BACKGROUND PAPER ON CLIMATE CHANGE IN SOUTH AFRICA AND THE PROPOSED MEASURES TO PROMOTE ENVIRONMENTAL SUSTAINABILITY

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Abbreviations

Greenhouse Gas (GHG)

Global Environmental Facility (GEF)

Independent Power Producers (IPPs)

Integrated Resource Plan (IRP)

Liquefied Natural Gas (LNG)

National Development Plan (NDP)

National Environmental Management Act (NEMA)

National Strategy for Sustainable Development and Action Plan (NSSD 1)

National Energy Regulator of South Africa (NERSA)

Power Purchase Agreements (PPAs)

Renewable Energy Independent Power Producers Procurement Programme (REIP4)

Renewable Energy Subsidiary Office (REFSO)

Renewable Energy Feed in Tariffs (REFIT)

United Nations Framework Convention on Climate Change (UNFCCC)

1. Introduction and Background

On the 17th of October 2014, President Zuma emphasized the importance of active citizenship in the fight against climate change to save our world for future generations.[1] The central objectives for climate change relate to sustainable development and enabling an environment where corporations have the space to develop innovative technologies for environmental friendly energy solutions particularly in terms of promoting socio-economic development in a developing country context with emphasis on the electricity sector, as well as the liquid fuels and gas sector.[2] Sustainable development affects areas necessary to ensure human development such as food security, health, water conservation, energy production and preservation of natural resources.[3] In developing countries like South Africa, protecting the vulnerable population who are sometimes dependent on natural resources is particularly important in ensuring that the effect of climate change does not make them more vulnerable and indeed through sustainable development, save our world for future generations.[4]

So far, South Africa's approach to climate change has been geared towards establishing the necessary governance frameworks in terms of establishing policies and frameworks that will facilitate the development of these initiatives. These include the 2003 White Paper on Renewable Energy; 2006 National Treasury Framework for Environmental Fiscal Reform; the 2007 Long Term Mitigation Strategy; the 2008 Department of Science and Technology Ten-Year Innovation Plan; the 2009 National Planning Commission Medium-Term Strategic Framework 2009–2014; the 2011 National Development Plan; the 2011 Department of Environmental Affairs National Climate Change Response; the 2011 Department of Environmental Affairs National Strategy for Sustainable Development; the 2012 Department of Trade and Industry Industrial Policy Plan; the Department of Energy's 2012

[1] The President specifically mentioned the importance of reducing carbon dioxide that leads to increasing global temperatures. http://www.news24.com/Green/News/Fight-climate-change-says-Jacob-Zuma-20141017 (accessed 23 October 2014).
[2] Department of Energy 'Integrated Energy Planning Report' Government Gazette 36690, July 2013, 57.
[3] Ibid.
[4] Department of Environmental Affairs 'National Strategy for Sustainable Development and Action Plan 2011–2014' 2011, 31.

Integrated Energy Resource plan; and 2013 Carbon Tax Policy Paper. An overview of these governance frameworks is necessary to understand the legislative and policy environment that addresses climate change in South Africa.

2. The Constitution

Section 24 of the South African Constitution provides that:

> Everyone has the right:
> (a) to an environment that is not harmful to their health or well-being; and
> (b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that -
>
> (i) prevent pollution and ecological degradation;
> (ii) promote conservation; and
> (iii) secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development.

The South African constitution recognises the importance of the changing nature of climate, the necessity to protect the environment in a way that we preserve it for future generations and ensure sustainable development as well as use of natural resources that promotes necessary social and economic development. These constitutional imperatives are at the core of the governance frameworks that have been developed to address climate change. While various frameworks existed before the National Development Plan (NDP), the NDP conceptualises the state's plan from a holistic perspective and ensures that any developmental objectives of the state to transition to a low-carbon and climate-resilient economy contributes to the objectives of overcoming poverty and inequality in South Africa.[5]

3. National Development Plan

There is recognition that the causes of climate change are a global problem requiring a global solution. South Africa's NDP therefore focuses on various core areas to grow South Africa's economy up to 2030. Chapter five of the NDP is dedicated to addressing South Africa's agenda for a low carbon and climate-resilient economy. The vision of this agenda is

[5] National Development Plan 2011.

to develop a low carbon economy through necessary adaptation[6] and mitigation[7] policy measures. The NDP recognises key strategies that the government could implement to reduce South Africa's Greenhouse Gas (GHG) emissions. These include an appropriate mix of pricing mechanisms, an expanded renewable energy programme, an effective mix of energy efficiency and demand management incentives, regulations to promote green buildings and construction practices, investment in an efficient public transport system, the extent to which energy intensity needs to be constrained, future energy sources, the impact of hybrid technologies, potential role of nuclear energy etc.[8] A carbon budget that sets the amount of carbon that can be emitted at a particular period is also proposed.

The NDP recognises that these solutions require rigorous, transparent processes with full stakeholder engagement and an investment in the development of skills and capacity to meet South Africa's commitments.[9] In addition, the NDP recognizes the necessity for a holistic approach where there is a mainstreaming of mitigation and adaptation activities across all government departments and at all levels.[10] Central to this is the collection of data, monitoring, reporting, and a process of verification which existing institutional arrangements have been unable to address. These are all discussed under the various

[6] Adaptation policies and measures include adequate support for the vulnerable; equitable disbursement of financial assistance; significant investments in new adaptive technologies and techniques in the water, biodiversity, fisheries, forestry and agricultural sectors; early warning systems for adverse weather, pest and disease occurrence; disaster relief preparedness, and significant investment in conserving, rehabilitating and restoring natural ecosystems to improve resilience. Gene banks should also be expanded to conserve critically endangered species that are increasingly vulnerable to climate change. See National Development Plan 2011, 180.

