluded that the DLNR was violating the ESA prohibition on taking a species by allowing the sheep and goats to remain in critical palila habitat and ordered it to develop a plan for their removal.[57]

In *Palila II*, the Ninth Circuit affirmed *Palila I*, noting that the facts of the case were undisputed and supported the finding of a taking.[58] The court noted that, while sheep and goat populations varied from year to year, they had an overall negative impact on the palila; fencing experiments clearly demonstrated cause by showing that the forest regenerated when sheep and goats were excluded.[59] Overall, however, the *Palila II* court conducted a rather perfunctory review, simply stating that "it must be shown that the alleged activity had some prohibited impact on an endangered species" before taking a sweeping view of the ESA that habitat modification would naturally be included in the purposes of the Act.[60]

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54. *Id.* at 758.

55. Palila v. Haw. Dep't of Land and Natural Res., 471 F. Supp. 985, 987 (D. Haw. 1979) (Palila I), *aff'd*, 639 F.2d 495 (9th Cir. 1981). While the analysis in the first two *Palila* cases is substantively the same as in the later two, the regulatory definition of "harm" was changed in the intervening period. The later cases address the definition as it is currently written and will be the point of emphasis in this Note.

56. *Id.* at 990.

57. *Id.* at 999.

58. Palila v. Haw. Dep't of Land and Natural Res., 639 F.2d 495, 495-96 (9th Cir. 1981) (Palila II).

59. *Id.* at 496.

60. *Id.* at 497-98.

Five years later, palila litigation returned to federal court in *Palila III*, this time to compel the State of Hawaii to remove mouflon sheep from critical palila habitat, the previous suit having excluded the sheep because studies of their impact on the palila were still in progress.[61] As Judge King, again presiding, indicated, the only issue was whether "mouflon sheep are harming the Palila, as prohibited by the Endangered Species Act."[62] As the case points out, following *Palila I*, the definition of harm was changed to the present definition.[63] "Harm" now constitutes "an act which actually kills or injures wildlife" including "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns."[64]

The *Palila III* court then proceeded to address the effect of the new definition on the palila's situation, concluding that there had been no substantive change from the previous definition.[65] The defendants in *Palila III* relied on the notion that "actual injury" would require a present population decline and that since the sheep fed on shoots and sprouts of mamane while the palila ate seeds and pods, the sheep could not be causing a present injury to the birds.[66] The court unequivocally rejected this narrow view of the timing of "harm," stating that even behaviors that prevent recovery by "affecting essential behavioral patterns" are sufficient to constitute an actual injury and, therefore, a taking.[67]

The *Palila III* court construed the requirement that habitat modification cause actual injury quite broadly. In interpreting the new definition, the court stated that the Secretary was actually clarifying, not altering, the standard.[68] In the court's reading, the earlier definition could have been read to prohibit all modification, while the new one acted only to prohibit modification that would significantly impair essential behavior patterns.[69] Thus, the court rejected the idea that a decline in population must be shown or that specific individuals must be found dead for a modification to constitute a taking.[70] Under the *Palila III*

61. Palila v. Haw. Dep't of Land and Natural Res., 649 F. Supp. 1070, 1071-72 (D. Haw. 1986) (Palila III), *aff'd*, 852 F.2d 1106 (9th Cir. 1988).

62. *Id.* at 1072.

63. *Id.* at 1075.

64. *Id.* (citing 50 C.F.R. § 17.3 (1985)).

65. *Id.* at 1075.

66. *Id.*

67. Palila v. Haw. Dep't of Land and Natural Res., 649 F. Supp. 1070, 1071-72 (D. Haw. 1986) (Palila III), *aff'd*, 852 F.2d 1106, 1075 (9th Cir. 1988).

68. *Id.* at 1076 n. 21.

69. *Id.* at 1077.

70. *Id.* at 1076 n. 22, 1077.

standard, only a "critical link" between the modification and the adverse impact on the species is required.[71]

In *Palila III*, the injury found was the destruction of habitat (combined with inhibited habitat regeneration) that indirectly acted to "suppress the population figures to a level which threatened extinction."[72] The finding that the "critical link" could extend forward in time to the effects on future populations, or, framed differently, to the effect on the reproductive success of the present population is perhaps the most important element of *Palila III*. This case adopted a very broad reading of harm that encompasses both a population approach and a long-term time frame, essentially allowing causation questions to be answered in any number of ways.

Once again, in *Palila IV*, the Ninth Circuit affirmed the district court, focusing on the present and future effects of mouflon sheep on the survival of the palila, but notably not mentioning harm to individual animals.[73] Instead, the court in *Palila IV* examined the scope of the "harm" definition, ultimately agreeing with the district court that harm included habitat destruction that could drive the species to extinction, even if that destruction has yet to happen but is likely.[74] The appellate court supplemented its argument by examining the legislative history of the ESA. It noted that "take [was] defined in . . . the broadest possible manner to include every conceivable way in which a person can 'take' or attempt to 'take'" a species.[75] Following an examination of activities that could potentially constitute harassment, including bird watching if it sufficiently disturbed an animal's nesting, the *Palila IV* court concluded that "harm" surely must preclude activities that could cause harm more directly, including preventing regeneration of critical habitat.[76] Thus, *Palila IV* endorsed a sweeping view of "harm" that encompassed harm to both populations and individuals, as well as a broad view of timing and imminence, as not all present acts will immediately cause tangible harm to a species.

In 1995, the issue of Section 9 takings finally reached the Supreme Court in *Sweet Home Communities for a Great Oregon v. Babbitt*, a facial challenge to the regulatory definition of harm that focused on habitat modification and the meaning of "actually kills or injures

71. *Id.* at 1077.

72. *Id.* at 1078.

73. Palila v. Haw. Dep't of Land and Natural Res., 852 F.2d 1106, 1107 (9th Cir. 1988) (Palila IV).

74. *Id.* at 1108.

75. *Id.* (citing S. Rep. No. 93-307 at 7 (1973)).

76. *Id.* at 1108-09.

wildlife."[77] The plaintiffs in *Sweet Home* were landowners, logging companies, and other individuals dependent on forestry who claimed that protections offered to the northern spotted owl and red-cockaded woodpecker under the ESA were harming their economic interests.[78] The Court noted that Congress intended "take" to be expansive and to include habitat modification, and that Congress had tacitly approved of the sweeping *Palila* decisions by leaving them in place when it revised the ESA.[79] The Court then set out the central issue of the case: whether private actions on private land may be regulated when they detrimentally alter habitat of listed species, even when that modification is unintentional.[80] Notably, the Court assumed that the harm was unintentional, an observation that has the potential to expand causation to a wider range of actions that alter habitat or otherwise cause harm, potentially as incidental outgrowths of otherwise permissible activity.[81]

After finding the definition to be reasonable, the Court then turned to the remaining question of how to deal with the word "actually," as it raised the twin issues of how direct harm must be in time as well as how directly it must affect an individual versus the population as a whole.[82] The majority indicated that but-for causation might be the appropriate standard, but did not explicitly say so, leaving the appropriate test and the proper scope of liability unresolved.[83] Beyond that, the majority did little to resolve how habitat modification is meant to fit into the causation framework, beyond stating that "Congress had habitat modification directly in mind" when it enacted the ESA.[84] It seems the majority either approved of the *Palila* analysis or, alternatively, was leaving the issue to the lower courts, perhaps for resolution in an as-applied challenge.

In her concurrence, Justice O'Connor directly addressed what the majority left unresolved. She would require "actual, as opposed to

77. Babbitt v. Sweet Home Chapter of Cmtys for a Great Or., 515 U.S. 687, 690 (1995).

78. *Id.* at 692.

79. *Id.* at 693.

80. *Id.* at 696-97.

81. It is conceded, however, that in this case the Court is simply assuming that the plaintiffs were not engaged in logging for the purpose of harming the species. Yet given the lack of specificity in the majority opinion on what the proper boundaries of causation are in a Section 9 taking case, it is worthwhile to examine every potential piece of guidance. This view of indirect causation is supported by the dicta in footnote 11 of the majority opinion, stating that the deliberate actions listed in the statute "do not duplicate the sense of indirect causation that 'harm' adds to the statute." *Id.* at 698 n. 11.

82. *Id.* at 700 n. 13.

83. Babbitt v. Sweet Home Chapter of Cmtys for a Great Or., 515 U.S. 687, 700 n. 13 (1995).

84. *Id.* at 707.

hypothetical or speculative," harm to "identifiable protected animals" and would limit the scope of the regulation "by ordinary principles of proximate causation" with an emphasis on foreseeability.[85] Justice O'Connor found impairment of reproduction to be an "actual injury" to a species, not because of the harm it does to the population or propagation of the species, but because reproduction is one of an animal's "most essential functions."[86] She contrasted this situation with that in the *Palila* cases, which she believes were wrongly decided, where the harm was entirely speculative in that it "merely prevented the regeneration of forest land not currently sustaining actual birds."[87]

The distinction here seems to be more artificial than actual. Both scenarios have an impact on the long-term survival and recovery of the species. The only difference is how closely one can tie the effects to an extant bird. Yet the "hypothetical or speculative" injury is not as clear a standard as Justice O'Connor makes it seem. It is possible to determine what the likely effect of a modification will be without imposing a "requirement that individual dead snail darters float atop the impounded reservoir" by using behavioral and ecological models, as was done in the *Palila* cases.[88] While Justice O'Connor's concurrence can lend some insight into the multiple causation questions surrounding Section 9 taking, it does not do so as definitively as Professor Rasband appears to argue.

B. Timing, Imminence, and Actual Harm to Individuals

Lower courts have examined these causation requirements and, not surprisingly, come up with divergent answers. Each of the following cases runs through a different sequence of analysis and places different degrees of emphasis on the various considerations. Despite this, it may still be possible to arrive at a coherent, if not totally consistent, idea of what constitutes "actual harm to individuals" and how imminent that harm must be. While superficially separate, it makes sense to address these two issues simultaneously as they are two forms of "actual harm to individuals." "Actual harm to individuals" is obvious: a direct, physical

85. *Id.* at 708-09 (O'Connor, J., concurring).

86. *Id.* at 710 (O'Connor, J., concurring).

87. *Id.* at 714 (O'Connor, J., concurring).

88. Palila v. Haw. Dep't of Land and Natural Res., 649 F. Supp. 1070, 1076 n. 22 (D. Haw. 1986), *aff'd*, 852 F.2d 1106 (9th Cir. 1988). The reference is to the snail darter, the endangered fish subject to the litigation in Tenn. Valley Auth. v. Hill, 437 U.S. 153 (1978), which was threatened with the complete destruction of its habitat by the completion of the Tellico Dam. The implication here is that some actions will so obviously have an adverse impact on a species and its individual members that it would be absurd to require a physical example of a harmed individual.

injury. Imminent harm is indirect, often not manifesting itself immediately and affecting both specific individuals and the population as a whole.

