

https://dspace.org/

Forging resistance: An analysis of opposition to nuclear energy in South Africa

Risimati, Risimati Elia

2018

https://hdl.handle.net/10539/31340

Downloaded from a DSpace repository. https://dspace.org/



Forging resistance: An analysis of opposition to nuclear energy in South Africa

BY

Risimati Elia Chauke

(1518959)

Research report submitted in partial fulfilment of the requirements

Of the

Master of Arts

Degree

In

Sociology

At the

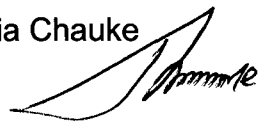
University of Witwatersrand

Department of sociology

Declaration

I, Risismati Elia Chauke declare that *Forging resistance*: *An analysis of opposition to nuclear energy in South Africa,* is my own work and I have given full acknowledgement to the sources referred to in this text.

Risimati Elia Chauke



04 day of September 2018

Dedication

I dedicate this research to my late father, Mr Jackson Chauke, who imparted in me the courage to face any challenging endeavour in life and to always believe in myself in whatever situation I might face. My salutation goes to my single mother who from 2007 to this day is confronted with the challenge of having to act both as a mother and a breadwinner.

Acknowledgements

My sincere appreciation goes to the following:

- My supervisor, Prof Michelle Williams for her support and guidance from the inception of this work to completion. Your critical supervision method and timely feedback are highly appreciated.
- To my mom, Selinah Makhubele, for supporting me financially, taking care of my child while her mom and I were busy pursuing our academic careers.
- To my wife, Lindiwe Veronica Mabasa, for firm and diligent emotional support as well as understanding my commitments for twelve months.
- Staff members of the Department of Sociology, particularly professor Lorena Nunez, for her prompt and constant support whenever I needed assistance.
- My research respondents (anti-nuclear activists around Gauteng) for contributing your valuable knowledge to my research project. Compromising your valuable commitments over my appointments is highly appreciated.
- Most importantly I would like to extend my message of gratitude to the almighty god, for his unconditional love and grace upon my life.

Abstract

The main purpose of this research is to provide an analysis of opposition to nuclear energy in South Africa, focusing on organisations and activists opposed to the current nuclear build programme. The organisations opposed to nuclear include Earthlife Africa, Greenpeace, Coalition Against nuclear Energy, national Union of Mineworkers, the Economic Freedom fighters and Democratic Alliance, COSATU and other organisations. The study utilises a qualitative approach, mainly document analysis complimented by in-depth expert interviews. The South African nuclear energy programme is a polarised issue triggering intense and often emotive debate on both sides, anti-nuclear activists and pro-nuclear proponents. The research pays specific attention to anti-nuclear activists and organisations opposed to South Africa's nuclear energy programme. In order to understand the anti-nuclear position, I have also incorporated pro-nuclear arguments in the study to have a better grasp of the concerns raised by organisations opposing nuclear energy. There are three main points of conflict: economic, environmental, and political. I show how opponents have framed resistance around cost and safety concerns, environmental impacts associated with nuclear and the nexus of elite political capture of state resources.

List of Acronyms

ABM	: Abahlali Basemjondolo
AEC	: Anti-Eviction Campaign
ANC	: African National Congress
APF	: Anti-Privatisation Forum
CANE	: Coalition Against Nuclear Energy
COSATU	: Congress of South African Trade Unions
CSIR	: Council for Scientific and Industrial Research
DA	: Democratic Alliance
DOE	: Department of Energy
DME	: Department of Minerals and Energy
EFF	: Economic Freedom Fighters
ELA	: EARHLIFE AFRICA
EMG	: Environmental Monitoring Group
FFSA	: Fossil Free South Africa
IRP	: Integrated Resource Plan
KAA	: Koeberg Alert Alliance
LPM	: Landless People's Movement
NDP	: National Development Plan
NUM	: National Union of Mine Workers
SAFCEI	: South African Faith Communities Environmental Institute
UDM	: United Democratic Movement
WEF	: World Economic Forum

Table of Contents

Chapter one: Introduction	**1**
Rationale of the study	4
Objectives of the study	4
Chapter outline	5
Chapter two: Literature review	**6**
International history of nuclear energy	6
Contours of arguments against nuclear energy	9
Social movements	11
Nuclear energy post-Fukushima	14
South Africa's Nuclear energy policy	16
Political discourse shaping South Africa's technology decision	17
Environmental justice in South Africa	19
South Africa's nuclear court case: the defining moment	22
Chapter three: Methodology	**24**
Sampling and population	24
Data collection	25
Data analysis	25
Ethical Considerations	26
Chapter: Four opposition on economic grounds	**27**
Arguments	27
Opposition to nuclear energy	28
Chapter five: opposition on political grounds	**33**
The politics of Parties	38

