“On carbon tax and emissions reduction through investments in renewable energy in South Africa”

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On carbon tax and emissions reduction through investments in renewable energy in South Africa

Abstract

The implementation of a carbon-tax policy comes with the burden for manufacturers to invest in renewable energy initiatives to reduce carbon emissions. Conversely, the objective of creating adequate return on investment by organizations and carbon emissions reduction are in fundamental conflict, thus placing the expectation of a carbon tax policy to spur investments in renewable energy under threat. This paper seeks to discuss current carbon emissions reduction practices in South Africa through renewable energy-related lens to understand the motivation for organizations to invest in renewable energy technologies; and then goes on to illustrate the essence of the problem of a forced carbon emissions reduction through the reporting of a new analysis of data from secondary sources. The paper works from the premise that (a) the implementation of a carbon tax policy is typically based on the implicit assumptions that it will promote investments among industrial concerns in renewable energy; and (b) that the implementation of a carbon tax to reduce carbon emissions is in fundamental conflict with firms' objective of return on investment. The paper suggests that achieving low-carbon industrialization requires that the government establishes a secure long-term investment that will increase the scale of production and installation of low-carbon technologies and infrastructural developments. The paper concludes that, for investments in cleaner energy technologies to be successful, such emissions' reduction should contribute significantly to reducing total global emissions and, in relation to investing organizations, to generate adequate return to shareholders.

Keywords: carbon tax, renewable energy, emissions reduction, South Africa.
JEL Classification: H23, Q48, Q49.

Introduction

As energy-related carbon dioxide (CO_2) emissions are produced through combustion of liquid fuels, natural gas, and coal which represented much of the world's anthropogenic GHG emissions; world energy-related CO_2 emissions are predicted to increase from 31.2 billion metric tons in 2010 to 36.4 billion metric tons in 2020 and 45.5 billion metric tons in 2040 (USEIA, 2013). Whereas the International Energy Agency (IEA) (2009) contends that transportation accounts for nearly one-quarter of global energy-related CO_2 emissions, growth in carbon emissions has been attributed to developing non-OECD nations that continue to rely heavily on fossil fuels to meet fast-paced growth in energy demand. Besides, the IEA (2009) reckons that non-OECD $C0_2$ emissions will reach 31.6 billion metric tons in 2040 or 69% of the world's total. Hence, energy consumption is an important component of the global climate change debate and needs to be addressed urgently.

At any rate, South Africa's response to climate change as a non-OECD nation has two major objectives. The first is to effectively manage the inevitable climate change impacts to sustain social, environmental and economic responsibilities, and the performance of corporate entities and households through the development of interventions in renewable energy technology capacity building (DoE, 2011). The second objective is to contribute toward reduction in global greenhouse gas (GHG) emissions through sustainable business and individual consumption practices (DoE, 2011). To achieve these objectives, the South African government proposed the use of carbon taxation as an economic instrument to mitigate the effect of carbon emissions. Despite the evidence from literature that the experiences of countries that have implemented a carbon tax policy show little or no effect on reducing carbon emissions (Fakoya, 2013), the South African government will commence with the implementation of a carbon tax policy as from January 2016 (DoE, 2011). The concern in this paper, however, is the likely effect of a carbon tax to promote and stimulate investments in renewable energy technologies by organizations in an economy like that of South Africa which is currently experiencing declining economic growth.

While it is necessary to understand the appropriate environmental objective of a carbon tax, it is more important to understand how a carbon tax in South Africa could stimulate industries to invest in renewable energy so as to reduce the effect of global carbon emissions. Incidentally, the primary objective of a carbon tax is to impose a price on emissions as a way to ensure that industries account for damages and effects expected from their actions on human health, food production, coastal inundation, and corporate induced climate change (Elkins & Baker, 2001). Consequently, a carbon tax is designed to discourage high carbon emissions in industrial and households activities so as to promote efficient car-

bon reductions throughout the economy. In South Africa, a uniform carbon price of $12 or R120 per ton of CO_2 emissions has been proposed, and this is regardless of the emissions' source; as in whether from electricity production or fuel consumption from transportation (The Carbon Report, 2013).