In *Marbled Murrelet v. Pacific Lumber Company*, environmental groups brought suit to enjoin a forest harvest that would destroy one of the marbled murrelet's only remaining nesting sites in California.[89] The court noted that the murrelet, a threatened species, was declining in population for two primary reasons: low annual reproduction and "loss of the vast majority of . . . old-growth nesting habitat."[90] It also observed that unless the population "is kept at a sustainable level, without further loss of habitat, it is very likely that the marbled murrelet will slip toward extinction."[91] This statement indicates that the court would at the very least implicitly consider the effect of the proposed timber harvest on the fate of the species as a whole, via the impact it would have on the reproductive impairment of any local breeding pairs.

That such an effect on breeding pairs occurred was demonstrated by the decline in murrelet detections during the peak breeding season after Pacific Lumber began its initial operations.[92] Extrapolating from this, the court determined that marbled murrelets would "actually be killed or injured" by logging, or at least their essential behavior patterns would be impaired.[93] Despite adopting an individual standard for evaluating harm, the court drew the connection between the local population and the regional and statewide persistence of the species, writing that the survivability of the local population is "important to the survivability of the entire California marbled murrelet population."[94] Under a *Marbled Murrelet* style analysis, one could focus on the effect habitat modifications would have on particular local populations, satisfying the individual harm requirement, even if only through inference, while still considering the broader impact on the species as a whole.

Similar issues were present in *Forest Conservation Council v. Rosboro Lumber Company*, another logging case, this time concerning the northern spotted owl.[95] Whether there would be harm to individual members of the species was not at issue in the case as the challenge focused on the effect the harvest would have on a specific breeding

89. Marbled Murrelet v. Pac. Lumber Co., 880 F. Supp. 1343, 1344-45 (N.D. Cal. 1995), *aff'd sub nom.* Marbled Murrelet v. Babbitt, 83 F.3d 1060 (9th Cir. 1996).

90. *Id.* at 1347.

91. *Id.* at 1348.

92. *Id.* at 1367.

93. *Id.* at 1365-66.

94. *Id.* at 1366.

95. Forest Conservation Council v. Rosboro Lumber Co., 50 F.3d 781 (9th Cir. 1995).

pair.[96] Rather, the question presented was whether future injuries were sufficient to block a proposed timber project that would result in habitat modification.[97] The district court held they were not and the Ninth Circuit reversed.[98] In doing so, the appellate court noted that a construction of the ESA that does not contemplate future harm is "antithetical to [its] basic purpose" as it would significantly undermine the ESA's policy purpose of protecting endangered species and "prevent[ing] their further decline."[99]

In applying a broad concept of "harm," the court noted that "take" was meant to be read broadly and stated that an imminent threat can clearly cause great harm to a species.[100] The defendant claimed that the word "actually" in the regulatory definition precluded the consideration of future harms, even if relatively certain or imminent, and that actionable harms should be limited to those that have already caused or are presently causing injury.[101] The court roundly rejected this argument, interpreting "actually" broadly to exclude only those modifications that would not lead to "death or injury to protected wildlife."[102] The court then distinguished "potential" and "actual" injury, stating that the two terms are meant to "specify the degree of certainty," not define the time frame of harm.[103] In doing so, the court did not give *carte blanche* to would-be challengers; rather, it retained a strong causation requirement for demonstrating harm to protected animals and simply allowed that harm to be analyzed prospectively. However, the court declined to provide any guidance as to where the line between hypothetical "potential harm" and imminent "actual harm" lies.

Some inferences as to how to make such a distinction can be drawn from a First Circuit case concerning bald eagles and lead slugs.[104] In *American Bald Eagle v. Bhatti*, the First Circuit adopted a narrow reading of "actual" in assessing harm to a protected species.[105] The plaintiffs alleged that if Massachusetts allowed a deer hunt on a particular island some of the deer would not be recovered after being shot but would die later and be fed on by eagles, with ingestion of lead

96. *Id*. at 783.

97. *Id.*

98. *Id.*

99. *Id.*

100. Forest Conservation Council v. Rosboro Lumber Co., 50 F.3d 781, 784 (9th Cir. 1995).

101. *Id*.

102. *Id*.

103. *Id*. at 784-85.

104. Am. Bald Eagle v. Bhatti, 9 F.3d 163 (1st Cir. 1993).

105. *Id*. at 166.

shot causing illness or death to the birds.[106] In assessing the likelihood of harm required to move from a "potential" to an "actual" injury, the court rejected a statistical analysis as arbitrary and unsupported by the statute.[107] It further noted that in non-ESA cases using statistical probabilities of harm, there had already been a clear demonstration of toxicity or harmfulness, while in *Bhatti* there was no evidence that any eagles had ingested lead shot from deer carcasses.[108] The court acknowledged that ingesting lead can harm eagles, but that the lack of evidence that any eagles had actually ingested lead, or were likely to do so, rendered the claim far too speculative for the deer hunt to constitute a taking under Section 9.[109] The *Bhatti* standard for actual harm, which rejects a probability-based approach to determine harm but acknowledges the possibility that actual future harm could still constitute a taking, is much narrower than the *Marbled Murrelet* and *Rosboro Lumber* standards.

The preceding cases were all decided prior to the Supreme Court's decision in *Sweet Home*. Although they remain good law, there have been some changes in the approach taken by courts in analyzing the "actual harm" requirement. For example, in *Defenders of Wildlife v. Bernal*, plaintiffs challenged the development of a proposed school site that they believed would destroy potential, though unoccupied, habitat of the cactus ferruginous pygmy owl.[110] While this would constitute a future injury, the Ninth Circuit stated that *Sweet Home* had not overruled *Rosboro Lumber* and that threats of imminent harm were sufficient to constitute an "actual" injury to a protected species.[111] In its discussion of ESA protection, the court stated that indirect harm, including that from habitat modification, could constitute a taking, but that every part of the definition was subservient to the phrase "actually kills or injures wildlife."[112] However, the court held that there was no evidence that the owl used or would use the proposed school site and that the alleged harms to the owl were too speculative to be actionable.[113] While still imposing a higher requirement than "potential harm," the court did not go as far as *Bhatti*, requiring only that the plaintiffs demonstrate that the modifications were "more likely than not" to harm or harass the owl.[114]

106. *Id*. at 164.
107. *Id*. at 165.
108. *Id*.
109. *Id*. at 166.
110. Defenders of Wildlife v. Bernal, 204 F.3d 920, 922 (9th Cir. 2000).
111. *Id*. at 925.
112. *Id*. at 924-25.
113. *Id*. at 926-27.
114. *Id*. at 925.

This standard takes into account both the cause-in-fact analysis requiring that a modification "actually" harm protected species and some notions of proximate cause, though not applying it so strictly as to undermine protection from future harm, as the O'Connor concurrence in *Sweet Home* suggested might be appropriate in some cases.

C. The Special Case of Failure to Regulate as a Taking

Governments can also be subject to Section 9 taking liability for their regulatory actions and omissions, often in ways that allow causal chains to be stretched farther than might be permissible for private actors. In *Defenders of Wildlife v. Administrator*, the court found that the Environmental Protection Agency ("EPA") was taking protected eagles by continuing to allow certain pesticide uses of strychnine.[115] In making this determination, the court noted the broad definition given to "take," as derived from the legislative history of the ESA, that included "every conceivable way" a species could be taken.[116] With such a sweeping definition, the central question was not whether regulatory actions could be a taking but whether a sufficient causal connection could be shown. This proved relatively easy for the court to do. The record contained examples of eagles poisoned by eating strychnine-laced bait. On this evidence, the court found the EPA's decision to register strychnine-based pesticides to be a "but-for" cause of the deaths, though through an indirect causal chain.[117] From this case it is possible to see how government actions can constitute a taking, simply by being the "critical link" in a chain, even though the direct harm may have been inflicted by another party.

Government has also been deemed to take a species when, rather than actively allowing an activity, as with the strychnine permit, it merely permits harmful actions of which it is aware to continue. In *United States v. Town of Plymouth*, the FWS brought an action to enjoin off-road vehicles from entering a town beach, arguing that such actions constituted an illegal taking of piping plovers.[118] As in *Administrator*, the vehicles were unquestionably causing harm to the birds, both past and future harm were found to exist; however, the court was concerned with whether the town itself could be held responsible.[119] There was substantial evidence that the vehicles not only killed individual birds by

115. Defenders of Wildlife v. Adm'r, Envtl. Prot. Agency, 882 F.2d 1294, 1298, 1303 (8th Cir. 1989).

116. *Id*. at 1300.

117. *Id*. at 1301.

118. United States v. Town of Plymouth, 6 F. Supp. 2d 81, 82 (D. Mass. 1998).

119. *Id.*

running them over, but also interfered with nesting, feeding, courtship, and breeding activities.[120] The town repeatedly took the position that it was a multi-purpose beach and that there was "room for the birds and the people and the vehicles," thus refusing to exclude the vehicles from potentially sensitive plover habitat.[121]

In issuing an injunction against the Town of Plymouth, the court observed that "take" is meant to be construed broadly and encompasses both direct actions and acts of third parties "authorized by the government to engage in activity resulting in a taking."[122] It then applied the narrow test of *Bhatti* to determine if Plymouth's continued inaction would "actually, as opposed to potentially, cause harm to the species."[123] Relying on expert evidence of long-term effects as well as specific examples of birds found dead in tire tracks, the court reasoned that such actual harm would occur absent an injunction.[124] It is also significant that the Town of Plymouth officials had a long history of failing to take action to protect the birds and demonstrated "long-standing intransigence" when confronted with evidence of likely harm.[125] The *Town of Plymouth* case illustrates that even government inaction can constitute a taking of a protected species if the causal chain is direct enough.

Despite the outcome in *Town of Plymouth*, not all such situations result in takings by the government. In *Loggerhead Turtle v. County Council of Volusia County*, environmental groups challenged the county's regulations permitting certain types of artificial outdoor lighting during the loggerhead turtle nesting season.[126] The only issue in the case was whether the county could be held liable for takings caused by artificial lighting in areas under the county's direct regulatory control.[127] The court found, and the county conceded, that light pollution on the beach had caused, and would likely continue to cause, takings of turtles by disorienting hatchlings and preventing them from reaching the sea.[128] Despite finding that the turtles had been taken by artificial beachfront

120. *Id*. at 84, 86.

121. *Id*. at 88.

122. *Id*. at 90.

123. *Id*. (quoting Am. Bald Eagle v. Bhatti, 9 F.3d 163, 166 (1st Cir. 1993)).

124. United States v. Town of Plymouth, 6 F. Supp. 2d 81, 91 (D. Mass. 1998).

125. *Id*.

126. Loggerhead Turtle v. County Council of Volusia County, 92 F. Supp. 2d 1296, 1298 (M.D. Fla. 2000).

127. *Id*. at 1300.

128. *Id*. at 1305.

lighting in violation of the ESA, the court declined to impose liability on the county itself.[129]

In analyzing whether the county's lighting regulations caused the takings, the court applied a narrowly defined form of proximate cause.[130] The county did not license or permit the lighting that caused the takings; in fact, it had taken steps to prohibit or otherwise limit artificial lighting on the beach.[131] While the *Volusia County* court observed that it was possible that failure to adequately enforce those standards could constitute a taking, it declined to take that step absent direction from a higher court.[132] Thus, the governmental entity escaped ESA liability because its actions were intended to protect the turtles and the "true violators, the persons responsible for illuminating the beaches, [were] not before [the] Court."[133] By this analysis, governments are not liable for takings if they are taking affirmative, though ineffective, steps toward protecting species. It remains an open question as to whether governments could be held liable for failures to enforce their standards against the "true violators."