[7] South Africa's level of emissions will peak around 2025 and then stabilize. This transition will need to be achieved without hindering the country's pursuit of its socioeconomic objectives. This can be attained through adequate international financing and technological assistance, and a carefully aligned domestic policy and regulatory environment. Key contributors to stabilizing emissions include a commitment to undertake mitigation actions; an appropriate mix of carbon pricing mechanisms; policy instruments that support mitigation; an expanded renewable energy progamme; an advanced liquid and bio-fuels sector; an effective mix of energy efficiency and demand management incentives; proactive local government climate change programmes in areas such as waste management and street lighting; regulation to promote green building and construction practices; investments in an efficient public transport system; and a robust and transparent monitoring, reporting and verification system. Additional investments in research and development, manufacturing, training and marketing are also critical. See National Development Plan 2011, 180-181.

[8] Ibid.

[9] National Development Plan 2011, 180-181.

[10] Ibid.

policy frameworks below and form the core background and context of the Mandela Institute's proposed initiative in Climate Change, Energy and the Environment..

4. The Climate Change Policy

South Africa is ranked the 18th largest carbon dioxide emitter in the world,[11] per capita standards, based on the significance of fossil fuel energy intensive sectors to the Gross Domestic Product (GDP).[12] South Africa however recognises its vulnerability to climate change and significant importance has been placed on the climate change agenda. In 2011, a National Climate Change Response White Paper was developed. This White Paper details the government's vision for an effective climate change response and the transition to a climate-resilient and lower-carbon economy through renewable energies and a green economy.[13] The White Paper is founded on section 24 of the Constitution protecting the right to environment, the objectives of the National Environmental Management Act[14] (NEMA), the NDP and other international instruments such as the Millennium Declaration and the United Nations Framework Convention on Climate Change (UNFCCC).[15]

The proposed overarching activity to deal with climate change in the White Paper includes continued participation in the international climate change negotiations with a view to concluding an equitable, but ambitious climate change agreement for the post-2012 period.[16] The expected outcomes of this activity include decreasing GHG emissions with particular emphasis on the energy sector, which accounts for more than 70 percent of South Africa's emissions, reduction of dependency on fossil fuels and the enhancement of security of electricity supply, building resilience to climate change in communities and ensuring that ecosystem resilience is not disrupted.[17]

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[11] Hood Christina & Guelff Christopher 'Integrating Carbon Pricing with existing Energy Policies /; Issues for South Africa' Worshop Report OECD/International Energy Agency (IEA) (2013) 3.
[12] Nel Shaun, 'Transforming the Energy Supply Industry' in Antoine Francis (ed) Keeping the lights on' 64 The Journal of the Helen Suzman Foundation (2012)16.
[13] National Development Plan 2011, 180-181.
[14] 107 of 1998.
[15] National Strategy for Sustainable Development and Action Plan (NSSD 1) 2011–2014 2011, 31.
[16] Ibid.
[17] National Strategy for Sustainable Development and Action Plan (NSSD 1) 2011–2014' 2011, 31.

South Africa's climate change policy aims to,

> 'guide the transition to a climate-resilient, low-carbon economy which requires efforts to mitigate the effects of climate change; adapting processes, systems and approaches; building technology and capacity; mobilising financial resources; and developing an appropriate system for monitoring and evaluation.'[18]

These objectives are consistent with some of the commitments made by South Africa in international agreements.

The objective of the 1992 UNFCCC is to achieve stabilisation of the concentrations of GHG in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.[19] The UNFCCC defined climate change as 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.'[20] South Africa ratified the UNFCCC in 1997, which enables South Africa to apply for financial assistance for climate change related activities from the Global Environmental Facility (GEF).[21]

Also, the Kyoto Protocol of 1997 which South Africa ratified in 2002 provides for the certified emission reductions between developing and developed countries to support sustainable development with respect to greenhouse gas emissions in developing countries while helping developed countries to comply with their commitments under the Kyoto Protocol.[22] South Africa is the largest emitter of GHGs in Africa and one of the most carbon emission-intensive countries in the world due to its dependence on coal for primary energy.[23] As a result, a core focus for South Africa is the development of renewable energy to reduce the dependence on coal.

[18] Department of National Treasury 'Carbon Tax Policy Paper: Reducing greenhouse gas emissions and facilitating the transition to a green economy' 2013 8.
[19] National Strategy for Sustainable Development and Action Plan (NSSD 1) 2011–2014' 2011, 32.
[20] UNFCC 1992.
[21] White Paper on the Renewable Energy Policy of the Republic of South Africa' Government Gazette 26169 2003 viii.
[22] Ibid 10.
[23] White Paper on the Renewable Energy Policy 2003, 10.

At the UNFCCC's COP 15 negotiations in 2009, President Zuma announced South Africa's voluntary commitment to reduce its GHG emissions.[24] This commitment is reflected in the Copenhagen Accord made by the parties to the Convention and the Kyoto Protocol and provides political direction to international climate change negotiations.[25] South Africa pledged to undertake nationally appropriate mitigation actions to ensure that its GHG emissions deviate from the business-as-usual growth trajectory by around 34 per cent by 2020 and 42 per cent by 2025.[26] In addition, based on the UNFCC, the government's Long Term Mitigation Strategy's focus is on the reduction of GHG emissions in South Africa which would see the growth of carbon emissions peak (up to 2020), plateau (between 2020–2030) and decline (from 2035).[27]

South Africa's ratification of these protocols creates the framework for access to international funds via the GEF and the Clean Development Mechanism (CDM) to reduce greenhouse gas emissions.[28] However, to get access to these funds, it is necessary that the policy frameworks are in place, current and ready for implementation.