Chapter six: Opposition on environmental grounds 44

Chapter Seven: Conclusion 55

References

Appendix A A

Appendix B B

Chapter One:

Introduction

The study analyses opposition to nuclear energy in South Africa, focusing on the organisations opposed to the nuclear energy programme. The programme intended to expand six new additional nuclear power plants to contribute electricity to the current grid. Opposition to South Africa's nuclear energy is fuelled by civic activists, political parties and non-governmental environmental organisations. Organisations opposed to South Africa's nuclear energy include among others Earthlife Africa (ELA), South African Faith Communities Environmental Institute SAFCEI), Coalition Against Nuclear Energy (CANE), Greenpeace, political parties such as the Economic Freedom fighters (EFF) and Democratic Alliance (DA), Council for Scientific and Industrial research (CSIR), National Union of Mine workers (NUM), Congress of South African Trade unions (COSATU), civic activists and other organisations. In this research I explore organisations opposing nuclear energy. I show that the opposition has three primary foci: political issues, economic issues, and environmental issues. I use these three issues to explore the forms of resistance to nuclear.

The issue of nuclear energy is a vital concern for any country as energy is the basis for economic growth. Yet the question of how a country generates its energy is hotly contested. South Africa has a long history of dependence on coal, a dirty source of energy, and for the proponents of nuclear energy, nuclear is a 'clean' alternative to coal. The world's increasing demand for energy and the challenge of decreasing emissions of greenhouse gases have created conditions for the argument that nuclear energy play a role in the transition to 'clean energy' (Skarnekark, Gllard, Ekberg and Nordlund, 2009:78). As an alternative to coal, a transition to nuclear energy has been put forward as a policy option for South Africa's energy sector (Department of Minerals and Energy, 2008).

South Africa depends on both renewable and non-renewable forms of energy for electricity generation. Coal provides 75% of fossil fuel and 91% electricity generation (Pegels, 2010: 4945). South Africa's economy is energy-intensive and dominated by non-renewable energy resources. The primary source of energy used in electricity production in South Africa is coal and it contributes about 86% to the national energy grid while nuclear energy only contributes 5%; and other renewable energies as hydro power (1% contribution), wind energy, biomass (9% contribution), solar energy (Pegels, 2010: 4945).

There various arguments around nuclear, both for and against. The proponents of nuclear energy argue nuclear is clean alternative to coal. For the opponents of nuclear, this type of energy is neither clean nor an affordable alternative. They argue that prosperity depends on supplies of emission-free and safe energy (Duffy, 2005: 536).

In some European countries, the expansion of nuclear is preferred due to its potential to reduce dependency on imports of fossil fuels, especially natural gas from the Middle East and Russia (Van der zaan, 2002). Williams (2015: 89) argues that there are a number of positives linked to the use of nuclear energy that need to be taken in to consideration. He further argues that nuclear energy is the least polluting, along with renewables such as wind, solar, hydro and biomass, and has a substantial lifespan. For example, Koeberg reactors are still in operation after 30 years and have an estimated life span of 40 years in total (Williams, 2015: 89).

In many countries of the world, nuclear energy industry has been targeted as a key area for investment for both environmental and economic reasons. The proponents of nuclear energy argue that energy generated from nuclear has environmental benefits due to reduced Co2 emissions, and can act as a driver of significant, positive economic growth through continual innovation (Wei, Shana, Daniel and Kammen, 2009). Nuclear energy can create many jobs, and additionally, many of these jobs are guaranteed to stay domestic as they involve construction and installation. It is for this reason that nuclear energy competes for a space in the energy supply circuits. For Wei et al (2009) low carbon energy sources such as nuclear are gaining attention as there are global efforts being made to reduce carbon emissions.

In contrast, other arguments point to the negative impacts of nuclear energy. For example, Beck (1997) argues that nuclear energy is highly contested as its generation bears a considerable amount of controversy over the possible risk posed to society. The production of nuclear is dangerous and often associated with risks. It requires inputs that are not necessarily 'clean'. The radioactive waste produced by nuclear industry has a significant impact to public health. There is also a problem of long-term nuclear waste storage. Many nuclear countries resort to using seas and oceans as alternative dumping sites, which exposes marine life to danger through contamination (Beck, 1997).

The most common fuel for nuclear is uranium. Processing uranium requires mining, enrichment and fuel fabrication, all of which use significant quantities of water.

Furthermore, mining uranium also produces waste that can contaminate local water sources, and which can be especially dangerous given the radioactivity of the materials involved. Uranium mining consumes one to six gallons of water per million Btus of thermal energy output while processing consumes seven to eight gallons of water (Union of Concerned scientists, 2012). Nuclear energy consumes large volumes of water as compared to alternative sources of electricity.