IV. APPLICATION OF TAKINGS LAW TO POLAR BEARS AND GREENHOUSE GASES

Global climate change poses a significant risk to a large number of species. One study has estimated that even a small increase in average global temperature could endanger twenty to thirty percent of all species.[134] The impacts of global climate change will be felt across a wide range of habitats and affect many different forms of life, both directly and indirectly.[135] While the polar bear is perhaps the most famous species affected, the stereotypical "charismatic megafauna" of environmental actions, other species have also been listed as endangered due, at least in part, to the effects of climate change.[136] Yet applying the "take" requirements of Section 9 to habitat alterations caused by climate

129. *Id*. at 1306.

130. *Id*. at 1307.

131. *Id*.

132. Loggerhead Turtle v. County Council of Volusia County, 92 F. Supp. 2d 1296, 1307-08 (M.D. Fla. 2000). The court stated that if the county's regulations violated the ESA on their face they could be struck down, but that it was unclear whether federal courts had the authority to compel municipalities to enforce their own ordinances.

133. *Id*. at 1308.

134. John Kostyack & Dan Rohlf, *Conserving Endangered Species in an Era of Global Warming*, 38 ENVTL L. REP. NEWS & ANALYSIS 10203, 10203 (2008).

135. *See id*. at 10205-06.

136. *Id*. at 10206.

change leads to difficulties of line drawing and causation.[137] Which activities are actually responsible for the greenhouse gas emissions that lead to habitat modifications? And even if that can be determined, is there any viable way of regulating these activities under the ESA?

In making its determination that the polar bear should be listed as threatened under the ESA, the Department of the Interior recognized that "polar bears are evolutionarily adapted to life on sea ice" and that the species depends on sea ice for all of its major life activities including feeding, breeding, and rearing young.[138] It was the almost certain continued loss of sea ice habitat that prompted the Department of the Interior to list the polar bear as a threatened species "throughout all of its range."[139] It also noted that while there are adequate protections from direct takings by humans, "there are no known regulatory mechanisms in place" at any level that "directly and effectively address the primary threat to polar bears" presented by loss of sea ice habitat.[140]

Based on the reasons given for listing the polar bear as threatened, it is clear that global climate change, and greenhouse gas emissions in particular, constitute significant threats to the continued survival of the species. Yet the Secretary of the Interior has stated that this listing should not be used as a backdoor method for regulating carbon emissions. Still, would such a use of the ESA be possible? Could emissions of carbon dioxide and other greenhouse gases constitute prohibited takings under Section 9? Such an application of the ESA would certainly push the edges of the takings case law for both cause-in-fact and proximate causation analyses, though it is not an entirely implausible use of the ESA either.

Starting with the *Sweet Home* actual injury requirement, it is clear that habitat modification is already a serious threat to the bears and that Congress explicitly contemplated such a threat when it enacted and revised the ESA.[141] However, as the majority opinion in the case gave little guidance as to what the actual causation standard should be, it is necessary to look to lower court decisions and to Justice O'Connor's

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137. *Id*. at 10209.

138. Determination of Threatened Status for the Polar Bear (*Ursus maritimus*) Throughout its Range, 73 Fed. Reg. 28212, 28219 (May 15, 2008) (to be codified at 50 C.F.R. pt. 17(h)).

139. *Id*. at 28212.

140. *Id*. at 28241.

141. *See* Babbitt v. Sweet Home Chapter of Cmtys for a Great Or., 515 U.S. 687, 704 (1995). Whether modification caused by climate change would fall within "any conceivable way" habitat could be modified at the time of the initial enactment is an interesting question and certainly one whose impact could influence the ultimate decision, but such questions of statutory interpretation fall well outside the scope and purpose of this note.

concurrence to piece together an answer. Justice O'Connor and decisions such as *Bhatti* would impose a harsh test of proximate causation to regulate greenhouse gases under the ESA. Other readings, particularly *Palila* and *Marbled Murrelet*, offer a more robust version of the law that could potentially sweep up climate change induced habitat modification within the definition of taking.

In addressing the question of whether there is sufficient cause-in-fact to establish a taking of polar bears via greenhouse gas emissions, it is first necessary to ask whether anthropogenic climate change exists. While there are still some doubters, the overwhelming scientific consensus on the answer to this question is yes.[142] It follows from that conclusion that sea ice habitat will be lost, although it is uncertain at what rate this will occur. *Palila IV* would allow regulation of emissions because a warming climate would pose not only a direct threat to the continued survival of the species but also a barrier to its recovery. That the time frame is uncertain is not particularly important under a *Palila* analysis since the focus is on the long-term effect on species and the overarching policy goals of the ESA, namely the preservation and recovery of protected species.

Marbled Murrelet and *Rosboro Lumber* both adopted individual harm readings of the "actually" requirement, though they also permitted expansive applications of the ESA. *Marbled Murrelet* allowed examination of the effect harm to individuals would have on the species as a whole, while *Rosboro Lumber* permitted imminent threats of future harm to satisfy the ESA. In the case of polar bears, it is likely that individual bears harmed by warming could be identified, such as those that have drowned, but it would be far more difficult to establish an imminent threat to specific bears because loss of sea ice is a far broader and more generalized threat than the logging of a specific tract of forest known to be inhabited by the protected species.

While this would pose a problem in establishing causation under the ESA, it would still meet the test imposed by *Bhatti* that harm be more than hypothetical. Even without using a statistical analysis, it is possible to see through logical deduction that there is a significant risk of harm to polar bears. A more applicable comparison is to *Bernal*, in which a narrow limit on proximate cause required examination of harm as "more likely than not." Given the nature of the threat, it seems unlikely that harm to polar bears, both as individuals and as a species, could not meet this requirement.

This is not the end of the analysis, however, as it only establishes a link between greenhouse gas emissions, climate change, and the threat to

142. *See* Kostyack & Rohlf, *supra* note 134, at 10203.

polar bears. It is still necessary to create a "critical link" to specific emitters that can be compelled to change their behavior. This is a far more problematic step. There are myriad emitters of numerous greenhouse gases spread across the nation and the globe. Is it possible to determine that emissions from a particular factory or a certain vehicle are the ones that tipped the balance and brought about the changes that threaten the polar bear? The problem of multiple actors is a significant one and there really is no good solution to it. Even if it were possible to identify a specific emitter as the cause of harm, absent some broader framework there would be no way of preventing other emitters from continuing their behavior, thereby negating any remedial effect of limiting the actions of the theoretical party at fault.[143]

Further problems in imposing restrictions on specific sources involve equitable concerns and the fairness of the burden of reduction. Is it really possible to determine what portion of harm can be attributed to any one particular emitter of greenhouse gases when the causal chain, while clear, is long and indirect? And even if such forced reductions were imposed, there is still a risk that other nations would fail to act or that the remedial action would otherwise prove futile.

A more promising theory under the ESA might be failure to regulate as a taking. As seen in *Administrator*, when a danger is known and the regulatory agency takes no action, it can be found liable for the deaths of protected species. Liability can also attach when a government entity has identified a problem caused by third parties but has repeatedly failed to take adequate steps to control the negative effects of those parties' actions, as in *Town of Plymouth*. In the case of polar bears, the most likely target of such a taking claim would be the EPA for its failure to regulate the emission of carbon dioxide.[144] Such an argument would run as follows: the EPA has the duty to regulate air pollutants; carbon dioxide is an air pollutant; failure to regulate carbon dioxide emissions is a cause of global climate change; global climate change is causing the

143. There is also the potential problem of incidental taking permits. Under 16 U.S.C. § 1539(a)(1)(B), the Secretary may issue permits authorizing takings "incidental" to an otherwise lawful activity if the purpose of the activity is not intended to cause harm to protected species. While this issue is generally beyond the scope of this Note, it is worth pointing out that requiring any emitter of greenhouse gases to apply for an incidental take permit would impose an almost impossible burden on the Department of the Interior as well as significantly increase bureaucratic drags on the economy.

144. For another discussion of the EPA's failure to regulate carbon dioxide, thereby contributing to harms resulting from global climate change, see Mass. v. Envtl. Prot. Agency, 549 U.S. 497 (2007). This case also provides a potential model of an indirect causal chain of harm that could flow from an agency's failure to regulate, through the emitters of greenhouse gases, all the way to harm to polar bears from loss of sea ice habitat.

loss of sea ice habitat in the arctic; this habitat loss is causing actual harm to polar bears. While there is no guarantee that such a causal chain would hold—it is far longer than any others in the cases analyzed, including *Administrator*, and there is far more opportunity for a court to find an intervening cause to break the chain—such a claim appears stronger, on both legal and policy grounds, than attempting to target millions of individual emitters.

Even if the EPA were forced to regulate greenhouse gases in response to a Section 9 taking claim, there is no guarantee that any actions would be successful. The problem of "too little, too late" is quite possible, as is the real potential of regulatory foot dragging and prolonged litigation. Furthermore, non-compliance and continued harm could potentially raise the same problems seen in *Volusia County*, in which the regulatory body was doing what it was meant to do, yet harm continued through either lax enforcement or ineffective standards. The structure of any regulations could also impede future taking claims, as permits and licenses are more likely to be viewed as sufficient government action under *Volusia County* than the simple enactment of passive, good-faith regulations.

V. CONCLUSION

The ESA is a highly effective means of protecting species from harm via direct habitat modification. While long causal chains can still result in takings, each additional step makes it more difficult to establish a "critical link" between the activity and the harm, particularly when there are potential intervening forces. Unless the chain leads back to a single actor, it is highly unlikely that a long causal chain would result in any liability for a taking of a protected species. The more speculative the harm or diffuse the causal chain, the less effective the ESA is at offering protection. Depending on the standard of causation applied, it is possible that even in cases where harm is almost certain to occur to some members of the species, and such harm is imminent, a court would decline to find a taking if a specific member of the protected species could not be identified as likely to suffer.

In the context of climate change, the causal chains are quite long and reach across international borders as well as into all sectors of the economy. While arguments can be made that the ESA could be used to force action on climate change, especially if plaintiffs focused on a failure to regulate as effecting a taking, these arguments are by no means ironclad. The ESA is well designed to address threats from direct modifications to habitat from logging, mining, development, and other physical alterations. It contains a number of finely tuned provisions that

prescribe and proscribe different actions in different circumstances. However, when addressing broader threats from diffuse sources, the ESA is a much blunter tool. The threats posed to species by climate change were almost certainly inconceivable at the time the ESA was written, and thus it contains very few provisions that could be used to address them efficiently. Habitat modification from climate change is well outside the established framework of the ESA and its attendant case law, and attempts to use the Act as-is to address these challenges would likely founder on issues of causation and imminence that are not problematic for more direct taking cases. While amending the ESA might be possible to address threats due to climate change, the social, political, and economic hurdles to such action could potentially prove insurmountable.