Since a carbon tax would likely lead to higher prices of goods and services for carbon-intensive organizations, developing and investing in innovative and efficient renewable energy and carbon sequestration or other technologies is considered a potentially rewarding venture in the longterm (Nassiry & Wheeler, 2011). This may lead to increased spending cost on research and development for cleaner energy by these organizations (Wiesenthal et al., 2012). In addition, further financing of cleaner energy technologies by developing countries could be sourced from the carbon tax revenue fund (Robson, 2014). This paper therefore works from the premise that (a) the implementation of a carbon tax is typically based on the implicit assumptions that it will promote investments among industrial concerns in renewable energy technologies; and (b) that the implementation of a carbon tax to reduce carbon emissions is in fundamental conflict with the firm's objective of return on investment. If this is so, then implementing a carbon tax policy in South Africa with a declining gross domestic product (GDP) may be contributing to inappropriate carbon reduction practices by organizations rather than promote investments in renewable energy technologies for a safe environment. While this study does not justify that climate change mitigation should entirely be based on cost-benefit analysis, a careful analysis of the longterm uncertainty of societal and ecological costs associated with unsustainable and inappropriate carbon reduction practices to mitigate climate change need to be performed. The paper therefore seeks to provide a review of current carbon emissions reduction practices in South Africa through renewable energy-related lens to understand what could motivate organizations to invest in renewable energy technologies and to anticipate the likely fallout of a forced carbon emissions reduction. This is illustrated through the reporting of a new analysis of data from the South Africa Department of Energy.

1. Carbon tax as an economic instrument

Carbon tax is considered an appropriate fiscal policy instrument to offset the negative effects of climate change (Callan et al., 2009). In contrast to other policy instruments, carbon tax has the advantage to generate tax revenue to cancel out undesired side-effect of greenhouse gas (GHG) emissions reduction (McKibbin & Wilcoxen, 2009). Conversely, Nordhaus (2009) argues that carbon taxes have a disadvantage in that they do not steer the world economy toward a particular climate change target such as limiting global carbon dioxide (CO_2) emissions. Although Callan et al. (2009) consider a carbon tax as regressive, they argue that a well-developed tax and benefit systems could be remedied if the tax revenue is used to increase social benefits and tax credits. Whereas an increase in social benefits and providing tax credit need to relate to carbon-reduction efforts, Geng et al. (2010) point out that, in order to respond to climate change, carbon-reduction efforts should link to renewable energy activities.

1.1. Carbon tax and the development of renewable energy investments. When carbon tax is used to finance GHG mitigation activities such as improvement of energy efficiency, the resultant environmental impacts are stronger as compared to its use for other purposes (Jaffe et al., 2005). Although there are other financing mechanisms such as importation of energy efficient equipment, trade financing through export credit agencies and leasing; private sector financing that cuts across several mechanism is considered as a major source efficient energy financing in developing economies (Painuly et al., 2003). One major challenge in developing economies efficient energy policies however, is mainstreaming its financing mechanism (Sarkar & Singh, 2010). While the longterm energy security and environmental sustainability challenge of an efficient energy policy in developing economies can be met through the deployment of efficient and less expensive cleaner and cheaper energy technologies sources, public policies that promote responsible and sustainable energy efficiency should clearly define the respective roles of government and business, as well as support for private initiatives (Kaygusuz, 2012).

Incidentally, industrial energy efficiency is a multifaceted issue entailing technical, economic and organizational challenges (Chai & Yeo, 2012). But investment in energy efficiency projects by organizations requires the determination of the level of operational barriers and transparency including better working methods for energy efficiency investment decisions. Consequently, organizations may need to calculate the payback period when determining their investments in energy efficiency projects (Bunse et al., 2011).

1.2. Carbon reduction practices and investments in renewable energy technologies. The challenges of energy efficiency and environmental problems seem intractable as the issue of carbon emissions reduction uncertainties weigh heavily on both policy

makers and emitters alike. But to think that investment in cleaner technologies can just change the curse of environmental degradation by organizations requires further analysis. Such analysis may include the determination of the cost of investing in cleaner technologies as well as estimates of the future realizable benefits. However, most innovation and diffusion of new technology are characterized by market failures due to incomplete information (Jaffe et al., 2005). In other words, attempting to raise investment capital for renewable energy technologies with incomplete investment analysis information may prompt investors to become sceptical about promised returns that are characterized by uncertainty (Jaffe et al., 2005).