For South Africa to make a transition to a low carbon economy, reducing its reliance on fossil fuels and the adoption of other sources of energy such as nuclear, natural gas and renewable energy is paramount.[29] These sources of energy will reduce its carbon footprint while ensuring energy security needed to drive economic development.[30]

5. Renewable Energy Policy

The White Paper on Renewable Energy Policy of South Africa is more than a decade old and seeks to provide clarity on South Africa's future direction and commitment in terms of its

[24] Department of National Treasury 'Carbon Tax Policy Paper: Reducing greenhouse gas emissions and facilitating the transition to a green economy' 2013 21.
[25] Ibid.
[26] Ibid.
[27] Martin Kaggwa, Shingirira Savious Mutanga, Godwell Nhamo & Thokozani Simelane, 'South Africa's Green Economy Transition: Implications for Reorienting the Economy Towards a Low-Carbon Growth Trajectory' South African Institute of International Affairs 2013 9
[28] Carbon Tax Policy Paper 2013, 15.
[29] Integrated Energy Planning Report 2013, 58. The energy demands in South Africa dictates that an energy mix capable of meeting peak demands and ensures a reliable base load capacity is the most sustainable.
[30] Ibid.

energy transition.[31] The central aim of government's policies is the creation of conditions for the conceptualization, development and implementation of renewable technologies to develop renewable energy projects and ensure that South Africa's national energy resources cater for the needs of the country through production and distribution of energy that is sustainable and improves the standard of living of South Africans. [32]

As stated earlier, South Africa's generation of energy has been mainly through coal. South Africa's vast reserves of coal and the intensive investment by government in coal plants are major factors contributing to the heavy reliance on coal.[33] The government has also subsidised coal energy through the public utility, energy generator and transmitter, ESKOM, making it harder for other cleaner sources of energy to compete in the market when it comes to pricing.[34] The reality is that cost and reliability dominate in the criteria for energy planning.[35] The cost determines 'what to build, how to build it and how to pay for it.'[36] Cost however should not be used as an excuse not to address climate change.[37] The National Energy Act[38] of 2008 in its preamble is mandated to ensure a diverse energy mix which is sustainable and affordable in support of economic growth, poverty alleviation and taking into account environmental management.[39] It also advocates for an Integrated Energy Planning which balances the above government priorities.[40]

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[31] White Paper on the Renewable Energy Policy 2003, i.
[32] Ibid vii.
[33] See the White Paper on the Renewable Energy Policy of the Republic Of South Africa (November 2003) vii-3, statistics in 1999 show that 95 percent of South Africa's energy was produced from fossil fuels with 91 percent of electricity being produced from coal.
[34] See Nel Shaun, 'Transforming the Energy Supply Industry' in Antoine Francis (ed) Keeping the lights on' 64 The Journal of the Helen Suzman Foundation (2012) 19, two thirds of electricity is sold to industry users and a third to domestic users. The subsidies given are recovered from the industrial users.
[35] Roussos Mike 'Energy Planning and Sustainability' in Antoine Francis (ed) 'Keeping the lights on' 64 The Journal of the Helen Suzman Foundation (2012), 71
[36] Ibid 69.
[37] Ibid.
[38] Act 34 of 2008.
[39] Roussos Mike, 'Energy Planning and Sustainability' in Antoine Francis (ed) 'Keeping the lights on' 64 The Journal of the Helen Suzman Foundation (2012), 69.
[40] Section 6, National Energy Act 34 of 2008. See the draft Integrated Energy Plan (IEP) Government Gazette Notice no. 36690 (24 July 2013 45-46, which indicates that energy planning should take into consideration the cost and benefits of each particular form of energy and proposes a suitable balanced energy mix. It also provides that energy planning should not compromise the government's objective to reduce South Africa's GHG emissions.

South Africa has abundant renewable energy resources that can be exploited to produce energy.[41] Renewable energy projects are capital intensive, however the maintenance costs thereafter are lower than those of fossil fuels.[42] In order to facilitate the development of renewable energy technologies, investment incentives such as the renewable energy generator tax credit, the renewable portfolio standard in the USA and the production incentive offered in European countries such as the feed-in tariff are necessary.[43] Due to high capital costs of renewable energy technology, there is a need to increase public awareness on the value of renewable energy.[44] Various barriers including financial, legal, regulatory and organisational factors need to be overcome in order to implement renewable energy technologies and develop markets.[45]

Financial incentives from the government to renewable energy projects are essential until renewable energy can compete with fossil fuel based technologies.[46] Government resources are however scarce and compete to meet its social and economic priorities,[47] therefore International sources of finance such as the GEF, CDM and the Power Africa US $7 billion financial support programme established by the US President, Barrack Obama, should also be explored.

There is existing legislation that already provides for incentives and the creation of alternatives within the South African energy sector. The Central Energy Fund Act (38 of 1977) allows levies to be imposed on liquid fuels products for collection into the Central Energy Fund and/or the Equalisation Fund which is used for dedicated energy purposes.[48]

[41] See White Paper on the Renewable Energy Policy 2003, 12-20 solar radiation in the Northern Cape region suitable for solar energy and wind along the coastal regions can be exploited for wind energy. Although renewable energy is not capable of replacing fossil fuels for base load energy due to the intermittent sources(the sun does not shine all day neither does the wind blow all the time) and the storage capacity, it can make a significant contribution to the energy mix and reduce the country's carbon footprint as it is clean energy. Solar CSP however has potential to contribute too base load electricity as new technology has enabled this energy to be stored.
[42] White Paper on the Renewable Energy Policy 2003, 5.
[43] Ibid 28.
[44] Ibid.
[45] Ibid
[46] Ibid 5.
[47] Ibid 5.
[48] White Paper on the Renewable Energy Policy 2003, x.

The Gas Act (48 of 2001) provides a basis for the integration of renewable energy derived from liquid fuels such as bio-diesel, ethanol and landfill gas into the gas and petroleum industry regulatory framework.[49]

The White Paper on Energy in 1998 and the Electricity Regulation Act (ERA) partially restructured the electricity sector by enabling the entry of multiple players into the generation of energy, paving the way for renewable energy Independent Power Producers (IPPs) into electricity generation.[50] The Medium Term Risk Mitigation Plan which forms part of the Integrated Resource Plan (IRP) for Electricity 2010-2030 recognises the role that IPPs can play in providing solutions to the electricity supply shortfall between 2011-2016.[51] The government's target for renewable energy between 2003-2013 was 10,000 Gwh,[52] which was not achieved as investment by IPPs was not as expected due to the low price of electricity.[53]