To conclude, while it is theoretically possible to use the ESA to address threats posed to protected species by climate change, the legal arguments are not clear cut. There are issues of causation regarding timing, the nature of the harm, the type of actions being regulated, and whether individuals are even being harmed. Even if it were possible to use the ESA to confront global climate change, it is not clear that it would be wise to do so. The ESA has some powerful enforcement provisions and is quite effective at regulating specific harm with localized sources. Using it to address a problem of global scale with millions of sources may not be particularly helpful, and certainly would pose problems of bureaucratic and economic efficiency. In short, absent significant revision, while it may be possible to use the ESA to force action on climate change, it would behoove environmentalists to pursue more direct methods grounded on stronger legal footing that carry fewer potentially significant side effects.

VI. AFTERWORD

On December 7, 2009, after this Note entered production, the Administrator of the EPA signed endangerment findings related to carbon dioxide and five other greenhouse gases.[145] While this is a positive step, it does not actually impose any regulations or limits on greenhouse gas emissions. Rather, it is a preliminary step that lays the required regulatory foundation for future regulations promulgated under the Clean Air Act.[146] While there has been some action in Congress

145. Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496 (Dec. 15, 2009) (to be codified at 40 C.F.R. ch I); Envtl. Prot. Agency, Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act, http://epa.gov/climatechange/endangerment.html (last visited Jan. 25, 2010).

146. *Id*.

addressing climate change,[147] it remains uncertain when, if ever, a final bill will pass both chambers.[148] This finding gives the EPA the option of moving forward unilaterally on greenhouse gas regulation, providing the Obama administration with a "stick" to use in negotiations with Congress and on the world stage.[149]

This development does not change the central argument of this Note. In some ways it actually strengthens it. Since the EPA has identified these six gases as posing a threat to the public health and welfare, it is obligated to regulate them in ways that mitigate their negative impacts. While there are many ways of doing so, and the agency would have broad discretion in deciding when and how to regulate them, it must take some kind of action. Failure to do so within a reasonable period of time could be actionable.[150] Furthermore, any regulations promulgated could be challenged for inadequacy under a failure to regulate or inadequate regulation theory as in *Administrator, Town of Plymouth*, and *Volusia County*.

The ESA is still best suited for addressing specific threats from specific sources in identifiable areas. Nothing about the endangerment finding changes this. However, it does fortify the legal arguments for forcing regulation, particularly if the EPA uses the threat of regulations as a bargaining chip with Congress and industry without ever taking any meaningful action. There is still great uncertainty about how both the United States and the global community will address the growing threats of climate change, or even if any solutions will be adequate.[151] While the author of this Note hopes for a real, workable, and successful legislative solution, it is important to explore all legal arguments and options available, should the political system fail to take meaningful action.

147. *See* American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009); *see also* John M. Broder, *With Something for Everyone, Climate Bill Passed*, N.Y. TIMES, Jul. 1, 2009, at A20.

148. *See* Editorial, *The Senate's Duty on Climate Change*, N.Y. TIMES, Nov. 22, 2009, at WK9.

149. Andrew Leonard, *Obama's Copenhagen Present*, SALON, Dec. 7, 2009, http://www.salon.com/technology/how_the_world_works/2009/12/07/the_big_global_warming_stick.

150. *See* Pub. Citizen Health Research Group v. Chao, 314 F.3d 143 (3d Cir. 2002) (nine-year delay in adopting new standard was excessive and not justified by scientific uncertainty or competing policy priorities).

151. Bill McKibben, *Why the Climate Talks Will Be a Disaster*, SALON, Dec. 7, 2009, http://www.salon.com/news/opinion/feature/2009/12/07/copenhagen/index.html (describing how the usual process of political compromise cannot work with problems like climate change because the laws of physics are immutable and immovable).

The Case for Preserving Nothing: The Need for a Global Response to the Space Debris Problem

Natalie Pusey*

ABSTRACT

Since the dawn of the Space Age, Earth orbit has become a highly utilized environment. The heavy traffic of man-made satellites has led to a large quantity of debris in orbit that detracts from the value that Earth orbit provides mankind. Several technical solutions exist or have been proposed to alleviate the space debris problem, but in order to preserve the orbital environment, these technical solutions need to work in conjunction with a legal regime that regulates the creation and remediation of space debris. Various laws, regulations, and guidelines address space debris at different levels of government, but currently, there is no strong international law, which serves this purpose. This Note proposes an international treaty that would make spacecraft operators liable for debris-caused damage to property, and that would require reasonable debris-mitigation measures to be taken for every mission.

I. INTRODUCTION

Earth orbit is a unique, limited, and incredibly valuable resource. The properties of this space allow humans to utilize thousands of satellites for research, national defense, and communications. Like so many of Earth's delicate regions, Earth orbit has been greatly altered by human activity. For a variety of reasons, human exploration and the commercialization of space create litter, or debris, that pollutes Earth orbit. Some debris occurs naturally, but of the 19,000 pieces of trackable

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debris in Earth orbit, ninety percent is artificial.[1] Orbital debris is a growing problem; over the last forty years, the amount of debris has decreased only during periods of extreme solar activity, which causes Earth's atmosphere to flare up and expand, increasing drag on debris.[2] Humans have yet to make any significant strides to reduce the amount of debris in Earth orbit. While debris modeling is difficult, experts estimate that the amount of Earth orbit debris will soar over the next two centuries.[3] Some speculators project that entire regions of space could become unusable if the generation of orbital debris increases as expected.[4]

This Note will discuss the high value of Earth orbit and the nature of the debris problem. A survey of relevant laws, treaties, and guidelines will show that states and international organizations have broached the debris problem, but that the current policies leave many issues unresolved. Finally, this Note will suggest changing existing law to better address some of the remaining problems.

II. ORBITS AND SPACE DEBRIS DESCRIBED

A. Orbits

The boundary between Earth and space is arbitrary; no international legal agreement actually describes its location.[5] However, 100 kilometers above sea level is widely accepted as the boundary, in part because space activity is impossible below this altitude.[6] A particular piece of debris' altitude determines how long it will take to encounter the atmosphere and when drag will return the debris to Earth.[7]

Low Earth orbit ("LEO") extends from the "beginning" of space, i.e., 100 kilometers above sea level, to 1,000 kilometers above sea level.[8] At this altitude, satellites can quickly orbit the Earth in about 100

1. Spacesecurity.org, Space Security Fact Sheet, http://www.spacesecurity.org/SpaceSecurityFactSheet.pdf (last visited Mar. 13, 2010).

2. OFFICE OF SCI. & TECH. POL'Y, EXECUTIVE OFFICE OF THE PRESIDENT, INTERAGENCY REPORT ON ORBITAL DEBRIS 11 (1995) *available at http://orbitaldebris.jsc.nasa.gov/library/IAR_95_Document.pdf* [hereinafter INTERAGENCY REPORT].

3. Michael W. Taylor, *Trashing the Solar System One Planet at a Time: Earth's Orbital Debris Problem*, 20 GEO. INT'L ENVTL. L. REV. 1, 18 (2007).

4. *Id.* at 18-19.

5. MARK WILLIAMSON, SPACE: THE FRAGILE FRONTIER 29 (2006).

6. *Id*.

7. *See* Taylor, *supra* note 3, at 6.

8. WILLIAMSON, *supra* note 5, at 32.

minutes.[9] This orbit is particularly useful for operating satellites with high-resolution imaging functions because satellites in LEO can fly over the entire planet.[10] In addition, almost all manned spaceflight takes place in LEO.[11] Debris in LEO will remain in orbit for months, or even up to a few hundred years, depending its altitude.[12]

The higher of the commonly used Earth orbits is geostationary orbit ("GEO").[13] Although a satellite can be placed at various altitudes, GEO satellites generally orbit at 35,787 kilometers above sea level.[14] At this altitude, satellites rotate in synch with a spot on the Earth's surface, such as a state, and maintain constant visualization of that spot.[15] This narrow orbit is extremely useful for weather observations, remote sensing, and telecommunications.[16]

GEO satellites tend to cluster at this useful altitude and at points that allow for the best view of certain regions, such as the continental United States.[17] These coveted spots create congestion, which exacerbates the debris problem by increasing the probability of collisions among satellites and between satellites and existing debris.[18] Such collisions create more debris, which again may collide with objects in the congested area.[19] These areas are essential to business, government, and research activities; debris pollution threatens all of these functions.

Satellites in GEO produce more debris when they change their positions. The shape of the Earth, as well as forces from the Sun and Moon, occasionally perturb the orbits of these satellites; thus, to maintain their geostationary position, they are equipped with propulsion systems to make altitude adjustments.[20] As will be discussed below, this on-board propellant is explosive and can potentially create debris.[21] Debris remains in GEO between 1 million and 10 million years.[22]

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9. *Id*. at 35.

10. Taylor, *supra* note 3, at 6.

11. *Id*. The exceptions are the Apollo lunar missions of the late 1960s and early 1970s.

12. *Id*.

13. WILLIAMSON, *supra* note 5, at 35.

14. HOWARD A. BAKER, SPACE DEBRIS: LEGAL AND POLICY IMPLICATIONS 25 (1989).

15. WILLIAMSON, *supra* note 5, at 35.

16. Lawrence D. Roberts, *A Lost Connection: Geostationary Satellite Networks and the International Telecommunication Union*, 15 BERKELEY TECH. L.J. 1095, 1100 (2000).

17. *Id*. at 1101-02.

18. Taylor, *supra* note 3, at 6-7.

19. *Id*. at 18.

20. WILLIAMSON, *supra* note 5, at 51.

21. BAKER, *supra* note 14, at 6, 25.

22. Taylor, *supra* note 3, at 7.

The International Telecommunication Union ("ITU") organizes the placement and radio frequency of geostationary objects.[23] ITU membership largely corresponds to that of the United Nations ("UN").[24] In conjunction with their national governments, satellite operators must apply to the ITU for permission to use a frequency and location in geostationary orbit before launching a satellite.[25] The ITU reviews the request and determines if the desired location is available.[26] If the ITU approves the application, it will add the satellite's position and frequency to the Master International Frequency Register.[27] Registry confers a usufructuary right to the satellite operator, rather than a property right.[28]

The ITU does not have an environmental mission, but because overcrowding in GEO has a detrimental effect on telecommunications, it has promulgated provisions to address the creation of debris in GEO.[29] The ITU has recommended that GEO satellites be repositioned into a disposal orbit, which should be at least 300 kilometers above GEO, before they become inoperable.[30] Disposal is especially important to maintaining the value of GEO because geostationary satellites generally only function for fifteen years.[31] Non-functioning satellites are simply large pieces of space debris; placing dead satellites in a "graveyard" orbit helps to keep GEO free of this harmful debris.[32] Furthermore, if a geostationary satellite is not removed to a disposal orbit before it stops functioning, a valuable piece of GEO is lost to the derelict satellite.[33]

Medium Earth orbit ("MEO") occupies the space between LEO and GEO.[34] Arguably, this space is not as useful as LEO and GEO because it does not permit collection of high-resolution data like LEO or maintaining an Earth-synchronous position like GEO.[35] However, MEO has become the standard orbit for navigational satellites, such as the Global Positioning System ("GPS") constellation, and the Russian equivalent of GPS, GLONASS.[36] Geosynchronous Transfer Orbit

23. Roberts, *supra* note 16, at 1105.
24. *Id*. at 1107-08.
25. *Id*. at 1112.
26. *Id*.
27. *Id.*
28. WILLIAMSON, *supra* note 5, at 176-77.
29. LOTTA VIIKARI, THE ENVIRONMENTAL ELEMENT IN SPACE LAW 87-88 (2008).
30. Roberts, *supra* note 16, at 1142.
31. WILLIAMSON, *supra* note 5, at 39.
32. *See id.*
33. *See id.*
34. Taylor, *supra* note 3, at 7.
35. WILIAMSON, *supra* note 5, at 35.
36. Taylor, *supra* note 3, at 7.

