Sustainable Development Law & Policy

Volume 9
Issue 2 *Winter 2009: Climate Law Reporter 2009*

Article 17

Climate Change, Energy, and Sustainable Development in South Africa: Developing the African Continent at the Crossroads

Edson L. Meyer

Kola O. Odeku

Climate Change, Energy, and Sustainable Development in South Africa:

Developing the African Continent at the Crossroads

by Professor Edson L. Meyer & Dr. Kola O. Odeku***

Introduction

Various scientific research has confirmed that climate change has started affecting the atmosphere and, in particular, the African continent.[1] International concerns regarding climate change are now overwhelming as various governments of the world create policies and measures to reduce the carbon dioxide emissions that cause climate change. The African continent is likely to be severely affected by climate change if the warming continues[2] because institutional capacities to combat the changing weather are not in place.[3] The irony is that developing African countries are more concerned with the issues of access to energy (modern fuels and electricity) in order to improve and increase industrial production and output, economic growth,[4] and development,[5] as opposed to policies that would reduce carbon dioxide emissions and halt climate change.[6]

Climate change is a grave threat to South Africa and a major obstacle to continued poverty reduction across its many dimensions.

There is ample consensus that sustainable development involves an integration of environmental protection and economic growth.[7] Economic growth can still be attained through alternative energy sources as opposed to fossil fuels. Due to the global nature of climate change and the unpredictability of its likely impacts, the cooperation of all countries is required to successfully address it. One approach that should be considered in order for developing African countries to grow their economies by utilizing their natural resources without contributing to climate change is encouraging more environmentally sustainable energy sector expansion. South Africa is currently the first nation in Africa to utilize this approach, which is the primary reason it has been chosen as a case study.

While developing countries are the most vulnerable to the impacts of climate change, they do not perceive or consider climate change as a priority or serious matter to be handled with levity.[8] Instead, most African leaders and policy makers have linked the issue of energy and natural resources to poverty alleviation,[9] which they consider the major challenge facing the continent.[10] They have consistently invoked the UN Millennium Development Goals ("MDGs") to support their positions and validate their actions.[11]

Interestingly, it is not only African leaders who believe that developing countries should vigorously pursue energy intensive economic activities. Some African pundits and their collaborators have also supported this position by asserting that "whether climate change proves benign or harmful, attempting to control it through global regulation of emissions would be counterproductive" because it would not engage individuals in sustainable development activities that improve their quality of life.[12]

There is a price to be paid for this inaction and lackadaisical attitude. Any major catastrophe from climate change would affect the natural resources and economies of African nations.[13] It might also result in "struggle for food, energy, and water as they lack resources and capacity to quickly adapt."[14] These negative impacts may "undermine sustainable development, increase poverty, and delay or prevent the realization of the Millennium Development Goals."[15] This could lead to a situation where millions would be forced to migrate to other regions of the world.[16]

South Africa as a Case Study

South Africa, as a developing country, is the most industrialized within the African region. It is well endowed with natural resources such as coal, gold, diamonds, metals, and minerals. Its overall economy is chiefly dependent on energy production and use, with coal accounting for seventy-five percent of the fossil fuel demand and ninety-one percent of electricity generation. The energy sector contributes approximately fifteen percent of gross domestic product and provides around 250,000 jobs.[17] Compared to other African countries, the South African economy is energy-intensive and the energy consumption rate is very high. This is mainly due to the heavy mining industries, such as iron and steel, cement, aluminum, etc. Furthermore, it is the

*Prof. Edson L. Meyer is the Director Fort Hare Institute of Technology, University of Fort Hare Alice, 5700 Eastern Cape South Africa. **Dr. Kola O. Odeku is a Research Fellow at Fort Hare Institute of Technology, University of Fort Hare Alice, 5700 Eastern Cape South Africa.

most electrified country in Africa; electricity plays a pivotal role in the economy and improves the quality of life of the previously disadvantaged majority in addition to supporting large-scale industrial development.[18]

South Africa is fully committed to growing its economy through exploration and use of energy resources to meet its development objectives.[19] When the country attained independence in 1994, the issues of climate change and global warming were not a priority and the perceived "linkages between sustainable development and climate change issues were very weak."[20] Be that as it may, there has been scientific evidence that climate change is far more rapid and dangerous than thought earlier.[21] The government has now realized that climate change is a grave threat to South Africa and a major obstacle to continued poverty reduction across its many dimensions. This is a great concern that calls for a change in attitude to make the issue of climate change a major priority. Bearing this in mind, South Africa is beginning to proactively link its objectives with climate change priorities within a sustainable development framework.