1.3. Carbon reduction and return on investment. The development of clean technologies promises substantial reduction in emissions (Brathwaite et al., 2010) because corporate investment in renewable energy technologies can lead to reduced profits, competitive disadvantages, lower stock values, and decreased firm values (Ziegler et al., 2009). Additionally, the stimulation to invest in carbon reduction technologies by organizations depends on whether they believe government commitments can be taken seriously since reducing carbon emissions is likely to require significant irreversible investment from organizations (Helm et al., 2003). More importantly, when organizations are convinced they could recoup their investments in research and development (R&D) through profitable returns, they may be willing to internalize their externalities (Fischer, 2008).

2. Methods

The method adopted in this study is a review of current carbon emissions reduction practices in South Africa through renewable energy-related lens and an illustration of the implication of a forced carbon emissions reduction in South Africa. The paper reports on a new analysis of data from secondary sources to provide an understanding and implications of attempts to reduce the level of carbon emissions in the country. The study adopts a documentary content analysis approach using relevant data from the South Africa's Department of Energy, Renewable Energy Independent Power Procurement Program and the United Nations Renewables 2013 Global Status Report as well as UNEP Collaborating Centre for Climate and Sustainable Energy Finance. The study favors the use of deductive qualitative content analysis as a method of examination of data material because it helps provide answers to the questions of what and how associated with a particular research problem. In addition, descriptive research is used to obtain information concerning the current status of the phenomena and to describe what exists with respect to variables or conditions in a situation, although, it cannot conclusively ascertain answers to why. But it can yield rich data that lead to important recommendations. This study discusses current implications of overreliance on fossil based energy and progress on renewable energy investment in South Africa. These data were analyzed using qualitative explanatory approach. It was unnecessary to adopt a statistical analysis since the data obtained from above-mentioned sources had been subjected to various statistical analyses. Consequently, relying on such secondary data allows inference to be made from which conclusions are drawn.

3. Discussions

Although renewable energy is considered a key feature of a sustainable economy, South Africa is at a crossroad in its energy development policy (WWF South Africa, 2014). South Africa is likely to encounter critical challenges in its future energy choice because its economy was founded upon and maintained by the burning of fossil fuels (WWF South Africa, 2010). Incidentally, South African industrialization is fundamentally based on the burning of fossil fuels that has resulted in the increased carbon emissions which may likely trigger ecological constraints and ecological catastrophe. As a consequence, the South African government proposed a carbon tax to tax the burning of fossil fuel emission by industries in proportion to their carbon content so as to reduce carbon emission and slow down global warming. But significant evidence from literature reveals that organizations are conscious to invest in renewable energy technologies for fear of losing their investments due to lack of conviction in government-driven carbon reduction policy. In this case, those organizations delaying their environmental investments in carbon reduction technology investments can take better advantage of their carbon emissions reduction once they are convinced there is an established rate of improvement by those who had already invested in similar projects. On a positive note, carbon reduction pressures on organizations may likely have them commit higher costs to research and development initiatives to avoid future carbon tax that moderately reduce owners' wealth in the short-term. Meanwhile, part of the reason for lower carbon reduction investment, especially in developing economies is the level of government commitment and seriousness to reversing the continued emission through policies that will ensure a balance of mutual benefit between organizations as emitters and the society as the victim of emissions. However, the pricing of carbon emissions may be a motivation for organizations to invest in clean production technologies to take advantage of promised government incentives for implementing carbon reduction projects.

On the other hand, the South Africa government has been very active in promoting investments in renewable energy through its Department of Energy's Renewable Energy Independent Power Procurement Program. In the past year, at least 250 wind turbines have been under construction in South Africa, with a target to generate 1850 MW of wind energy by 2030. Whilst Africa is considered a relatively minor investor in global renewable energy; with the continent's investment accounting for less than 1% of global total investment in 2009, progress is evident in the United Nations Renewables 2013 Global Status Report whereby South Africa's investment in renewable energy is reported to equal US$5.7 billion. In 2012, South Africa's investment in wind farms totalled US$1.5 billion and US$4.2 billion is invested on solar projects (UNEP Collaborating Centre for Climate & Sustainable Energy Finance, 2013). According to (DoE, 2014), South Africa presently has a projected renewable energy target of about 10 000 GWh, with 3 725 MW to be generated between the years 2010-2030.