("GTO") is also located between LEO and GEO.[37] In GTO, upper stages of rockets fire in order to boost geostationary satellites into GEO.[38] GTO is highly elliptical; the apogee—the point of the orbit farthest from Earth—is near GEO, and the perigee—the point closest to Earth—is in LEO.[39] Satellites that travel in this intermediate orbit encounter the debris hazards present both in LEO and in GEO because of this elliptical trajectory.[40]

B. Space Debris: Description and Problems

Space debris refers to "any man-made artifact discarded, or accidentally produced, in space . . . ."[41] This Note will use the term orbital debris to refer specifically to human-made space debris that exists in Earth orbit. Routine human space activity creates orbital debris. Every time a satellite or space shuttle, known as the payload, is launched, it is accompanied by the launch vehicle (the rocket). Early in the history of human space exploration, launch vehicles consisted of multiple rockets stacked on top of each other, with the payload at the very top; the rockets were fired sequentially from the bottom to the top, and explosive charges would free the "upper stages" of the launch vehicle from the spent "lower stages."[42] Missions were designed so that the upper stages of the launch vehicle would enter into orbit with the payload.[43] When the upper stages of the rocket exploded, they littered the orbit with debris.[44]

Debris also enters Earth orbit as a by-product of normal satellite function.[45] For example, when a satellite deploys instruments or solar panels, it may accidentally release small pieces of hardware, such as bolts.[46] Additionally, a gradually deteriorating space object can produce "microdebris," such as bits of metal and paint flecks.[47] Extravehicular activity ("EVA"), i.e., astronaut spacewalks, also generates a relatively small quantity of space debris;[48] International Space Station astronauts

37. *Id.*

38. *Id*.

39. INTER-AGENCY SPACE DEBRIS COORDINATION COMM., IADC SPACE DEBRIS MITIGATION GUIDELINES 2 (2007), *available at* www.iadc-online.org/docs_pub/IADC-101502.Mit.Guidelines.pdf [hereinafter IADC].

40. *See id.*

41. WILLIAMSON, *supra* note 5, at 46.

42. *Id*. at 47.

43. *Id*. at 47.

44. *Id*. at 48.

45. *Id*. at 51.

46. *Id*.

47. INTERAGENCY REPORT, *supra* note 2, at 13.

48. WILLIAMSON, *supra* note 5, at 72.

have lost an access panel, a foot restraint, and a thermal blanket during EVAs.[49] Finally, satellites create debris when they stop functioning.[50] When satellites run out of power or fuel, operators can no longer maneuver these dead satellites, also known as inactive payloads. Thus, these inactive payloads become debris.[51] As recently as February 2009, an inactive Russian satellite collided with a functional American commercial satellite; the two former satellites are now 402 pieces of orbital debris.[52]

Space debris causes a variety of problems for objects in Earth orbit. For example, debris can physically damage satellites, particularly those in LEO.[53] Debris is more heavily concentrated in LEO than in GEO simply because more space activity occurs in LEO.[54] In this highly active orbit, objects travel at such rapid speeds that a piece of debris just 1 centimeter in diameter could disable a functioning satellite upon collision.[55] On the other hand, objects in GEO move more slowly; hence, they do less damage compared to similar sized objects in LEO.[56]

In addition to physical damage, orbital debris disrupts precisely positioned satellites by knocking them off balance.[57] Tiny debris particles can also create electric charges that may cause a functioning satellite to short circuit.[58] While satellites can be shielded to protect against damaging debris, the extra material shields require makes launch more difficult and expensive.[59] Additionally, the extra mass makes it more difficult for satellite operators to maneuver the satellite away from debris to avoid collisions.[60] Even with shielding, the ability to maneuver the satellite is still very important because shielding only protects against debris of up to 2 centimeters in diameter.[61]

Orbital debris also presents a significant risk to manned spaceflight.[62] A piece of debris just 0.2 millimeters in diameter can

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49. *Id*.

50. BAKER, *supra* note 14, at 4.

51. *Id*.

52. Secure World Found., *Satellite Collision: Need for Better SSA Highlighted*, Feb. 28, 2009, *available at* http://www.secureworldfoundation.org/siteadmin/images/files/file_286.pdf [hereinafter Secure World].

53. *See* WILLIAMSON, *supra* note 5, at 60-61.

54. *Id*. at 55.

55. Roberts, *supra* note 16, at 1125.

56. WILLIAMSON, *supra* note 5, at 51.

57. *Id*.

58. *Id*.

59. BAKER, *supra* note 14, at 24.

60. Taylor, *supra* note 3, at 19-20.

61. INTERAGENCY REPORT, *supra* note 2, at 8.

62. WILLIAMSON, *supra* note 5, at 64.

damage the window of a space shuttle badly enough to require replacement.[63] Several space shuttle windows have already been replaced due to damage from space debris, some at a cost of $40,000 a piece.[64]

Space debris is also a form of visual pollution. It can interfere with the observation function of some satellites by scattering light into the satellite's telescope.[65] The debris can also obscure ground-based astronomical observation.[66]

In addition to the incidental dangers that space debris poses, it has the potential to be intentionally used as a military weapon.[67] Nations could deliberately create debris and use it to harm or destroy enemy reconnaissance satellites, communications devices, and even astronauts.[68] Space debris could also be intentionally used to effectively render a particular orbit unusable for space activity.[69] The lack of international law regarding the intentional and aggressive use of space debris makes this problem even more concerning. While Cold War-era space treaties prohibited nuclear warfare and the use of weapons of mass destruction in space, international space law does not prohibit the use of conventional explosives in Earth orbit.[70]

Some states have already deliberately used space debris for their own military gain.[71] In the early 1960s, the U.S. Air Force experimented with releasing copper "needles" into LEO as part of a communications project.[72] Intentional debris-creating events with no known scientific purpose have also occurred.[73] For example, in the 1980s the Soviet Union destroyed three of its Cosmos reconnaissance satellites to prevent the United States from recovering them.[74] On January 11, 2007, China tested an anti-satellite missile by destroying one of its inoperable satellites; the satellite broke apart into several hundred pieces of debris.[75] When the United States blew up its USA-193 satellite on February 20,

63. *Id.*

64. *Id.*

65. BAKER, *supra* note 14, at 16-17.

66. *Id.* at 17.

67. *Id.* at 21.

68. *Id.*

69. *Id.*

70. Taylor, *supra* note 3, at 22.

71. BAKER, *supra* note 14, at 5.

72. WILLIAMSON, *supra* note 5, at 52-53. This experiment, "Project West Ford," was intended to reflect speech signals.

73. BAKER, *supra* note 14, at 5.

74. *Id.*

75. William J. Broad, *Orbiting Junk in Space, Once a Nuisance, Is Now a Threat*, N.Y. TIMES, Feb. 6, 2007, at F1.

2008, the explosion did not contribute to orbital debris because the maneuver took place at a much lower altitude, 210 kilometers, and the resulting satellite pieces burned up in the atmosphere.[76] However, the United States' proposed missile defense system would be yet another source of intentionally created debris, if it is ever utilized, because it would work by causing missiles to collide in the upper atmosphere.[77]

Perhaps one of the most discouraging characteristics of the orbital debris problem is its capacity to self-generate.[78] Orbital debris not only presents a collision hazard to satellites and spacecraft, but to other debris as well. When two pieces of space debris collide, they can fragment and create even more debris. As the amount of debris increases, the likelihood of collision increases. This process is known as the "cascade effect."[79] According to the cascade effect hypothesis, if humans add no additional debris to Earth orbit, but also fail to remediate the problem, the amount of debris in orbit could still grow exponentially.[80]

Another possible danger of space debris is its potential surface harm when it re-enters the atmosphere. Approximately 200 objects return to Earth from space each year.[81] Despite this frequency, re-entry does not pose a notable risk to people, property, or the environment, as most of the debris incinerates when it enters the atmosphere.[82] The dangers of radioactive debris re-entry, however, represent a disconcerting reality. Cold War-era satellites were often built with radioactive components.[83] Approximately 1,500 kilograms of radioactive material orbits Earth.[84] If this type of debris re-enters Earth's atmosphere over a populated area, it could greatly harm human health and property.[85] In addition to the alarming possibility that radioactive debris can re-enter the atmosphere, it also presents a safety hazard for manned space operations.[86]

76. Dennis O'Brien & Frank D. Roylance, *Missile Hit is Reported on Errant Spy Satellite*, BALTIMORE SUN, Feb. 21, 2008, at 1A.

77. Taylor, *supra* note 3, at 10.

78. BAKER, *supra* note 14, at 13.

79. *Id.*

80. *Id.*

81. Taylor, *supra* note 3, at 22.

82. *Id.* at 22-23.

83. *Id.* at 23.