The government has tried to provide incentives for renewable energy through the Renewable Energy Subsidiary Office (REFSO) and the Renewable Energy Feed in Tariffs (REFIT) which were not quite successful.[54] The government however has been successful in providing incentives to IPPs with the Renewable Energy Independent Power Producer Programme (REIP4) introduced to replace REFIT. The REIP4 involves a competitive bidding process for IPPs to obtain tenders to deploy renewable energy. The objective of the REIP4 is to meet future energy demands through investment in solar, wind, biomass, hydro power projects, geothermal energy and ocean and tidal energy.[55]

[49] White Paper on the Renewable Energy Policy 2003, xi.
[50] Nel Shaun, 'Transforming the Energy Supply Industry' in Antoine Francis (ed)19, New Generation Capacity regulations (ERA).
[51] Ibid 15.
[52] White Paper on the Renewable Energy Policy 2003 ix.
[53] Lloyd Phillip, 'Restructuring South Africa's Electricity Supply Industry' in Antoine Francis (ed) Keeping the lights on' 64 The Journal of the Helen Suzman Foundation (2012), 20.
[54] Ibid 12. REFIT was successful in offering IPPs incentives, however, there were issues surrounding 'who would pay for the difference between the standard tariff and the REFIT' and in the power purchase agreements were signed with ESKOM.
[55] White Paper on the Renewable Energy Policy 2003, 5.

The REIP4 has been successful due to the support from the Department of Energy, National Treasury and ESKOM. IPPs have been allocated 3725 MW to generate by the Department of Energy in line with the IRP 2010-2030.[56]

The National Energy Regulator of South Africa (NERSA) is mandated to regulate the energy sector and give licenses to power generators. ESKOM, a state owned entity, and an energy generator however, has the sole license to transmit energy. ESKOM has through Power Purchase Agreements (PPAs) signed with IPPs guaranteed to purchase energy from IPPs and to connect them to the grid. The current regulations are not clear on the co-existence of the public utility and the IPPs and this has the potential to frustrate investments into Renewable energy.[57] The uncertainty of policy and regulation relating to the interaction between the public utility and IPPs requires discourse between the various stakeholders to identify inhibitions that deter investment by IPPs.

To liberalise energy generation and transmission, draft legislation was approved by parliament for the establishment of an Independent System and Market Operator (ISMO) whose mandate includes, acting as a single buyer of energy generated, selling and dispatching electricity.[58] This will diffuse the perception by IPPs of conflict of interest by ESKOM and create competition in energy market prices that will improve investment into renewable energy. ESKOM is currently financially constrained as it has been unable to recover its energy generation costs due to its low electricity prices. The government has developed a strategy to bail out ESKOM,[59] however internally, ESKOM has reviewed and reduced its budget for the expansion of its transmission lines for the next ten years.[60] This

[56] <http://www.ipprenewables.co.za/#index.php.> accessed 28 October 2014.
[57] Nel Shaun, 'Transforming the Energy Supply Industry' in Antoine Francis (ed) Keeping the lights on' 64 The Journal of the Helen Suzman Foundation (2012), 21.
[58] Independent System and Market Operator (ISMO) Bill Gazette Notice 290 of 2011, s 17.
[59] Creamer Terrence , 'Eskom to receive R20bn injection, but no other SoC bailouts' http://www.engineeringnews.co.za/searchadvanced_en.php?is_id=81&sortOrder=DESC&st=i&searchString=eskom+bail+out&x=0&y=0&searchAll=on&searchStartDate=&searchEndDate=&searchSortBy=sr_date/
[60] Creamer Terrence, 'Eskom warns on IPP connections as it defers some transmission capex' Engineering news available <http://www.engineeringnews.co.za/searchadvanced_en.php?is_id=81&sortOrder=DESC&st=i&searchString=Eskom+warns+on+IPP+connections+as+it+defers+some+transmission+capex&x=0&y=0&searchAll=on&searchStartDate=&searchEndDate=&searchSortBy=sr_date/>accessed 28 October 2014.

move will have an impact on connecting IPPs to the grid and providing incentives for the entry of new players.

In addition to the heavy reliance on coal, the excessive use of fuel wood in rural parts of South Africa has led to harmful consequences for the environment such as air pollution.[61] In developing efficient and safe technologies to alleviate the burden of women in areas heavily reliant on fuel wood, not only will renewable energy be favourable to the environment but it will ensure rural electrification of areas that are far from the grid or expensive to connect to grid. Section 5 of the National Energy Act provides that the Minister has the responsibility to adopt measures that provide universal access to electricity at affordable prices.[62] Access to energy will improve the livelihoods of the community and enable them to engage in social economic activities that are possible through access to energy. Renewable energy therefore has the potential of realising the government's strategy as laid out in the NDP, to achieve social and economic growth goals by 2030 through green jobs and to ensure that 95 percent of the population has access to electricity.[63]

As a developing country, South Africa is under pressure to create jobs and its extractive industry is central to the creation of jobs. However, this industry is heavily reliant on the use of energy, particularly through coal and as a result; the sustainable development of this source and continued production is in question.[64] The South African government enacted the National Energy Act of 2008 as a regulatory framework that seeks to ensure that diverse energy mixes are available in sustainable quantities and at affordable prices.[65] Due to the dwindling capacity to generate energy, South Africa intends to in addition to exploiting renewable energy, turn to nuclear power as a source of energy despite

[61] Independent System and Market Operator (ISMO) Bill Gazette Notice 290 of 2011, s 17.
[62] The state has made progress in providing free solar Photovaltic panels in rural areas and has provided water heaters to RDP housing .
[63] National Development Plan 2011, 147.
[64] Martin Kaggwa, Shingirira Savious Mutanga, Godwell Nhamo & Thokozani Simelane 'South Africa's Green Economy Transition: Implications for Reorienting the Economy Towards a Low-Carbon Growth Trajectory' South African Institute of International Affairs 2013 12
[65] Department of Energy 'Integrated Energy Planning Report' Government Gazette 36690, July 2013

developed countries such as Germany moving away from this mode of energy production.[66] The viability of this alternative mode of energy production needs to be studied.