This was a clear indication of political will by governments worldwide to combat climate change.

The Era of Turning Up the Heat in South Africa

Since 1994, various government policies, legislation, and regulations in South Africa have been primarily based on the development paradigm that addresses the injustices of the past and focuses on the provision of basic needs, equity, employment creation, and economic growth for all South Africans by utilizing available natural resources, in particular energy from coal. Consequently, the issue of integrating energy, economic growth, and environment has not been a major concern. This deliberate oversight on the part of the government created a major barrier to integrating climate change into South Africa's vision of a sustainable development pathway. There has been a lack of an adequate policy approach to consider energy and climate change objectives alongside each other, as well as a lack of institutional, human, legal, and financial capabilities.[22] Furthermore, South Africa's ability to respond to concerns about climate change are complicated by the fact that the greater majority of South Africans live in varying degrees of poverty and want to increase their living standards, leading to increased energy use per capita and increased reliance on fossil fuels with high carbon dioxide emissions.[23]

This scenario had the support of the government based on the 1998 White Paper on Energy Policy ("1998 White Paper").[24] The 1998 White Paper sets the main objectives of the energy sector in South Africa as follows: increasing access to affordable energy services; stimulating economic development; improving energy governance; managing energy-related environmental impacts; and securing supply through diversity.[25] However, aggressive approaches to increasing access to affordable energy services to stimulate economic growth have been without regard to the environmental impacts.[26]

In South Africa, energy sector activities are the largest sources of greenhouse gas ("GHG") emissions, accounting for about eighty-nine percent of the total emissions.[27] More importantly, electricity is mainly supplied by Eskom, a public utility company, based on coal-fired systems; this accounts for ninety-one percent of all electricity produced in the country, and there is continuous increase in demand.[28] Increase in electricity supply based on coal-fired systems has lead to increased carbon dioxide emissions.[29]

As a result of the high levels of energy production and consumption, there are high levels of particulate concentrations in South Africa.[30] High level of particulate matter results in "serious environmental and health problems because air quality, land, water, and forest resources have been severely degraded."[31] The use of coal, wood, paraffin, and candles for cooking, heating, and lighting also exposes households to hazardous levels of indoor air pollution and the risk of fire. Illness and death can result.[32]

The aggressive drive by the South African government to grow the economy by utilizing energy intensively without regard to the negative consequences has put South Africa at a crossroads. However, the government has now decided to live up to its responsibility by implementing drastic measures to reduce carbon dioxide emissions to mitigate the affect of potential catastrophes on what has been gained through economic growth.

The Era of Turning Down the Heat in South Africa

The threat of global climate instability and its likely impacts on countries worldwide led to the signing and subsequent ratification of the United Nations Convention on Climate Change ("UNFCCC"). This was a clear indication of political will by governments worldwide to combat climate change. Unfortunately, however, as clearly expressed in the UNFCCC, it will be difficult for developing countries to avoid increasing emissions as they attempt to meet their needs through fossil fuel production.[33] The challenge, therefore, is to ensure that there are synergies between sustainable development goals and carbon dioxide reduction strategies in order to avoid the impact of climate change. The South African government is now heeding the clarion call by implementing various strategies that will lead to massive reduction of carbon dioxide in the country. The most potent of these is the synergy between achieving sustainable development goals within the context of climate change.

Policies to Fight Climate Change Through Emission Reduction

It must be pointed out from the outset that South Africa does not have emission reduction targets for the first commitment period of the UNFCCC Kyoto Protocol, which runs from 2008–2012, because it is not an "Annex I" country.[34] Even so, the South African government recognizes that it needs to take adequate measures as one of the highest emitting of the non-Annex I countries.[35]

South Africa's Environmental Affairs and Tourism Minister, Marthinus van Schalkwyk, described the overall approach to climate change mitigation and adaptation as "progressive, ambitious, and far-reaching" as well as focused on protecting South Africa from the "onslaught" of global warming.[36] He added that the goal is for carbon dioxide emissions to "stop growing by 2020–2025 at the latest, stabilize for up to ten years, and then decline in absolute terms."[37] Towards this end, the government has started implementing stringent policies and measures and also enforcing the laws relating to environment[38] and pollution.[39] This approach is now shifting the country's development path to become more sustainable and should gradually reduce carbon dioxide emissions.[40]

South Africa has designed a Renewable Energy Strategy.