84. *Id.*

85. VIIKARI, *supra* note 29, at 48.

86. *Id.*

C. Tracking Debris

Several agencies around the world have varying abilities to track space debris; thus far, only the United States and Russia have systems that do systematic observation, as opposed to spot checks.[87] In the United States, the U.S. Space Surveillance Network ("SSN") is dedicated to this objective.[88] However, the SSN optical and radar sensors are a dated technology; they were all built in the 1960s and 1980s.[89] Despite its extensive worldwide sensor network, the SNN cannot continuously track debris smaller than 10 centimeters in diameter.[90] This is a troubling limitation because, as stated previously, satellite and spacecraft collisions with debris as small as 1 centimeter can be catastrophic. The U.S. Air Force has proposed improving the tracking system by deploying a constellation of satellites with a specific mission to monitor debris.[91] Tracking debris is an important part of space management, because without information about the location of debris, satellite operators cannot make informed decisions about how to direct their equipment.[92] Data from the SSN, while limited, is very helpful to satellite operators.[93] Satellites can be maneuvered to avoid collisions with known debris; however, these maneuvers can still cause the satellite to be temporarily off mission and deplete fuel.[94]

Debris that is 1 centimeter in diameter or larger can be detected from the ground, but the quality of visualization varies depending on the altitude of the debris.[95] Resolution is better at lower altitudes;[96] therefore, the detection of debris is more difficult in GEO than it is in LEO.[97] However, this difficulty in monitoring does not necessarily mean that GEO satellites are in more peril than LEO satellites because the debris moves faster and exists in higher quantities in LEO.[98]

87. WILLIAMSON, *supra* note 5, at 54.
88. *Id.*
89. Taylor, *supra* note 3, at 12.
90. INTERAGENCY REPORT, *supra* note 2, at 3.
91. WILLIAMSON, *supra* note 5, at 69.
92. *See* Secure World, *supra* note 52.
93. Taylor, *supra* note 3, at 19.
94. *Id.*
95. BAKER, *supra* note 14, at 27.
96. *Id.*
97. WILLIAMSON, *supra* note 5, at 55.
98. *Id.*

D. Technical Solutions to the Space Debris Problem

Space debris is now a well-recognized problem; hence, major space agencies have sought to address this issue.[99] Untouched, debris can remain in an orbit for centuries, but some satellites are designed to keep a reserve of fuel that allows a change of orbit, a process called "re-orbiting," at the end of their lives.[100] Space objects are "de-orbited" when the change of orbit causes the object to re-enter Earth's atmosphere.[101] For example, the French satellite SPOT-3 is being lowered from its LEO position using these fuel reserves, in order to reduce its decay time from 200 years to just fifteen years.[102] With proper planning, even immense space objects can be de-orbited; the Russian space station Mir was safely returned to Earth in 2001.[103] However, satellites placed in GEO are too high above Earth for de-orbiting to be practical.[104]

Spacecraft design can also affect the potential for debris creation.[105] For example, some launch vehicles include a venting feature that releases unspent fuel, thus decreasing the chances of an explosion.[106] Spacecraft design has also moved away from using explosive techniques for deploying moving parts.[107] Furthermore, removal of spent batteries that are prone to explosion is now commonplace[108] and launch vehicles can be designed to separate from the payload at a low enough altitude so that they never become orbital and thus, never become space debris.[109]

As this section has demonstrated, the various Earth orbits are greatly valuable to humankind, but that value diminishes if the characteristic "nothingness" of space is lost to debris. Orbital debris is a looming problem, but the technology exists to mitigate debris-creation. However, these mitigation technologies cannot make a dent in such a large problem if they are not widely used. Therefore, global legal and political approaches are needed to encourage the protection of the orbital environment.

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99. *Id*. at 75-77.

100. *Id*. at 75.

101. IADC, *supra* note 39, at 3 (de-orbiting is the "intentional changing of orbit for re-entry of a space system into the Earth's atmosphere to eliminate the hazard it poses to other space systems, by applying a retarding force, usually via a propulsion system.").

102. WILLIAMSON, *supra* note 5, at 76.

103. *Id*.

104. *Id*.

105. *Id*. at 77.

106. *Id*.

107. *Id*.

108. *Id*. at 78.

109. *See* INTERAGENCY REPORT, *supra* note 2, at 35.

III. EXISTING LAW REGARDING SPACE DEBRIS

This section will address the existing laws and policies relevant to the space debris problem. The dawn of the Space Age spurned the need for a new category of law: international space law. This section will begin by reviewing the treaties originated by the UN that filled this void, followed by a study of non-binding but influential resolutions, policies, and guidelines that are pertinent to the space debris problem. Finally, this section will look at how the United States has, or in some cases, has not, adopted these laws and policies.

A. Binding International Treaties

1. The Outer Space Treaty

The most important law dealing with human activity in space is the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies ("Outer Space Treaty" or "the Treaty").[110] The Treaty clarifies that international law applies in outer space and on other celestial bodies.[111] It was drafted at a time when placing objects into space was far too expensive to be as commonplace as it is today. The Treaty, therefore, did not address the problems of pollution and overcrowding in space.[112] It does, however, address responsibility for space objects.[113]

Article I contains the heart of the Outer Space Treaty: "[t]he exploration and use of outer space . . . shall be carried out for the benefit and in the interests of all countries . . . and shall be the province of all mankind."[114] This clause aptly summarizes the purpose of the document, but it also has enormous preservation implications. Article II expands this egalitarian theme, stating that "[o]uter space . . . is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[115] The Outer Space Treaty makes

110. *See* Outer Space Treaty, Jan. 27, 1967, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

111. *Id.* art. III (specifically "the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international co-operation and understanding").

112. *See* Outer Space Treaty, *supra* note 110.

113. *Id.* art. VIII.

114. *Id.* art. I.

115. *Id.* art. II.

Earth orbit, as a matter of international law, a common pool resource.[116] All of the international "tragedy of the commons" issues that have long existed with regard to the ocean, air, and Antarctica come with this designation. The entire document is largely permissive, restricting only non-peaceful uses of space.[117] Further, the Treaty invites the whole world to explore, undertake commercial action, and make any other peaceful uses of space.

Under Article VI of the Outer Space Treaty, states are responsible for "national activities in outer space" that both their governmental and private entities undertake.[118] States must ensure that all of these activities are carried out in compliance with the Treaty[119] and they cannot relinquish this responsibility.[120] Thus, all space activity, whether carried out by a state or a non-governmental party, is subject to international law.[121] A space activity is a national activity of the state from which a space object is launched, or that of a state that procures the launch of a space object.[122] The Treaty implies that states have an obligation to prevent their nationals from violating the Treaty.[123] As will be discussed below, the creation of space debris might be considered a violation of Article IX of the Treaty.[124]

Under Article VIII of the Treaty, a launching state has jurisdiction over its space objects and over "their component parts."[125] However, the Article does not address whether fragments from a space object are considered part of the original space object and thus still subject to the jurisdiction and ownership of the launching state, or if they are new objects but still within the launching state's jurisdiction, or if they are not space objects at all.[126] Debris such as intact, but non-functioning space objects, for instance inactive satellites, are easier to classify. Space law scholar Dr. Bin Cheng suggests that non-functioning space objects should still be considered space objects for the purposes of international

116. *See* VIIKARI, *supra* note 29, at 58-59.

117. *See* Outer Space Treaty, *supra* note 110.

118. *Id*. art. VI.

119. *Id*.

120. BAKER, *supra* note 14, at 74.

121. *See id*.

122. *See* Outer Space Treaty, *supra* note 110, art. VII.

123. BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 604 (1997).

124. *See* Outer Space Treaty, *supra* note 110, art. IX (parties must behave with "due regard to the corresponding interests of all other States Parties to the Treaty"; studies should be conducted so as to avoid "harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter.").

125. *Id*. art. VIII.

126. *See* Outer Space Treaty, *supra* note 110.

space law.[127] The Treaty also states that launching states will be "internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space . . . ."[128] Therefore, a launching state could be liable under the Treaty for damage caused by one of its non-functioning satellites.[129]

Although nothing in the Treaty explicitly mentions space debris, Article IX of the Treaty nods to preservation of the space environment by stating that "State Parties to the Treaty shall pursue studies of outer space . . . and conduct exploration of them so as to avoid [its] harmful contamination."[130] However, the Article does not clarify what types of contamination are "harmful." Article IX continues:

> [i]f a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space . . . would cause potentially harmful interference with activities of other State Parties in the peaceful exploration and use of outer space . . . it shall undertake appropriate international consultations before proceeding with such activity or experiment.[131]

In sum, State Parties concerned that another state's activities could interfere with their own peaceful uses of space "may request consultation concerning the activity or experiment."[132] The purpose of Article IX was not to protect the orbital environment, but rather to preserve space for scientific experimentation.[133] This language simply creates a procedural hurdle for activities that may harm another state's interests; it does not impose an absolute injunction against such actions.

2. The Registration Convention

The Convention on Registration of Objects Launched into Outer Space ("Registration Convention") requires nations to assemble a registry of space objects launched from, or launched by, that nation.[134] Launching states must ensure that every space object is registered in compliance with the Registration Convention[135] and must supply the

127. *See* CHENG, *supra* note 124, at 506.

128. Outer Space Treaty, *supra* note 110, art. VII.

129. *See id.*

130. *Id.* art. IX.

131. *Id.*

132. *Id.*

133. BAKER, *supra* note 14, at 96.

134. Convention on Registration of Objects Launched into Outer Space, art. II, ¶ 1, *opened for signature* Jan. 14, 1975, 28 U.S.T. 695 [hereinafter Registration Convention].

135. *See id.*

information from its registry to the Secretary-General of the UN.[136] The UN compiles the national registries into an international registry, to which the public has "full and open access."[137] The Registration Convention requires states to provide certain identifying and location information on their satellites including: nodal period, inclination, apogee, and perigee.[138] However, more information—such as satellite orbital positions, notifications of orbit changes, and notifications if an object has broken apart—is necessary to make the registry useful.[139] Article IV of the Convention permits states to provide this and other useful information at their discretion.[140] But the utility of the UN registry to states and other parties that are trying to evaluate space debris risk could be vastly increased if the registry was automated and if the Registration Convention required states to provide information on their space objects continuously, rather than only at the time of launch.[141]

The North American Aerospace Defense Command ("NORAD") is the joint U.S.-Canadian entity that ensures U.S. compliance with the Registration Convention. From NORAD, U.S. Space Command monitors and catalogues all known space objects in Earth orbit.[142] Detecting and tracking space debris is crucial to NORAD's mission of aerospace defense because without an updated inventory of orbital debris, a piece of debris could be mistaken as an intercontinental ballistic missile.[143] NORAD shares information with NASA to assist NASA operations in avoiding collisions.[144] Because objects that are closer to Earth are easier for sensors to "see," NORAD is not able to track debris in GEO as accurately as it in can in LEO.[145]

3. The Liability Convention

The Convention on International Liability for Damage Caused by Space Objects ("Liability Convention") established a basic framework of tort law applicable to space activities.[146] The Liability Convention was a response to concerns about the danger that space objects pose on Earth

136. *Id*. art. III, ¶1.

137. *Id*. art. III, ¶ 2.

138. *Id*. art. IV, ¶ 1.

139. BAKER, *supra* note 14, at 77.

140. *Id*.

141. Taylor, *supra* note 3, at 45.

142. BAKER, *supra* note 14, at 30.

143. *Id*.

144. *Id*.

145. WILLIAMSON, *supra* note 5, at 53-55.

146. Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T. 2389 [hereinafter Liability Convention].

when they re-enter the atmosphere.[147] Damage caused by space objects while they are in space, on the other hand, did not motivate the formation of the Liability Convention, which explains why terrestrial damage has a stricter liability scheme under the Liability Convention than damage that occurs in space.[148] The Liability Convention instituted an absolute liability policy for damage on the Earth's surface, or in airspace, caused by space objects.[149] However, a state is only liable for damage to another state's space objects if "the damage is due to [the state's] fault or the fault of persons for whom [the state] is responsible."[150] An injured party cannot recover compensation under this Convention if another entity of the same state harmed its space object.[151] In that case, the injured party would most likely have a remedy under national tort law, but these remedies extend beyond the purview of this Note. Although the Liability Convention does not specifically address space debris because the problem was considered to be "relatively exotic" when the instrument was drafted, it arguably creates a remedial mechanism for some space debris damage.[152]

The term "damage," as used in the Liability Convention is understood to extend to people and property, but not to the space environment itself.[153] Thus, under the Liability Convention, states cannot be held liable for polluting Earth orbit with debris unless that debris harms a person or property.[154]

The Liability Convention imposes a fault standard for recovery for damage caused in space, but it does not define "fault." One of the primary criticisms of the fault provision is that it does not establish a standard of care, and no standard of care has otherwise been established in space law.[155] Moreover, it is especially difficult to demonstrate fault with regard to the space environment as collecting and producing physical evidence is impossible in most cases.[156] Canada brought a claim against the Soviet Union under the Liability Convention in 1979.[157] In January of 1978, the Soviet satellite Cosmos 954 re-entered the

147. BAKER, *supra* note 14, at 79.

148. *Id*.