6. Developing Nuclear Energy

Nuclear energy currently accounts for 6 per cent of the energy mix in South Africa and is generated at the Koeberg nuclear plant.[67] Nuclear energy is a better source of energy than coal due to its low carbon intensity and it is suitable for base load electricity.[68] The journey in adopting nuclear energy has been a challenging one. Between 1998-2010, South Africa tried to develop the Pebble Bed Modular Reactor which could use helium as a coolant, however, this project was abandoned costing the tax payer about R10 billion.[69] ESKOM did not get discouraged in its efforts and in 2006 it called for tenders for a new capacity build of 3200-3600MW.[70] The process was eventually cancelled due to ESKOM's rating and its inability to finance nuclear energy.[71]On 17 June 2014, the President indicated that the government is going to increase its nuclear energy capacity[72]. The government has since concluded Intergovernmental Agreements on Strategic Partnership & Co-operation in Nuclear Energy and Industry with Russia and France towards the Nuclear reactors procurement programme.[73]

Nuclear energy generation is posed with several challenges. First, nuclear energy projects are very capital intensive and the plants take a long time to build.[74] These costs translate into higher energy prices until the plant can achieve low cost operation. The IRP 2010-

[66] Ibid 12.
[67] <http://www.energy.gov.za/files/nuclear_frame.htm> accessed 28 October 2014.
[68] Bosselman Fred, 'The Ecological Advantages of nuclear Power' 15 NYU Environmental Law Journal (2007) 6.
[69] Thomas Steve, 'The Economics of Nuclear Energy' in Antoine Francis (ed) Keeping the lights on' 64 The Journal of the Helen Suzman Foundation (2012), 52.
[70] Ibid 53.
[71] Ibid.
[72] There have been other nuclear energy accidents of Three Mile Island in 1978 in the USA, Chernobyl IN Ukraine in 1986.
[73] See, < http://www.engineeringnews.co.za/article/russia-kicks-off-south-africas-nuclear-vendor-parade-2014-10-24/searchString:nuclear+energy > accessed 28 October 2014.
[74] Ibid 49-50.

2020[75] incorporating nuclear into the energy mix has been criticised that it does not reflect the true cost of nuclear energy and that the Department of Energy imposed nuclear energy as a source of energy without questioning the adverse consequences.[76] The capital input into nuclear plants surpasses what has been injected into renewable energy projects and the government's intention to redevelop nuclear energy has the potential of diverting financial resources for the development of renewable energy.[77]

The second challenge that nuclear energy generation faces is the disposal of spent nuclear. Disposing of spent nuclear is a global problem especially because spent nuclear remains radioactive for thousands of years.[78] Spent nuclear can be recycled up to 95 per cent,[79] however, few countries have the technology capacity. Britain has the capacity to recycle and currently offers this service to Japan and England but this is costly.[80] Consideration has to be made on the suitability of permanent disposal sites to ensure that public health and the environment are not put at risk. These aspects need to be considered when analysing the proposed Radioactive Waste Management Policy and Strategy for South Africa.

Lastly, the transportation of nuclear materials is considered dangerous due to the potential risks it poses on employees, the public and the environment.[81] It is for this reason that transportation of nuclear material is subjected not only to domestic legislation but international legislation.[82] The UN has regulations dealing with transportation by road and rail.[83] Complying with regulation increases the transportation costs of nuclear material.[84]

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[75] Published by the Department of Energy in 2011. It projects the country's energy demands for the next 20 years and proposes the most suitable energy mix to meet this demand.
[76] Roussos Mike, 'Energy Planning and Sustainability' in Antoine Francis (ed) Keeping the lights on' 64 The Journal of the Helen Suzman Foundation (2012), 73, 79. The cost of decommissioning nuclear plants has not been taken into consideration in the IRP which would increase the cost of nuclear by ten per cent.
[77] Garcier Romain, 'The nuclear renaissance and the geography of the uranium fuel cycle' 94(3) Geography (2009) 205.
[78] Scott Hellen, 'The legal problems of Spent Nuclear Fuel Disposal' 23 Energy L. J 179 (2002) 179.
[79] Ibid 181.
[80] Ibid.
[81] Garcier Romain, 'The nuclear renaissance and the geography of the uranium fuel cycle' 94(3) Geography (2009), 203.
[82] Ibid.
[83] Ibid.
[84] Ibid.

These transportations costs are usually passed to the consumer through energy prices. The true cost of nuclear energy however cannot be assessed due to contradicting studies.[85]

The dual utility of nuclear energy for legitimate energy uses and for atomic bomb manufacture make the use of nuclear energy a highly political and sensitive matter. Countries using this source of energy need to sign a non-proliferation treaty which South Africa is a signatory to, to ensure that it uses this form of energy for legitimate energy uses. Security of nuclear plants and disposal sites has to be seamless. Where recycling is considered, a security strategy has to be ensured. The US for instance has been reluctant to recycle spent fuel due to the potential of extraction of plutonium which can be used in the making of nuclear weapons and lead to the violation of non-proliferation policies.[86]

Nuclear energy generally is a risky source of energy to exploit due to the nature of radioactive waste and security concerns related to its utility. The Draft National Energy Policy and Strategy and the Nuclear Act should address the above concerns adequately to establish whether South Africa should explore this source of energy on a greater scale as it has vast deposits of uranium. The Department of Mineral Resources, National Nuclear Disaster Management Plan approved in 2005 needs also to be evaluated to assess South Africa's preparedness to respond to nuclear disasters like the one in Fukushima, Japan, as nuclear disasters cost a government in damages approximately USD 200m.[87]Providing expert inputs into this strategy backed up by research will therefore be necessary.