A National Agency to Promote CDM Projects

In 2005, the South Africa Department of Minerals and Energy created a Designated National Authority to coordinate CDM activities as required by the Kyoto Protocol.[41] The agency coordinates activities to attract investors and project developers to South Africa. Shortly after the agency was established, it received information on four projects from the private sector, including one for the Kuyasa Low-Cost Housing Project in Khayelitsha, Cape Town, the first CDM project in Africa.[42] This project includes the construction of energy-efficient houses.

A Carbon Tax on Businesses

One of the South African government's most ambitious proposals for dealing with climate change is considering the passage of a carbon tax on carbon dioxide-emitting industries.[43] The policy, which some consider "the point at which the government began steering the economy along a more sustainable growth path,"[44] imposes a 2 Rand cents per kilowatt-hour tax on non-renewable electricity sources. [45] Of South African's many proposals on the table for cutting GHG emissions, a carbon tax could have the most significant impact.[46] The carbon tax proposal also includes stringent energy efficiency measures and would begin at 100 Rand per ton on carbon dioxide equivalent and increase to 250 Rand per ton by 2020.[47] At the time of writing, the South African cabinet has endorsed the plan but it has not achieved final parliamentary approval. Nevertheless, financial officials have begun discussing an effective implementation framework.[48]

Integrating Energy Policy and Sustainable Development

Although the 1998 White Paper does not specifically refer to sustainable development goals or objectives, it does contain a number of provisions that refer to environmental, social, and economic aspects of energy. For instance, it states that:

> Fossil fuels such as coal, uranium, liquid fuels, biomass and gas continue to play a central role in the socio-economic development of our country, while simultaneously providing the necessary infrastructural economic base for the country to become an attractive host for foreign investments in the energy sector . . . energy policy should balance the use of natural energy resources with environmental considerations.[49]

It is in this regard that the government published the White Paper on Renewable Energy in 2003 ("2003 White Paper")[50] and established a long-term goal to build an energy industry that will offer a fully non-subsidized alternative to fossil fuels.[51] This policy approach has been concretized through significant financial support for renewable energy research and development.[52]

A key challenge in the reform agenda is to make sure that the public benefits of sustainable development are advanced. The electricity industry can make a difference in the arena of sustainable development through underpinning sustainable economic growth, promoting social equity, and adopting more environmentally-friendly technologies. The goal is an electricity industry that delivers secure, low-cost supplies that support industrial competitiveness; provides widened access to affordable services; and encourages energy efficiency, increased use of renewable energy technologies, and reduced emissions generally. These goals are now embedded in the on-going reform processes and the government has started implementing crucial policies that ensure reduction in emissions activities.[53]

Energy Efficiency and Renewable Energy

In South Africa, energy efficiency was not really an issue until recently; however, the situation has now changed. Stakeholders are now aware of the need to consume energy differently. The CDM has mobilized several industrial players and sensitized them on the need to modernize energy equipment. South Africa has designed a Renewable Energy Strategy which sets a target of 10,000 GWh of renewable energies by 2013 (this would amount to four percent of production in 2004). In addition, an energy-saving framework by the Department of Minerals and Energy has set its goal to save fifteen percent by 2015. Energy efficiency and renewable energies are the focus of the framework, a first for Africa that may serve as a model for other countries.[54]

The government has started implementing policies on energy efficiency, which is assuredly the most effective and eco-

The government has started implementing policies on energy efficiency, which is assuredly the most effective and economically advantageous means of reducing carbon dioxide emissions and other pollutants from energy production.

nomically advantageous means of reducing carbon dioxide emissions and other pollutants from energy production. Efficiency measures have also drastically reduced the cost of electricity bills to industry and individuals. This is producing substantial economic benefits.[55]

In 2006, Environment Minister van Schalkwyk demonstrated the energy-efficiency conversion of his home, which consisted of the installation of "energy-efficient lighting, solar water heating, better insulation, and a range of other measures."[56] Minister van Schalkwyk stressed that although government action draws attention to these issues, individuals in South Africa must also take steps to save energy in their homes.[57] The Minister also stated that replacing one normal light bulb with a compact fluorescent bulb could result in savings of 18.50 South African Rands per year, as well as a total of 430 kilograms of coal and 1,100 liters of water.[58]