149. Liability Convention, *supra* note 146, art. II.

150. *See id*. art. III.

151. BAKER, *supra* note 14, at 81.

152. *Id*. at 79.

153. *Id*.

154. *See id*.

155. *Id*. at 84.

156. *Id*. at 85-86.

157. Canada: Claim Against the Union of Soviet Socialist Republics for Damage Caused by Soviet Cosmos 954, 18 I.L.M. 899 (1979) [hereinafter Canada].

atmosphere and littered western Canada with debris.[158] The Soviet government knew about the impending re-entry of the satellite, but failed to warn the Canadian government, believing that the satellite would burn up and that any leftover material would fall near the Aleutian Islands.[159] Cosmos 954 was a nuclear reactor satellite that contained uranium-235.[160] The majority of the fragments that the Canadian government found were radioactive and some had lethal levels of radioactivity.[161] During Canada's search and recovery operation, its Department of External Affairs requested several times that the Soviet government provide Canada with technical information about Cosmos 954 to help Canada estimate the location of the debris and to evaluate its harmful effects.[162] The Soviet Union refused to provide most of the requested information.[163]

Cleaning up the Cosmos 954 incident cost Canada CAD$14 million.[164] Canada sought to recover about CAD$6 million from the Soviets, basing its claim on Article II of the Liability Convention.[165] The matter was settled in 1981 for CAD$3 million.[166] Ultimately, the legal procedures set forth in the Liability Convention were never used, and the Soviet Union made no admission of liability.[167]

4. The Prohibition Convention

Recognizing that warfare could have far-reaching and enduring effects on the environment, the UN drafted the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques Convention ("Prohibition Convention") in 1977.[168] The Prohibition Convention prohibits states from "engag[ing] in military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury to any other State Party."[169] This agreement was progressive

158. *Id*. at 902.

159. *Id*. at 902-03.

160. *Id*. at 902.

161. *Id*. at 904.

162. *Id*. at 913-26.

163. *Id*. at 915, 922-28.

164. BAKER, *supra* note 14, at 66.

165. Canada, *supra* note 157, at 905.

166. BAKER, *supra* note 14, at 66.

167. *Id*.

168. Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, May 18, 1977, 31 U.S.T. 333 [hereinafter Prohibition Convention].

169. *Id*. art. I.

enough to specifically protect outer space.[170] Effectively, this signifies that space cannot be modified to harm another country, and it seems to outlaw the creation of space debris as a military tactic as well.

B. Non-Binding International Guidelines and Policies

1. The Nuclear Power Principles

A more recent addition to international space policy are the Principles Relevant to the Use of Nuclear Power Sources in Outer Space ("Nuclear Power Principles" or "Principles").[171] This UN resolution sets forth guidelines for the safe use of nuclear power in space activities.[172] The Principles suggest that radioactive material can make space activities quite hazardous.[173] Therefore, the Principles state "[i]n order to minimize the quantity of radioactive material in space and the risks involved, the use of nuclear power sources in outer space shall be restricted to those space missions which cannot be operated by non-nuclear energy sources in a reasonable way."[174] The Principles not only call for launching states to protect people and the terrestrial environment when using nuclear power in space, but also demand that those states protect the space environment from nuclear contamination.[175] Nuclear reactors are permissible for inter-planetary missions and for missions in which the reactor will be stored in high orbit.[176] Radioisotope generators may only be used if they will not return to Earth.[177] These restrictions are intended to prevent radioactive materials from re-entering the atmosphere while they are still harmful.[178]

The Nuclear Power Principles address re-entry of radioactive material with great concern and require international cooperation in response to such an event. If a launching state expects that one of its nuclear powered space objects might re-enter the atmosphere that state is required to inform any other states that could be affected by the re-entry.[179] The launching state must provide the affected states with

170. *Id*. art. II.

171. Principles Relevant to the Use of Nuclear Power Sources in Outer Space, G.A. Res. 47/68, U.N. GAOR Supp. 49, at 88, 47th Sess., 85th plen. mtg., U.N. Doc. A/RES/47/68 (Dec. 14, 1992).

172. *Id*. principle 3.

173. *See id*.

174. *Id*.

175. *Id*. principle 3, ¶1(a).

176. *Id*. principle 3, ¶2(a).

177. *Id*. principle 3, ¶3(a).

178. *Id*. principle 3, ¶3(b).

179. *Id*. principle 5.

information about the space object and respond to requests for additional information.[180] The launching state is also required to render assistance to affected states immediately after re-entry.[181] In the event of a radioactive material re-entry, every nation capable of monitoring the space object is expected to do so and to share any garnered information with the UN Secretary-General and with the concerned states.[182]

The Nuclear Power Principles do not have the same legal significance as the Outer Space Treaty, Registration Convention, or the Liability Convention, because unlike UN conventions, UN resolutions are not legally binding.[183] However, the Principles are not inconsequential; the General Assembly unanimously adopted this resolution, which indicates that the Principles represent internationally recognized standards.[184]

2. The IADC Guidelines

One of the most important sources of space debris policy is the Inter-Agency Space Debris Coordination Committee ("IADC"). The IADC is an international organization dedicated to researching space debris problems and proposing solutions. Its membership includes the space agencies of all of the major space-faring states.[185] The IADC has compiled a set of debris mitigation guidelines designed to be incorporated into mission planning and spacecraft design so that debris-creating events can be minimized and debris-caused hazards can be avoided.[186] These guidelines are not binding international law, but "[o]perators of existing space systems are encouraged to apply [them] to the greatest extent possible."[187]

The meat of the guidelines is the section on Mitigation Measures, which lists specific recommendations for spacecraft operators. The first Measure aims to limit debris released during normal operation.[188] This

180. *Id*. principles 5-6.

181. *Id*. principle 7, ¶2(a).

182. *Id*. principle 7, ¶¶1, 2(b).

183. VIIKARI, *supra* note 29, at 84.

184. *Id*. at 83-84.

185. IADC, *supra* note 39, at iii. The IADC membership includes: Italian Space Agency ("ASI"), British National Space Centre ("BNSC"), Centre National d'Études Spatiales ("CNES"), China National Space Administration ("CNSA"), Deutsches Zentrum fuer Luft-und Raumfahrt e.V. ("DLR"), European Space Agency ("ESA"), Indian Space Research Organisation ("ISRO"), Japan, National Aeronautics and Space Administration ("NASA"), National Space Agency of Ukraine ("NSAU"), and Russian Aviation and Space Agency ("Rosaviakosmos").

186. *Id*. at 1.

187. *Id*.

188. *Id*. at 4.

recommendation would probably preclude activities such as Project West Ford, in which the United States released copper needles into orbit. This Measure would also conceivably curtail the use of pyrotechnic devices to deploy moving arms and solar arrays. The second Measure looks to minimize the potential for on-orbit break-ups.[189] States may achieve this goal by employing passivation measures, such as burning up or venting unspent fuel.[190] Another way to meet this objective is to monitor space objects, detect malfunctions, and de-orbit malfunctioning satellites into a disposal orbit.[191] A third way is to refrain from intentionally destroying space objects, and when they must be destroyed, to move them into a lower orbit first, so that the debris will decay more quickly.[192] The third Measure calls for post mission disposal.[193] This essentially suggests that geostationary satellites should be re-orbited into a disposal orbit above GEO and that LEO satellites, which will take more than twenty-five years to decay, should be de-orbited into an orbit where they will have a reduced lifetime.[194] The fourth Measure calls for "prevention of on-orbit collisions," which involves assessing risk created by space debris and utilizing all necessary avoidance maneuvers.[195]

3. The COPUOS Guidelines

The space-centric arm of the UN is the Committee on the Peaceful Uses of Outer Space ("COPUOS"). COPUOS first took notice of the orbital debris problem in the early 1980s.[196] COPUOS is divided into two subcommittees: the Scientific and Technical subcommittee, and the Legal subcommittee.[197] The Scientific and Technical subcommittee has drafted a resolution for space debris mitigation standards based largely on the IADC guidelines.[198] In doing so, it noted that "[t]he prompt implementation of appropriate debris mitigation measures is . . . a prudent and necessary step towards preserving the outer space environment for future generations."[199] Like the IADC guidelines,

189. *Id*.

190. *Id*. Passivation is "the elimination of all stored energy on a space system to reduce the chance of break-up." *Id*. at 3.

191. *Id*. at 5.

192. *Id*.

193. *Id*.

194. *Id*. at 5-6.

195. *Id*. at 6.

196. BAKER, *supra* note 14, at 108.

197. U.N. Comm. on the Peaceful Uses of Outer Space, http://www.unoosa.org/oosa/en/COPUOS/copuos.html (last visited Feb. 1, 2010).

198. Taylor, *supra* note 3, at 40-41.

199. U.N. Comm. on the Peaceful Uses of Outer Space, *Report of the Scientific and Technical Subcommittee on its Forty-Fourth Session, Held in Vienna from 12 to 23*

however, the COPUOS guidelines "are not legally binding under international law."[200] Nevertheless, all of the major space-faring states contribute to these guidelines; hence, they are indicative of a global consensus about how space activity should be conducted.[201]

C. United States Space Debris Law and Policy

1. The Orbital Debris Mitigation Standard Practices

The U.S. Government Orbital Debris Mitigation Standard Practices ("Standard Practices") also resemble the IADC guidelines, but with two key differences: they are more specific and less stringent.[202] Debris released during normal operations should be avoided under the Standard Practices specifically when the debris is larger than 5 centimeters and would remain in orbit for more than twenty-five years.[203] This rule is not entirely prohibitory, however, as the release of debris can still be "justified on the basis of cost effectiveness and mission requirements."[204] Passivation and collision avoidance are recommended to avoid accidental explosions.[205] One bright spot in the Standard Practices that acknowledges the problem of space pollution is the instruction that "projects will plan for . . . disposal procedures . . . to minimize impact on future space operations."[206] The Standard Practices indicate that atmospheric re-entry should be permitted for structures that would re-enter on their own in twenty-five years or less.[207] They also specifically describe several disposal orbits, and indicate which objects should be placed there.[208] Finally, the Standard Practices suggest that direct retrieval of the space object should be conducted when possible, perhaps anticipating that retrieval will become a more economical option in the future.[209] Currently, removal rarely occurs.[210] However, scientists

February 2007, annex IV, at 42, U.N. Doc. A/AC.105.890 (Mar. 6, 2007) (Space Debris Mitigation Guidelines of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space).