7. Use of Natural Gas

The use of natural gas could accelerate South Africa's transition into a low carbon economy, and enable the country to meeting its climate change objectives while providing a

[85] Garcier Romain, 'The nuclear renaissance and the geography of the uranium fuel cycle' 94(3) Geography (2009), 205.
[86] Scott Hellen, 'The legal problems of Spent Nuclear Fuel Disposal' 23 Energy L. J 179 (2002), 181.
[87] Thomas Steve , 'The Economics of Nuclear Energy' in Antoine Francis (ed) Keeping the lights on' 64 The Journal of the Helen Suzman Foundation (2012), 51.

sustainable energy source.[88] Natural gas is 60 percent cleaner than coal in terms of GHG emissions.[89] South Africa is currently importing natural gas from Mozambique which has substantive reserves.[90] Natural gas currently accounts for three per cent of the energy mix, however, there is potential to increase this amount. South Africa could import more natural gas or explore its potential to produce natural gas.

South Africa has previously ventured into natural gas production in the offshore Bredasdorp basin which PetroSA Mossel Bay Gas to Liquid facility has been converting gas into a useable form, Liquefied Natural Gas (LNG).[91] This however has been done on a small scale and the depleting resources have impaired the operation of the facility.[92] Several studies have indicated that the southern Karoo basin could have gas resources of shale gas and coal bed methane, however, further exploration is required to verify the reserves.[93] Research by the United States Energy Information Administration in 2011 indicated that South Africa's shale gas reserves were the fifth largest in the world.[94]

Shale gas exploration is capital intensive and pipelines would have to be developed to transport the gas from the source in the Karoo, which is in a remote area to enable its consumption. The pipeline infrastructure required for transportation of the gas is more expensive than of oil due to the lower density of gas.[95]

The proposed method to extract the gas in the Karoo is hydraulic fracturing, which the United States has used successfully in extracting natural gas. Hydraulic fracturing is a water

[88] It is for these reasons that the President in the state of nation address recognised that pursuing shale gas 'as a game changer for the economy.' <http://www.iol.co.za/news/zuma-s-state-of-the-nation-address-1.1704800#.VEkN9lfDt6M>accessed 28 October 2014. Enabling domestic generation capacity to provide sustainable energy will reduce the economy's reliance on imported energy from Mozambique and Congo. The government has signed the Grand Inga Hydro Power treaty with the government of the Democratic Republic of Congo which has the potential to generate 40,000 megawatts of hydroelectricity.
[89] Winkler Harold, Energy '*Policies for sustainable development in South Africa: Options for the Future*' Energy Research Centre, University of Cape Town (2006) 15.
[90] Integrated Energy Planning Report 2013, 65.
[91] Ibid.
[92] Ibid.
[93] Integrated Energy Planning Report 2013, 69.
[94] National Development Plan 2011, 143.
[95] Integrated Energy Planning Report 2013, 66.

intensive process and could pose a water crisis in South Africa as the country is water scarce.[96] Although natural gas can aid South Africa's transition to a low carbon economy it poses other environmental problems. The water used during the hydraulic fracturing process is usually added sand and other chemicals. There is a risk that the wells used for the fracturing could leak water into other water bodies which would result in contamination of water for human or animal consumption.[97] Underground disposal of used water may also result in seismic activity due to the pressure in the earth's surface. The Department of Mineral Resources noting this concerns, had halted licensing for exploration of shale gas pending research on the benefits of shale gas exploration and the potential impact on the environment while reviewing legislation to address these concerns.[98]

Research is indeed needed and the development of legislation addressing environmental concerns on water disposal and water use. There is indeed a lot to learn from jurisdictions like the USA who have been exploiting this source of energy especially when reviewing legislation to mitigate risks associated with shale gas exploration. The DMR is however considering lifting this moratorium and will finalise consultations with communities that will be affected in December 2014, to finalise technical regulations.[99] Issuing of exploration licences could begin in July-August 2015 for exploration commencing in mid-2016.[100]
With the potential for natural gas and nuclear energy, within the South African discourse on climate change, there is a need to conduct a baseline study on the quantity and nature of renewable energy currently in use in South Africa.[101] Part of the objectives of this study will be to address the information deficit around the availability of renewable energy products and services.[102]

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[96] Integrated Energy Planning Report 2013, 65.
[97] Ibid.
[98] Ibid 65-66.
[99] SAPA, 'Karoo fracking could start by mid-2016'.
<http://www.engineeringnews.co.za/article/karoo-fracking-could-start-by-mid-2016-2014-10-28> accessed 28 October 2014.
[100] Ibid.
[101] The current South African Renewable Energy Resource Database (RRDB) is based on the analysis of a comprehensive data set, which covers the whole of South Africa (DME, Eskom, CSIR, 2001).
[102] White Paper on the Renewable Energy Policy 2003, 32.

While renewable energy, nuclear energy and natural gas are important in addressing climate change considerations, it is by no means sufficient and other proposals endorsed by the NDP include the introduction of a carbon tax policy to curb GHG emissions.

8. The Carbon Tax Policy

The Department of National Treasury published the Carbon Tax Policy Paper in May 2013. This Policy paper was developed from a carbon discussion paper published for comment in December 2010.[103] Most of the comments received acknowledged the need for a carbon pricing mechanism to address climate change by reducing GHG.[104]

In the 2013 budget speech, former Minister of Finance, Pravin Gordhan, announced the implementation of a carbon tax at $12 per tonne of carbon dioxide equivalent (CO2e), effective from 1 January 2015.[105] The primary objective of a carbon tax is to change the current and future behaviour of producers and consumers in their consumption of carbon intensive goods and services by reflecting the price of pollution in the final cost for goods and services.[106] To create an enabling environment where renewable energy can compete, fossil based energy should reflect the social cost of its impact on the environment through GHG emissions.