There has also been an aggressive approach towards promotion and production of environmentally friendly biodiesel and bioethanol fuels manufactured from crops such as canola, soya, sunflower, sugar beet, maize, sorghum, wheat, and sugarcane.[59] This will create new jobs, protect the country from volatile oil prices, and decrease damage to the environment.[60]

Training and Capacity Development

South African universities are beginning to focus on the specialized educational needs for climate research and CDM project implementation.[61] Furthermore, National Research Foundation funds research on climate change.[62] The government is currently investing in technology and upgrading existing institutions of research and education by promoting courses on engineering, science, agriculture, and forestry and also collaborating with various institutions in developed countries.[63] The government has also started creating awareness and sensitizing entrepreneurs and industrial sectors to embark on research into energy-efficient activities.[64]

Monitoring for Adaptation

South Africa has embarked on a program for Monitoring, Mapping and Analysis of Disaster Incidents known as MANDISA.[65] It is a core activity for the Disaster Mitigation for Sustainable Livelihoods Programme of the University of Cape Town.[66] MANDISA began as a pilot program from 1990 to 1999 in the Cape Town Metropolitan Area.[67] The program evaluates socio-economic and environmental risk factors that can affect the impacts of disasters and allows for tracking of the conditions that may cause disaster.[68] This requires cooperation between several agencies, "consultation and feedback, active sourcing of emergency and disaster information, strategic consolidation of information across agencies and robust geo-referencing."[69] The project also includes an online database which provides information for disaster management workers, educational institutions, and researchers.[70]

Non-Governmental Approaches

In addition to government policy, other major stakeholders are also taking action to combat climate change in South Africa. Two examples are discussed below.

Clinton Climate Initiatives

In 2008, the Clinton Climate Initiative ("CCI") committed funding and technical support to decrease energy consumption in Johannesburg.[71] This prompted the city to implement energy efficiency measures, including the Rea Vaya bus rapid transit system and the energy efficiency building retrofit program.[72] The initiative has also provided know-how, in the form of a technical director for project support, to assist with joint projects between the City of Johannesburg and CCI. Other initiatives include drives to reduce energy consumption in the city by promoting solar power and a project to convert methane gas generated by landfills into energy used for electricity.[73]

The Kuyasa Project

South Africa has successfully developed a low-cost housing project known as the Kuyasa project, the first of its kind in Africa and one of fewer than fifty in the world.[74] It was developed by SouthSouthNorth, an international CDM non-governmental organization, and Cape Town. The city has committed to use ten percent renewable energy sources by 2020, and have ten percent of households with solar water heaters by 2010.[75] It is in recognition of this achievement that Kuyasa was awarded gold standard recognition by the UNFCCC, allowing it to earn certified emission credits. The price of these credits is calculated according to the amount of carbon dioxide saved.[76] Some of the benefits of this project to South Africa are: retrofitted buildings are five percent warmer in winter and five percent cooler in summer, allowing a savings of up to forty percent on electricity bills;

the buildings reduce localized air pollution, helping prevent pulmonary pneumonia, carbon monoxide poisoning, and other respiratory illnesses which are major sources of health hazards to poor people; and more importantly, a decrease in the deadly fires common in high-density and low-income settlements. Apart from the individual benefits of the program, the projects stand to earn carbon credits equaling nine million tons of carbon a year, with a value of US$253 million to the South African economy. The projects have crediting periods lasting until at least 2015; some extend until 2026.[77]

Conclusion

The effects of climate change are no longer limited to predictions; temperatures are rising, icecaps and glaciers are melting, and extreme weather conditions are becoming more frequent and more intense.[78] Africa is both the continent most vulnerable to climate change as well as the one with the least capacity to adapt. For the developing continent, there exist multiple and concurrent stresses and development challenges, such as endemic poverty, governance and institutional dimensions, limited access to capital, ecosystem degradation, and complex disasters and conflicts. These are obstacles to reducing carbon dioxide emissions.

Realizing that economic growth, sustainable resource management, and climate change are closely connected, the executive and legislative arms of the government of South Africa have agreed on a progressive policy on climate change. This will ensure that the country reduces emissions to become a "low carbon" economy while also helping to limit the effects of global warming. South Africa should serve as an example to the other nations of Africa as the developing continent becomes a stronger and more effective player in the fight against global climate change.