200. *Id*. at 43.

201. VIIKARI, *supra* note 29, at 100.

202. *See* U.S. Government Orbital Debris Mitigation Standard Practices, www.orbitaldebris.jsc.nasa.gov/library/USG_OD_Standard_Practices.pdf (last visited Feb. 1, 2010).

203. *Id*. at 1.

204. *Id*.

205. *Id*.

206. *Id*. at 3.

207. *Id*.

208. *Id*.

209. *Id*.

regularly propose new removal methods using, for example, robots that collect debris mechanically or lasers that perturb the debris in orbit.[211] If these technologies come to fruition, removal may become a worthwhile policy that the U.S. government should implement.[212]

Private space activity conducted from the United States is regulated by the Federal Aviation Administration, the National Oceanic and Atmospheric Administration, and the Federal Communications Commission.[213] These agencies create their own debris mitigation policies based on the Standard Practices described above.[214]

2. NASA Policy

The National Aeronautical and Space Act created NASA in part to "encourage, to the maximum extent possible, the fullest commercial use of space."[215] NASA may have been created for a commercial, rather than an environmental purpose, but like all federal agencies, NASA is subject to the National Environmental Policy Act.[216] Operations that are "expected to have a significant effect upon the quality of the human environment" require an environmental impact statement ("EIS").[217] Projects in space, on the other hand, require an environmental assessment ("EA").[218] Each EA must contain a brief discussion of the need for the proposed project, any available alternatives to the project, and the environmental impacts of the proposed action.[219] While these requirements are not as stringent as those of an EIS and will not alone foreclose projects that will adversely impact the space environment, they demand forethought about the environmental consequence of activities in space.[220] NASA's own policies require the agency to conduct "a review of each spacecraft to assess its debris-creating potential."[221]

NASA has implemented several policies that mitigate the orbital debris problem. Concerned for the space shuttle and its occupants, NASA has promulgated guidelines prohibiting shuttle launches if a piece

210. The space shuttle has removed a few large objects, but removal has yet to be accomplished by an unmanned mission. INTERAGENCY REPORT, *supra* note 2, at 36.

211. WILLAMSON *supra* note 5, at 78-79.

212. INTERAGENCY REPORT, *supra* note 2, at 36.

213. WILLIAMSON, *supra* note 5, at 82-83.

214. Taylor, *supra* note 3, at 33.

215. National Aeronautics and Space Act of 1958, 42 U.S.C. § 2451(c) (2006).

216. 14 C.F.R. § 1216.305 (1988).

217. *Id*. § 1216.305(c).

218. *Id*. § 1216.305(b).

219. 40 C.F.R. § 1508.9(b) (1978).

220. VIIKARI, *supra* note 29, at 274.

221. Taylor, *supra* note 3, at 33.

of debris is predicted to enter a 5 x 25 x 5 kilometer area around the shuttle within two hours of its launch.[222] While this policy exists for safety purposes, it also helps prevent new debris-creating events by avoiding collisions between the shuttle and debris.[223] NASA also removes its GEO satellites to a disposal orbit whenever it is practical to do so.[224]

3. The U.S. Space Policy

In 2006, President Bush issued a new U.S. National Space Policy ("Policy").[225] The Policy notes that orbital debris creates safety and economic problems for U.S. space activities, though the Policy does not address the environmental implications of debris.[226] As such, the Policy states that "[t]he United States shall seek to minimize the creation of orbital debris by government and non-government operations in space in order to preserve the space environment for future generations."[227] The Policy does not specify how the United States will achieve this goal.[228] The only guidance in the Policy recommends that: "the United States Government Orbital Debris Mitigation Standard Practices, consistent with mission requirements and cost effectiveness," should consider debris problems with regard to licensing private space activities and encourage the world to also adopt mitigation policies.[229] The Policy also limits the United States' commitment to international orbital debris mitigation efforts: "[t]he United States will oppose the development of new legal regimes or other restrictions that seek to prohibit or limit U.S. access to or use of space."[230]

222. WILLIAMSON, *supra* note 5, at 69.

223. Taylor, *supra* note 3, at 9.

224. BAKER, *supra* note 14, at 113.

225. OFFICE OF SCI. & TECH. POL'Y, EXECUTIVE OFFICE OF THE PRESIDENT, U.S. NATL. SPACE POL'Y (2006), *available at* http://www.ostp.gov/galleries/default-file/Unclassified%20National%20Space%20Policy%20--%20FINAL.pdf.

226. *Id*. at 9.

227. *Id*.

228. *See id*.

229. *Id*.

230. *Id*. at 2.

IV. PROPOSAL FOR NEW INTERNATIONAL STANDARDS TO COMBAT THE ORBITAL SPACE DEBRIS PROBLEM

States generally prioritize national gain over preventing international harm. Space law is no exception.[231] The launching state receives almost all the gains of using Earth orbit for commercialization and defense, but the harm of debris-creation is spread among members of the international community. An international agreement has made Earth orbit a common pool resource, and certainly, an international agreement could address space pollution. Treaties have been used with varying degrees of success to protect terrestrial common pool resources; small additions to the existing body of space law should be used to protect the celestial commons.

A. Reforming the Liability Convention

Space law reformers will face difficulties regarding debris causation. If a particular piece of debris known to have come from a particular launch vehicle or satellite collides with a functioning payload, fault can be assigned relatively easily. However, determining the origins of a piece of debris can be quite difficult.[232] The process involves complex calculations and accuracy is restricted by the limitations of the detection equipment.[233] For this reason, the fault-based liability standard set forth in Article III of the Liability Convention should be liberalized. States that have permitted their space objects to become derelict should be held to an absolute liability standard for those objects after a given grace period has expired. This rule could be softened by allowing states that make approved mitigation efforts, such as moving dying space objects into a disposal orbit, to permit these space objects to remain within the fault-based liability system.

B. Addressing the Issue of Jurisdiction over Debris

One of the most sensible ways to address the space debris problem is to rethink the Outer Space Treaty's stance on ownership of space objects.[234] Currently under the Treaty, space debris might be considered

231. BAKER, *supra* note 14, at 75.

232. *Id*. at 31-32.

233. *Id*.

234. *See* CHENG, *supra* note 123, at 506.

space objects that remain within the jurisdiction of the launching state.[235] Even if one state had the resources and willingness to remove another state's debris, such action could violate the Treaty. If states could simply "disown" their debris, then any state would be free to remove the disowned objects.[236] States may not be altruistically motivated to provide remediation services for the benefit of the entire space-faring world, but if states or the private sector find that remediation is necessary to continue to provide space-based services, then remediation would simply become part of the "overhead" for those operations. This proposed "disownment amendment" to the Outer Space Treaty would merely remove a legal obstacle from that potential market-driven solution.

Of course, if states were able to divest jurisdiction over their inactive space objects, there would be no way to assign fault if those objects later damaged another state's property. Therefore, states should not be permitted to divest jurisdiction over operational space objects. Furthermore, it is in the best interest of states to maintain jurisdiction over operational spacecraft, because if another state damages spacecraft under their jurisdiction, they will be able to use the remedies in the Liability Convention. The Treaty could be further amended to hold states strictly liable for damage caused by debris that they do not disown.[237] Failure to disown an inoperable object would be negligence per se.

In the alternative, if Article VIII of the Outer Space Treaty is amended to clearly state that pieces of space debris are not "space objects" within the meaning of the Treaty, then the debris would not be owned by the launching state and any state could remove any orbital debris without the fear of liability. As debris becomes a greater threat to operating satellites, the desire to protect these assets may motivate states to pursue remediation efforts.

C. Space Access Tax and Orbital Maintenance Fund

Another way to deal with the space debris issue is to tax access to space in order to create an orbital maintenance fund.[238] Remediation of space debris is extremely expensive, but with a dedicated fund, "cleaning up" Earth orbit may become routine. Furthermore, with commercial space enterprises competing over government contracts, remediation technology would likely become more sophisticated and less expensive. Essentially, the system would be similar to how highways are maintained

235. Outer Space Treaty, *supra* note 110, art. VIII.

236. CHENG, *supra* note 123, at 506.

237. *Id.*

238. WILLIAMSON, *supra* note 5, at 270.

in the United States: drivers are taxed for using the roads when they register their vehicles and the resulting funds are used to maintain infrastructure for those vehicles. As orbital debris becomes a greater risk to satellite operators, the expense of an "orbit tax" would probably seem less burdensome, in comparison to the lost value of missions that would no longer be possible.

By way of creating incentives for environmentally-conscious engineering, the tax could vary based on mitigation procedures implemented by the satellite operators. For example, satellite operators that voluntarily comply with the IADC guidelines might face a reduced tax liability. In this manner, a taxation system would provide both a carrot and a stick to encourage desirable conduct in space missions.

The orbital maintenance fund could be used both for remediation efforts as well as for improving debris-tracking networks by supporting an exhaustive public catalog so that satellite operators have access to the information necessary to avoid collisions. While nations are hesitant to publicize the locations of their military satellites, these "secret" space objects are not invisible to other governments with tracking systems and are just as vulnerable to collisions as are civil satellites. Ultimately, all operational space objects will be easier to manage and protect from collisions when there is more transparency surrounding satellite location. Furthermore, as mentioned earlier in this Note, the current technologies in place for tracking objects in GEO lag behind the technologies for tracking objects in LEO. The orbital maintenance fund could address this disparity and allow operators to better navigate this congested region of space. Improvements in tracking and registering data on orbital debris could be even more useful if the Registration Convention is amended to require continuous reporting on the location and condition of space objects.

V. CONCLUSION

Space operators need to be concerned with the environmental impacts that their activities have on Earth orbit. As with terrestrial development, sustainability is at stake. From the human perspective, space might be infinite, but not all space is created equal. Limitless outer space will never be as valuable to humans for communications, research, and defense as the Earth's own orbit. Earth orbit is a limited, precious resource and has no conceivable substitute. As the number of countries participating in space activities grow, it becomes increasingly important for the international community to create legal incentives for orbital debris mitigation.

Space law needs to move beyond the Cold War-era. The dominant space law did an adequate job of addressing the concerns of its day: ownership of space, weaponization, and nuclear proliferation. Early space law invited the nations of the world to explore and create in space, and they did. But, the opening of the Space Age also initiated runaway pollution of the orbital environment. The goal of open space innovation for the world, as codified in the Outer Space Treaty, is still relevant. However, space policy must address the problems of modern space in order to achieve that goal. Given the tremendous economic, scientific, and aesthetic value of Earth orbit, the international community must take steps to maintain space development as a sustainable modern enterprise. The only way to achieve this goal in a common pool resource is to create real disincentives for activities that pollute and damage the environment and to create real incentives to apply debris mitigation practices. Space law should invite innovation and cooperation in space by persuading satellite operators to remove their inoperable satellites from useful orbits, permitting capable states to pursue remediation of debris, and by requiring space users to pay their share of maintaining the space environment. If broadly adopted, these small changes in space law would likely support preservation of the orbital environment and permit the continued human enjoyment of space.