Nuclear power plants require lots of water for normal cooling as well as for normal operation. In the event of serious accident, such as overheated reactor, nuclear power plants draw significant amount of water from natural water sources than any other alternative source of electricity. This process poses a serious challenge to wild and marine life. For example, fish and other wild life get caught in the cooling system water intake structures. (Union of Concerned Scientists, 2012).

In relation to the cost of nuclear project, a report by Greenpeace international argues that 'the cost of building a nuclear reactor is consistently two to three times higher than the nuclear industry estimates. In India, for example, the country with the most recent experience of nuclear reactor construction, completion cost for the last ten reactors have, on average been 300% over the budget. Over the years, billions of dollars of taxpayers' money has been poured to nuclear energy, compared to trifling sums that have gone promoting clean, renewable technologies' (Greenpeace international, 2009).

In South Africa, the trade unions such as National Union of Mineworkers (NUM) argue, that there will be incremental job losses as a result of the increase in highly skilled labour required for nuclear energy procurement away from labour-intensive coal mining (Williams, 2015:89). Williams (2015:89) further notes that "a report by Greenpeace states that the global demand for coal will drop as a result of the rise in carbon emission standards and that has already been evident in South Africa with annual reductions in production of roughly 5%". Subsequently, this would mean that jobs in the coal sector, as well as in power generation will inevitably decrease

South Africa's key government parastatals in the nuclear industry are Eskom and the South African Nuclear Corporation (NECSA). The state owned nuclear enterprises control the three major nuclear facilities: Koeberg, owned and operated by Eskom, and the two Necsa facilities, at Pelindaba west of Pretoria, and the Vaalputs, Southeast of Springbok in the Northern Cape (Van wyk, 2013).

Rationale of the study

The main aim of the study is to analyse opposition to nuclear, focusing on organisations opposed to nuclear energy programmes in South Africa. The study looks at the organisations of those opposed to nuclear programme; such as Earthlife Africa, Greenpeace, National Union of Mineworkers, independent researchers, Southern African Faith Communities Environmental Institute (SAFCEI), Coalition Against Nuclear Energy (CANE), Council for Scientific and Industrial Research (CSIR) and civic activists. The study is motivated by growing opposition embedded within anti-nuclear movements and political parties, and the South African government's urgency to expand nuclear programs. South Africa's call for nuclear energy provokes a controversial debate characterised by a conflict between nuclear proponents and anti-nuclear activists. The controversy provoked the reaction of non-governmental environmental organisations such as Earthlife Africa, South African Faith Commission Environmental Institute, political parties, trade unions and other important organisations. While nuclear proponents claim that nuclear energy is safe, clean and cost-effective, organisations opposed to nuclear argue that nuclear energy is too costly, dangerous, not economically viable and does not create jobs.

Among these organisations is Earthlife Africa, a non-governmental environmental organisation standing against South Africa's nuclear energy programmes. The organisation claims that the nuclear energy project is not in the economic interest of the country. Moreover, it argues that the programme is intended to serve the interests of a small group of elite business people and politicians (du Venage in National Business, 2017). Moreover, du Venage (2017) points out that the nuclear deal is being championed and fuelled by a cabal of business and political individuals that stand to gain financially. Moreover, these include the country's former president, Jacob Zuma and the Gupta brothers (Ajay, Atul and Rajesh). In order for the government to proceed with the nuclear procurement plans, it has to overcome the ferocious opposition from various organisations, civil society and other significant anti-nuclear activists. The research objective is to analyse opposition to South Africa's nuclear energy programme, focusing on organisations opposed to nuclear energy.

The research is guided by the following questions:

- What are the organisations opposed to nuclear?
- Do these organisations form networks among themselves to coordinate their opposition to nuclear?
- What are the objectives of these organisations in relation to nuclear build programme?

Chapter outline

The study is divided in to six chapters. Chapter one, the introductory chapter, presents an introduction and background information of the study. Chapter two presents an overview of the literatures that have been reviewed in global and local contexts. This section of the research report reviews literature around nuclear energy.

Chapter three presents the research methodology. It narrates how the research was conducted and explains how each method was applied in order to achieve the objectives of the study. Chapter four, five and six each present an analysis of opposition to nuclear energy in South Africa. These chapters discuss the arguments put forward by groups opposed to nuclear energy in South Africa. They also involve the integration of the findings of the study with literature.

Chapter Two:

Literature review

This chapter reviews some of the literature in relation to nuclear energy. The framework of the research report includes literature to highlight on the history of nuclear energy, nuclear energy policy, social movements, environmental justice in South Africa, arguments against nuclear energy, the political discourse shaping South Africa's nuclear technology and a brief examination of nuclear court case.