Endnotes: Climate Change, Energy, and Sustainable Development in South Africa

[1] *See generally* African Workshop on Adaptation, Accra, Ghana, Sept. 21–23, 2006, *Background Paper on Impacts, vulnerability and adaptation to climate change in Africa*, *available at* http://unfccc.int/adaptation/adverse_effects_and_response_measures_art_48/items/3743.php (follow link to title) (last visited Feb. 2, 2009).

[2] Scott Johnson, *World News*, Sustainable Dev. L. & Pol'y, Winter 2007, at 71.

[3] UN News Center, *New Climate Change Alliance Will Benefit Millions of World's Poor – UN Agency* (Nov. 7, 2007), *available at* http://www.un.org/apps/news/story.asp?NewsID=24579&Cr=climate&Cr1=change (last visited Feb. 2, 2009); Consultancy Africa Intelligence, *Evaluating the Challenge of Climate Change: Southern African Adaptation Measures*, *available at* http://www.consultancyafrica.com/africa-watch/newsletter/november-2008 (last visited Feb. 2, 2009).

[4] Ogunlade Davidson & Harald Winkler, South Africa's Energy Future: Visions, Driving Factors and Sustainable Development Indicators 12 (2003), *available at* http://developmentfirst.org/Studies/SouthAfricaCountryStudies.pdf (last visited Feb. 26, 2009).

[5] *See generally* Renatè Janse van Vuuren, *Alternative Energy for Africa: Enhancement of the UN Millennium Development Goals*, ScienceScope, June 2008, at 54-55, *available at* http://www.csir.co.za/enews/2008_july/pdfs/sciencescope.pdf (last visited Feb. 26, 2009).

[6] *See generally* Kyle W. Danish, *An Overview of the International Regime Addressing Climate Change*, Sustainable Dev. L. & Pol'y, Winter 2007, at 10.

[7] Nico Schrijver et al., International Law and sustainable Development: Principles and Practice 7 (2004).

[8] *See generally* Davidson & Winkler, *supra* note 4; Ogunlade Davidson et al., Climate Change, Sustainable Development and Energy: Future Perspectives for South Africa 5 (2002), *available at* http://www.oecd.org/dataoecd/22/14/1934698.pdf (last visited Feb. 2, 2009).

[9] This is what prompted the African leaders to make a pledge, through The New Partnership for Africa's Development (NEPAD), to eradicate poverty and put African countries on a path of sustainable growth and development. NEPAD, NEPAD in brief, http://www.nepad.org/2005/files/inbrief.php (last visited Feb. 2, 2009).

[10] *See generally* van Vuuren, *supra* note 5.

[11] *Id*.

[12] Martin Ågerup et al., Int'l policy Network, Climate change and sustainable development, A blueprint from the Sustainable Development Network 3 (2004), *available at* http://www.policynetwork.net/uploaded/pdf/cc_sd_final.pdf (last visited Feb. 2, 2009).

[13] Günther Fischer et al., Int'l Inst. for Applied Systems Analysis, Climate Change and Agricultural Vulnerability 2-13 (2002), *available at* http://www.iiasa.ac.at/Research/LUC/JB-Report.pdf (last visited Feb. 2, 2009).

[14] Michael K. Lee, *The Day After Tomorrow Scenario: What if Global Warming Causes Rapid Climate Change?*, Sustainable Dev. L. & Pol'y, Winter 2007, at 39.

[15] Particularly, the lack of effective adaptation to the adverse effects of climate change can jeopardize the achievement of goal 1 (eradicating extreme poverty and hunger), goal 6 (combating HIV/AIDS, malaria and other diseases), and goal 7 (ensuring environmental sustainability). United Nations Framework Convention on Climate Change, *Climate Change: Impacts, Vulnerabilities and Adaptation in Developing Countries* at 42-43, *available at* http://unfccc.int/resource/docs/publications/impacts.pdf (last visited Feb. 15, 2009).

[16] UN News Center, *supra* note 3.

[17] Davidson & Winkler, *supra* note 4, at ii.

[18] *Id*.

[19] *Id*.

[20] Davidson et al., *supra* note 8, at 5.

[21] *See generally* Intergovernmental Panel on Climate Change, Climate Change 2007: Synthesis Report, *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf (last visited Feb. 26, 2009).

[22] Davidson et al., *supra* note 8, at 5.

[23] Trade Knowledge Network, Sustainable Development: The Case of Energy in South Africa 5 (Rashad Cassim & Wendy Jackson, eds. 2003).