Since the publication of the Carbon Tax Policy paper, two public discussions and several meetings have been held.[107] Some of the consultations made have yielded suggestions to refine the carbon tax design to ensure that households and firms are not unnecessarily disadvantaged.[108] Taking into account suggestions from public consultations, as well as the agreement between the Department of Environmental Affairs and the Department of National Treasury that there was a need to 'align the carbon tax design and the proposed

[103] Carbon Tax Policy Paper 2013, 7.
[104] Ibid.
[105] http://www.infrastructurene.ws/2013/02/28/carbon-tax-comes-into-effect-from-2015/
[106] Carbon Tax Policy 2013, 29.
[107] Alistair Anderson, 'Carbon tax postponed to 2016 to allow for 'coherent package' <http://www.bdlive.co.za/national/science/2014/02/27/carbon-tax-postponed-to-2016-to-allow-for-coherent-package> accessed 20 August 2014.
[108] Department of National Treasury, 'Budget Review 2014' (26 February 2014) 55.

desired emission reduction outcomes,'[109] the implementation of a carbon tax in South Africa was postponed from January 2015 to January 2016.[110] The postponement of the implementation of the carbon tax to January 2016 gives various departments sufficient time to align their policies with the carbon tax design. This move has been welcomed by many to ensure that a coherent policy is structured and aligned with various policies affecting or affected by its implementation.

South Africa's 2010 carbon tax discussion paper proposes three options for implementing a comprehensive carbon price through the carbon tax by proposing the following tax bases: tax applied directly to measured GHG emissions; fossil fuel input tax on coal, crude oil and natural gas, based on their carbon content and tax levied on energy outputs (electricity and transport fuels).[111]

The purpose of the proposed carbon tax is to correct the existing prices of goods and services that generate excessive levels of anthropogenic GHG emissions, so that it reflects the social costs of such emissions.[112] As the current carbon tax designs suggests, carbon taxes will be passed through product prices (electricity, petroleum, energy intensive goods like steel, cement and aluminium).[113] Carbon tax will therefore 'affect wider policies on energy access and affordability, as well as industrial competitiveness.'[114] Policies of the energy, transport, industrial and trade sectors therefore need to be coordinated to complement the carbon tax design.[115]

Carbon tax will allow for early development or implementation of cleaner energy, it will reduce the risk of South Africa's exports being subject to border carbon tax adjustment tariffs by countries that have adopted policies and regulations targeting high carbon

[109] Department of National Treasury, 'Budget Review 2014' (26 February 2014) 55.
[110] Ibid.
[111] Carbon Tax Policy Paper 2013, 12.
[112] Ibid 15.
[113] International Energy Agency, 'Integrating Carbon Pricing with Existing Energy Policies: Issues for South Africa' Workshop Report 2013, 6. <
http://www.iea.org/media/workshops/2013/SouthAfricapolicyintegrationfinal.pdf >
[114] Ibid.
[115] Ibid10.

emitting producers and it will encourage the development of technologies for capturing carbon.[116]

As stated earlier, the objective of the carbon tax is to correct the pricing of energy by incorporating the social external costs of climate change.[117] In this way, carbon tax reduces the gap in energy prices from different sources thus encouraging the adoption of less carbon intensive technologies and the adoption of cleaner energy. A carbon tax will also increase the price of carbon intensive products and encourages a reduction in their demand and substitution with cheaper low carbon intensive alternatives.

The impact of competiveness of local firms however will be determined by the nature of goods traded, the market structure of the traded goods and whether the producers are price setters or price takers.[118] The South African economy is driven mainly by the mining sector and the export of industrial goods. South Africa does not enjoy a monopoly in any of these sectors and is a price taker of factors that have an impact on the market price of goods.[119] For low income households, the current carbon tax designs suggests that carbon taxes will be passed through electricity, fuel and transport prices, which means they will be susceptible to higher costs.[120]

The impact of the proposed carbon tax on industry competitiveness and low income households needs to be evaluated in line with the carbon tax model adopted by the Department of National Treasury which seeks to neutralise the impact of carbon tax in relation to 'producers, consumers, domestic and foreign economies.'[121] As a result, it is necessary to understand the impact of carbon tax on South Africa's energy and industrial

[116] Carbon Tax Policy Paper 7. Climate change being a global concern which many countries are trying to address, 'trade partners may impose carbon constrains through either regulation or market based instruments' to reduce their domestic 'demand for carbon intensive goods and services.
[117] Ibid 29.
[118] Carbon Tax Policy Paper 2013, 29.
[119] Ibid.
[120] International Energy Agency, 'Integrating Carbon Pricing with Existing Energy Policies: Issues for South Africa' Workshop Report 2013,
16.<http://www.iea.org/media/workshops/2013/SouthAfricapolicyintegrationfinal.pdf>
[121] Carbon Tax Policy Paper, 2013 10.

sectors, the cost of doing business, trade implications (competitiveness locally and internationally) that carbon tax will have and the challenges that industries foresee to encounter after the implementation of carbon tax.

The nature of climate change requires a multipronged approach through market-based instruments, regulatory measures, information awareness programme and voluntary initiatives to ensure cost effective mitigation.[122] The government has developed several other mitigation policies to enable the transition to a low carbon economy.[123] These policies need to be aligned with the carbon tax policy to prevent any overlap, which might hinder efforts to address climate change and related environmental challenges. To ensure that complementary instruments are adopted, a Tax Review Committee has been established under Judge Dennis Davis.[124] Policies intended to reduce emissions could reduce the price of carbon to help achieve the desired emission reduction outcome.

Transition in the key sectors with the highest emission such as electricity generation, liquid fuels, transport system and industrial process, is paramount in ensuring that climate change is cost effective.[125] Several flagship programmes have been highlighted in the 2011 White Paper focussing on mitigation of GHG. The 2011 White Paper sets processes to identify the optimal combination of mitigation measures to achieve the National Climate Change Response Objective.[126] All of these are consistent with South Africa's new growth path that is focused on developing a green economy.

[122] Carbon Tax Policy Paper, 2013 7-8.
[123] National Climate Change White Paper 2011, 26.
[124] Alistair Anderson, 'Carbon tax postponed to 2016 to allow for 'coherent package' < http://www.bdlive.co.za/national/science/2014/02/27/carbon-tax-postponed-to-2016-to-allow-for-coherent-package >accessed 22 August 2014
[125] Carbon Tax Policy Paper, 2013 8. Statistics from the year 2000 showed that electricity generation constituted almost half of energy emissions at 40% followed by industrial processes at 14% and transport and energy used by industries at 10 percent, as a result of heavy reliance on fossil fuels: coal, gas and petroleum as their source of energy.
[126] National Climate Change White Paper 2011, 27.