While South Africa is determined to be in the forefront of honouring its commitment to reducing carbon emissions in line with global agreements and standard, the introduction of carbon tax may not be appropriate at this time since the country contributes about 2% to global emissions (IEA, 2009). More importantly, the extent and impact of South Africa's carbon emissions reduction to global emissions reduction will be limited. At any rate, since South Africa has one of the lowest ratios of carbon consumed to carbon produced by any of the developed countries, and considering that about 30% of its population depends on government grants for basic household need – which includes electricity cost (Fakoya, 2013), a carbon tax at this time will further exacerbate poverty among poor rural dwellers. In the same way, seeing that the electricity sector in South Africa contributes about 48% of its carbon emissions because of its heavy reliance on fossil fuels, a carbon tax will severely affect poor rural households in the absence of an effective measure in place to rechanneling carbon tax revenue to palliate the impact in view of the fact that corruption is a hydra that needs to be curtailed. Furthermore, a carbon tax may have a negative impact on South Africa's economic growth, and subsequently employment generation, because of its effect on export prices and severe impact on the competitiveness of both the mining and manufacturing sectors. Moreover, South Africa's investment undertakings in renewable energy is dependent on financial and technological support from developed countries and, without a binding commitment from these countries, that may expose its carbon tax adjusted export prices to international competitiveness with significant implications on its current account balances.

The guarantee of a stable low-carbon investment environment is necessary to ensure the commitments of organizations with the assurance that their longterm investment and current short-term price regime are capable of achieving economies of scale, which is repaid with longterm returns to investors from projected cost savings from the project. Therefore, for the private sector to commit funds to low-carbon investments, governments should create a stable longterm investment atmosphere that fosters a secure market for both industries and their investors.

Conclusion

Admittedly, investments in renewable energy require a great deal of financial commitments which may not be attainable by individual organizations. Furthermore, achieving low-carbon industrialization requires that the government establishes a secure longterm investment that will increase the scale of production and installation of low-carbon technologies and infrastructural developments. Moreover, the guarantee that many of these investments will be eventually commercially viable in their own right is the reason organizations that are financially competent to commit huge sums to renewable energy investment are taken it slowly to see those that had invested receive return on the investments. At any rate, for investments in cleaner energy technologies to be successful, such emissions reduction should contribute significantly to reducing total global emissions and, in relation to investing organizations, to generate adequate return to shareholders. In contrast, the imposition of a carbon tax to reduce carbon emissions can lead to increased emissions in another country or carbon leakage, where there is no imposition of a carbon tax when 'organizations seek to avoid costs of investing in renewable energy technologies'. This situation happens for a variety of other reasons, such as to avoid tax; and because a reduction in South Africa's demand for fossil fuel may possibly result in lower prices for fossil fuels, thereby making fossil fuels more attractive in unregulated or non-carbon taxed countries. Further studies are required to assess the effect of a carbon tax on investments in renewable energy beyond its implementation in 2016.

References

1. Brathwaite, J., Horst, S. & Iacobucci, J. (2010). Maximizing efficiency in the transition to a coal-based economy, *Energy Policy*, 38 (10), pp. 6084-6091.
2. Bunse, K., Vodicka, M., Schönsleben, P., Brülhart, M. & Ernst, F.O. (2011). Integrating energy efficiency performance in production management gap analysis between industrial needs and scientific literature, *Journal of Cleaner Production*, 19 (6), pp. 667-679.