[24] *See generally* South Africa Department of Minerals and Energy, White Paper on the Energy Policy of the Republic of South Africa (1998), *available at* http://www.info.gov.za/whitepapers/1998/energywp98.htm (last visited Feb. 4, 2009).

[25] *Id*.

Endnotes: Climate Change, Energy, and Sustainable Development in South Africa *continued on page 74*

[26] *Compare* S. AFR CONST. 1996, § 24, *with* South Africa Department of Minerals and Energy, *supra* note 24.

[27] DAVIDSON ET AL., *supra* note 8, at 7-8

[28] *Id*. at 8.

[29] *Id*. at 11.

[30] *Id*. at 19.

[31] *Id*.

[32] *Id*.

[33] United Nations Framework Convention on Climate Change, May 9, 1982, 1771 U.N.T.S. 107, 165; S. Treaty Doc No. 102-38 (1992); U.N. Doc. A/AC.237/18 (Part II)/Add.1; 31 I.L.M. 849 (1992).

[34] Kyoto Protocol to the United Nations Framework Convention on Coimate Change art. 12(1)(a), Dec. 10, 1997, U.N. Doc FCCC/CP/1997/7/Add.1, 37 I.L.M. 22 (1998).

[35] Debbie Sparks, *Energy and the Environment*, *in* ENERGY POLICIES FOR SUSTAINABLE DEVELOPMENT IN SOUTH AFRICA: OPTIONS FOR THE FUTURE 88, 101 (Harald Winkler ed., 2006), *available at* http://www.iaea.org/OurWork/ST/NE/Pess/assets/South_Africa_Report_May06.pdf (last visited Feb. 26, 2009).

[36] Shaun Benton, *SA adopts 'bold' climate change policy*, SOUTHAFRICA.INFO, July 30, 2008, http://www.southafrica.info/about/sustainable/climate-300708.htm (last visited Feb. 4, 2009).

[37] *Id.*

[38] *See generally* Tim De Wet, *South Africa: Improved Environmental Law Enforcement – The Era of the Environmental Law Bounty-Hunter?*, MONDAQ, Oct. 20, 2005, *available at* http://www.mondaq.com/article.asp?articleid=35600 (last visited Jan 26, 2009).

[39] SouthAfrica.info, *SA gets tough on air pollution*, SOUTHAFRICA.INFO, June 27, 2005, http://www.southafrica.info/about/sustainable/air-pollution-2106005.htm (last visited Feb. 26, 2009).

[40] Themba Gadebe, *Climate Change Body Launched,* SOUTHAFRICA.INFO, Oct. 20, 2005, http://www.southafrica.info/ess_info/sa_glance/sustainable/update/climate2010.htm.

[41] *See* Department of Minerals and Energy: Designated National Authority, *available at* http://www.dme.gov.za/dna/index.stm (last visited Feb. 15, 2009); *see also* Gadebe, *supra* note 40.

[42] *See* Gadebe, *supra* note 40.

[43] Sibongile Khumalo, *Climate change proposal includes carbon tax*, IOL NEWS FOR SOUTH AFRICA, http://www.iol.co.za/index.php?set_id=1&click_id=13&art_id=nw20080803082221974C18277.

[44] Ingi Salgado, *SA's First Carbon Tax Sets Precedent*, BUSINESS REPORT, http://www.busrep.co.za/index.php?fSectionId=563&fArticleId=4265871.

[45] *Id.*

[46] Posting of Ingi Salgado to Environment News and Forums of South Africa, http://www.environment.co.za/topic.asp?TOPIC_ID=1999 (May 26, 2008).

[47] Sanchia Temkin, *South Africa: Deloitte Warns on Carbon Tax*, BUSINESS-DAY, Jan. 19, 2009, http://allafrica.com/stories/200901190024.html.

[48] *See* Khumalo, *supra* note 43.

[49] South Africa Department of Minerals and Energy, White Paper on the Energy Policy of the Republic of South Africa (Dec. 1998), http://www.info.gov.za/whitepapers/1998/energywp98.htm (last visited Feb. 4, 2009).

[50] South Africa Department of Minerals and Energy, White Paper on Renewable Energy (Nov. 2003), http://www.dme.gov.za/pdfs/energy/renewable/white_paper_renewable_energy.pdf (last visited Feb. 4, 2009).

[51] *Id*.