9. New Growth Path

For South Africa, a transition to a green economy is necessary as a result of growing concerns about the environmental unsustainability of past and current economic growth patterns, increased awareness of a potential future climate crisis, and the need for the substantial transformation of behaviour, as well as of industry technologies and structures.[127]

In a bid to create more jobs, South Africa's new Growth Path released in 2010 sets a target of 5 million new jobs by 2020.[128] As a result, the South African government in developing a partnership with the private sector was to develop policies that promote green industrial development as well as offer financial support.[129] Some of the commitments made by the South African government included rolling out 1 million solar heating systems; increasing green economy initiative funding from the Industrial Development Corporation; procuring renewable energy, and investments in bio-fuels; launching clean coal initiatives and promoting energy efficiency; waste recycling, reuse and recovery.[130]

The transition from reliance of fossil fuels which employs quite a significant number of people from the mining of coal to generation, transmission and distribution to the adoption of other 'energy technologies should also be labour intensive.'[131] The Department of Economic Development estimates the creation of 400 000 jobs by 2030 if the green economy plan is successful.[132] However, it has been argued that the change in approach will also result in the loss of 35 000 jobs per year and the employment dynamics will shift to highly skilled people and fails to address the social dynamics of South Africa.[133]

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[127] Martin Kaggwa, Shingirira Savious Mutanga, Godwell Nhamo & Thokozani Simelane 'South Africa's Green Economy Transition: Implications for Reorienting the Economy Towards a Low-Carbon Growth Trajectory' South African Institute of International Affairs 2013 6.
[128] Ibid 11.
[129] Ibid.
[130] Ibid 11.
[131] Integrated Energy Planning Report 2013, 60.
[132] Martin Kaggwa, Shingirira Savious Mutanga, Godwell Nhamo & Thokozani Simelane 'South Africa's Green Economy Transition: Implications for Reorienting the Economy Towards a Low-Carbon Growth Trajectory' South African Institute of International Affairs 2013 13
[133] Ibid.

In promoting a green economy, the concerns that the government will need to balance include lowering the cost of living such that measures such as carbon tax on vehicles for instance are not transferred to owners and keeping government spending low despite the likelihood of having to provide subsidies to local producers to encourage green production as applicable in the USA.[134]

To aid the development of a green economy, South Africa developed the National Strategy for Sustainable Development and Action Plan. This plan emphasises the importance of the green economy to facilitate a resource-efficient, low-carbon and pro-employment growth path.[135] A core part of the strategy is building sustainable communities and sustaining ecosystems through efficient use of natural resources.[136] The government has committed R800 million for green economy initiatives.[137]

The Department of Minerals and Energy also developed a National Energy Efficiency Strategy which sets a target of 12 percent for energy efficiency improvement by 2014.[138]The key goals of the strategy included improving the health system, creating jobs, alleviating energy poverty, reducing environmental pollution and CO2 emissions, improving industrial competiveness and enhancing energy security.[139]

In meeting these objectives, there are several initiatives that need to be tackled from various perspectives which include socio-economic development of the vulnerable in South Africa, providing incentives to the private sector to embrace renewable energy projects, building the technical expertise and capacity around climate change in South Africa, promoting public awareness on the benefits of a low-carbon and climate-resilient economy, collecting data to back up claims, monitor and verify the effectiveness of various suggested

[134] Martin Kaggwa, Shingirira Savious Mutanga, Godwell Nhamo & Thokozani Simelane 'South Africa's Green Economy Transition: Implications for Reorienting the Economy Towards a Low-Carbon Growth Trajectory' South African Institute of International Affairs 2013 13.
[135] Ibid 9.
[136] Ibid.
[137] Ibid.
[138] Ibid.
[139] Ibid.

policy approaches and ensuring a coordinated inter-departmental function across government levels to ensure a consistency in approaches and understanding.

10. Conclusion: Future Advocacy Strategies

To promote the constitutional imperative of protecting our environment for future generations and embarking on sustainable development path that relies on equitable use of natural resources which promotes socio-economic development, a holistic consultative process is necessary. This is why this inception and scoping workshop is important to identify gaps and areas to focus on to complement the work of government through various departments that will aid the attainment of the goals set out in the NDP efficiently and in accordance with established timeframes. The role of law and policy in realizing the NDP's Vision 2030 and a low carbon economy anchored on renewable energy is beyond question. However, whether the existing legal and policy environment is effective requires investigative research particularly the experience of IPPs with the REIP4 and the resurgence of nuclear.

South Africa occupies a unique position of balancing any climate change objectives with the national objectives of the state taking into account its developing economy status as well as the social, economic and environmental development imperatives that goes with this status. For this effective balancing to take place, it is therefore necessary for all interested stakeholders to harmonize their various functions and roles to protect South Africa's future.

In starting the conversation on a multi-stakeholder approach, the Mandela Institute proposes to do the following:

- Work with government to mainstream mitigation and adaptation activities across all government departments and at all levels. This will be done through the collection of data, monitoring, reporting, and a process of verification;
- Conduct field research to collect data to back up claims, monitor and verify the effectiveness of various suggested policy approaches;

- Study the feasibility of nuclear energy and natural gas as a viable alternative to energy production;
- Review the REIP4 to evaluate the progress of the programme and challenges faced by the both the private and public sector in administering the programme, and in generation of renewable energy and transmission;
- Work with the private sector representative bodies in identifying required support needed from the state in developing incentives to embrace renewable energy projects;
- Conduct an updated study on the magnitude of renewable energy sources currently being explored in South Africa to address the information deficit around the availability of renewable energy products and services and their potential;
- Offer certificate courses, workshops and seminars to build the technical expertise and capacity around climate change in South Africa;
- Promote a public awareness campaign on the benefits of a low-carbon and climate-resilient economy;
- Promote the adoption of renewable energy in rural communities and areas that are not accessible to the grid to reduce their reliance on fossil fuels and empower them economically.