3. Callan, T., Lyons, S., Scott, S., Tol, R.S. & Verde, S. (2009). The distributional implications of a carbon tax in Ireland, *Energy Policy*, 37 (2), pp. 407-412.
4. Chai, K. & Yeo, C. (2012). Overcoming energy efficiency barriers through systems approach — a conceptual framework, *Energy Policy*, 46, pp. 460-472.
5. DoE Department of Energy South Africa (2014). *Renewable Energy Independent Power Producer Procurement Programme*, http://www.ipprenewables.co.za/. (Accessed May 14, 2014).
6. DoE Department of Energy South Africa (2011). South African Energy Price Report, http://www.energy.gov.za/files/media/explained/2011EnergyPrice%20Report_new.pdf (Accessed September 28, 2013).
7. Elkins, P. & Baker, T. (2001). Carbon taxes and carbon emissions trading, *Journal of Economic Surveys*, 15 (3), pp. 325-376.
8. Fakoya, M.B. (2013). Proposed carbon tax policy in South Africa: learning from the experience of other countries and effect on consumer price index, *Environmental Economics*, 4 (4), pp. 65-74.
9. Fischer, C. (2008). Emissions pricing, spillovers, and public investment in environmentally friendly technologies, *Energy Economics ,* 30(2), pp. 487-502.
10. Geng, Y., Xinbei, W., Qinghua, Z. & Hengxin, Z. (2010). Regional initiatives on promoting cleaner production in China: a case of Liaoning. *Journal of Cleaner Production*, 18 (15), pp. 1502-1508.
11. Helm, D., Hepburn, C. & Mash, R. (2003). Credible carbon policy, *Oxford Review of Economic Policy*, 19 (3), pp. 438-450.
12. IEA International Energy Agency (2009). Transport, Energy and CO_2: Moving toward Sustainability, http://www.iea.org/publications/freepublications/publication/name,3838,en.html, (Accessed September 20, 2013).
13. Jaffe, A., Newell, R. & Stavins, R. (2005). A tale of two market failures: Technology and environmental policy, *Ecological Economics*, 54 (2), pp. 164-174.
14. Kaygusuz, K. (2012). Energy for sustainable development: A case of developing countries, *Renewable and Sustainable Energy Reviews*, 16 (2), pp. 1116-1126.
15. McKibbin, W. & Wilcoxen, P. (2009). *The economic and environmental effects of border tax adjustments for climate policy*, Brookings Institution Press, pp. 1-34.
16. Nassiry, D. & Wheeler, D. (2011). A green venture fund to finance clean technology for developing countries, *Center for Global Development Working Paper*, p. 245.
17. Nordhaus, W. (2009). *Economic issues in a designing a global agreement on global warming*, Copenhagen, Denmark, pp. 10-12.
18. Painuly, J., Park, H., Lee, M. & Noh, J. (2003). Promoting energy efficiency financing and ESCOs in developing countries: mechanisms and barriers, *Journal of Cleaner Production*, 11 (6), pp. 659-665.
19. Robson, A. (2014). Australia's Carbon Tax: An Economic Evaluation, *Economic Affairs*, 34 (1), pp. 35-45.
20. Sarkar, A. & Singh, J. (2010). Financing energy efficiency in developing countries – lessons learned and remaining challenges, *Energy Policy*, 38 (10), pp. 5560-5571.
21. The Carbon Report (2013). The proposed South African carbon tax, http://www.thecarbonreport.co.za/the-proposed-south-african-carbon-tax/. (Accessed September 21, 2013).
22. UNEP Collaborating Centre for Climate & Sustainable Energy Finance (2013). Global Trends in Renewable Energy Investment 2013, www.unep.org/pdf/GTR-UNEP-FS-BNEF2.pdf. (Accessed May 14, 2014).
23. USEIA US Energy Information Administration (2013). Energy-related carbon dioxide emissions, http://www.eia.gov/forecasts/ieo/emissions.cfm. (Accessed September 20, 2013).
24. Wiesenthal, T., Leduc, G., Haegeman, K. & Schwarz, H. (2012). Bottom-up estimation of industrial and public R&D investment by technology in support of policy-making: The case of selected low-carbon energy technologies, *Research Policy*, 41 (1), pp. 116-131.
25. WWF South Africa (2010). 50% by 2030: Renewable energy in a just transition to sustainable electricity supply, http://awsassets.wwf.org.za/downloads/50__by_2030___renewable_energy_in_a_just_transition_to_sustainable_electricity_supply_.pdf. (Accessed May 14, 2014).
26. WWF South Africa (2014). *Renewable Energy*, http://www.wwf.org.za/what_we_do/climate_change/dealing_with_climate_change/change_energy_system/renewable_energy/. (Accessed May 14, 2014).
27. Ziegler, A., Busch, T. & Hoffmann, V. (2009). *Corporate Responses to Climate Change and Financial Performance: The Impact of Climate Policy*, Zurich: CER-ETH-Center of Economic Research.