[52] TRADE KNOWLEDGE NETWORK, *supra* note 23, at 10.

[53] *Id*. at 19.

[54] Agence Française de Développement, AFD and Combating Climate Change, http://www.afd.fr/jahia/Jahia/site/proparco/lang/en/pid/3976 (last visited Feb. 18, 2009).

[55] *See* RICHARD L. OTTINGER, GLOBAL CLIMATE CHANGE KYOTO PROTOCOL IMPLEMENTATION: LEGAL FRAMEWORKS FOR IMPLEMENTING CLEAN ENERGY SOLUTIONS PACE LAW FACULTY PUBLICATIONS 24 (2000). *See also* DAVIDSON & WINKLER, *supra* note 4, at 31.

[56] SouthAfrica.info, *Fighting Climate Change at Home*, SOUTHAFRICA.INFO. Feb. 14, 2006, http://www.southafrica.info/services/consumer/kyoto-140206.htm (last visited Feb. 4, 2009).

[57] *Id.*

[58] *Id*.

[59] Lucky Khumalo, *Biofuels to Power Eastern Cape*, SOUTHAFRICA.INFO, March 9, 2007, http://www.southafrica.info/business/investing/opportunities/biofuels-080307.htm (last visited Feb. 7, 2009).

[60] Shaun Benton, *South Africa goes for green fuels*, SOUTHAFRICA.INFO, Feb. 13, 2006, *available at* http://www.southafrica.info/about/sustainable/biofuel-13130206.htm (last visited Feb. 7, 2009).

[61] BALGIS OSMAN ELASHA ET AL., BACKGROUND PAPER ON IMPACTS, VULNERABILITY AND ADAPTATION TO CLIMATE CHANGE IN AFRICA, Prepared for the African Workshop on Adaptation Implementation of Decision 1/CP.10 of the UNFCCC Convention, Accra, Ghana, Sept. 21–23, 2006, at 14.

[62] *Id.* at 15.

[63] *See* South African Government Information, Science and Technology, http://www.info.gov.za/aboutsa/science.htm (last visited Feb. 26, 2009).

[64] South Africa.info, Government, business join climate change, SOUTH AFRICA.INFO, Oct. 18, 2005, http://www.southafrica.info/ess_info/sa_glance/sustainable/update/climate1810.htm.

[65] EM-DAT: Emergency Events Database, http://www.emdat.be/Activities/other_data_subnational.html (last visited Feb. 16, 2009).

[66] Disaster Mitigation for Sustainable Livelihoods Programme, http://www.egs.uct.ac.za/dimp/ (last visited Feb. 16, 2009).

[67] UNITED NATIONS DEVELOPMENT PROGRAM BUREAU FOR CRISIS PREVENTION AND RECOVERY, REDUCING DISASTER RISK: A CHALLENGE FOR DEVELOPMENT at 43, *available at* http://www.undp.org/cpr/whats_new/rdr_english.pdf (last visited Feb. 16, 2009).

[68] *Id*.

[69] *Id*.

[70] *Id*.

[71] *See* Combating Climate Change: Clinton Climate Initiative, http://www.clintonfoundation.org/what-we-do/clinton-climate-initiative/what-we-ve-accomplished (last visited Feb. 15, 2009); *see also* Emily Visser, *Joburg, Clinton climate initiatives,* SOUTHAFRICA.INFO, Jan. 4, 2008, *available at* http://www.southafrica.info/about/sustainable/clintonclimateinitiative.htm (last visited Feb. 7, 2009).

[72] Visser, *supra* note 71.

[73] *Id*.

[74] Kuyasa Low Income Urban Housing Energy Upgrade Project, ICLEI, http://www.iclei-europe.org/index.php?id=kuyasa (last visited Feb. 15, 2009); *see also* Mary Alexander, *From Kyoto to Khayelitsha*, SOUTHAFRICA.INFO, Feb. 22, 2005, http://www.southafrica.info/about/sustainable/kuyasa-121205.htm (last visited Feb. 7, 2009).

[75] Alexander, *supra* note 74.

[76] *Id.*

[77] *Id.*

[78] *See generally* CONSULTANCY AFRICA INTELLIGENCE, EVALUATING THE CHALLENGE OF CLIMATE CHANGE: SOUTHERN AFRICAN ADAPTATION MEASURES, *available at* http://www.consultancyafrica.com/africa-watch/newsletter/november-2008 (last visited Jan. 26, 2009).