International history of nuclear energy

Narrating the history of nuclear energy, Bretschger and Zhang (2017:167) note that in the past decades, nuclear energy has contributed a considerable share to total electricity generation, most notably in Europe, the U.S., Japan, and South Korea. In 2010, 19 European countries had at least one nuclear power plant in operation and many relied substantially on nuclear energy, such as France (74.1%), Switzerland (38%), Germany (before decommissioning, 28.%) and the UK (nuclear share 15.7%).

In France, the need for nuclear power was underpinned by the notion the country had poor traditional energy reserves. France's dependency on foreign imported oil to respond to the energy needs sparked the country's need to find alternative energy sources. French interests in nuclear date back to 1945. Following the installation of the experimental reactor at Zoe in the Paris region in 1948, substantial deposits of uranium were discovered in Limousin (Mariam, Boyle and Robinson, 1981:301). However, the then challenges of French nuclear programme were the critiques levelled against nuclear programs within anti-environmental movements and local people who felt threatened by nuclear installations.

Dawson (1996:1) notes that numerous countries, including the US, UK, Germany, France, and Japan adopted ambitious programs to dramatically expand their reliance on nuclear power in the early 1970's. However, all of these governments found themselves confronted with substantial and often popular opposition to their chosen path.

For Davies (2011: 1940), "the devastating Fukushima nuclear accident that happed in Japan on the 11th of March 2011 changed people's perceptions towards nuclear energy. The accident occurred after a 15-metre tsunami disabled the power supply and cooling of three Fukushima Daiichi reactors, causing a nuclear accident. A nuclear

meltdown in such a densely populated, well developed nation could scarcely do anything less than utterly transform how nuclear energy would be seen, used and not be used for years to come" (Davies 2011). In other words, this was the immediate reaction to the accident.

Davies (2013:1) notes that in the months after Fukushima, some nations announced their decisions to forsake nuclear energy, Germany most prominent among them. Drawing from the Fukushima disaster, Davies' article uses the tragedy at Fukushima Daiichi as a vehicle to critically analyse the role that disasters play in nuclear energy policy.

While the need to expand nuclear energy seems to grow rapidly in some countries, its popularity in relative terms decreased since the catastrophic nuclear accident in Fukushima and Chernobyl. Chernobyl nuclear accident occurred in April 26 1986 following the explosion of reactor from the four plants. This highlighted the vulnerability of nuclear power plants and the economic consequences of the accident (Bretschger and Zhang (2017:167). Moreover, this event has, according to Brestchger and Zhang (2017:167), refuelled the discussions on external cost and led to considerable tightening of security standards.

Although a few of these countries, particularly France and Japan were able to insulate nuclear decision making from public opposition, and thus permit the continuation of their expansion programs, most of these democracies were overwhelmed by an explosion of popular fear and mistrust. Furthermore, in the United States and across much of Western Europe, citizen mobilisation proved highly successful in the past in forcing government and industry to abandon plans for the expansion of nuclear power (Dawson, 1996)

From 1988 to 1990, anti-nuclear activists were unexpectedly successful in pressurising the proponents of nuclear programmes. In Lithuania, for example, plans to expand the republic's sole nuclear power were cancelled; while in Armenia the only operating nuclear power station was completely closed (Dawson, 1996: 3). In Russia and Ukraine, plans for one new project after another fell in the face of overwhelming popular opposition, and construction projects under way already were suspended or occasionally halted completely.

Narrating the history of nuclear energy in South Africa, Fig (2004:13) does not overlook the role the nuclear industry played in creating nuclear weapons of mass destruction to defend the apartheid regime. Under the apartheid regime, the nuclear industry received

billions of Rand in subsidies, and was protected as part of the military establishment. Equally important, this tradition of secrecy continues even in the democratic South Africa (Fig 2004:13).

Discussing nuclear energy, Fig (2004) acknowledges that the establishment of Koeberg under the apartheid government was done with little or no public input, which sparked mass public outrage resulting in the start of anti-nuclear campaigning. In this regard, any further move to implement the 'stop-start' (progressing with interruptions resulting to discontinuity of plans) nuclear plans may need a sound justification

This secrecy and undemocratic decision-making in the nuclear industry go back to its roots, most notably, in the development and use of weapons of mass destruction. Fig further acknowledges that "the first objective of nuclear industry was to make bombs" (Fig 2004:13). In the mid-1950s nations started realising the possibility of generating electricity from nuclear energy. Nuclear has long received attention and support from members of the South African society, with the apartheid architect Hendrik Verwoerd one of those (Fig 2004: 15).

Van Wyk (2013:1) acknowledges that South Africa was the first country to own and operate a nuclear reactor and a nuclear power station in the entire continent. Moreover, South Africa is also the first country to develop nuclear weapons programme that produced nuclear devices (Davies 2013:1).

Davies (2013) notes that the South African government owns and operates three nuclear reactors, namely, a research reactor SAFARI-1 and two nuclear power reactors Koeberg 1 and Koeberg 2. The latter have been operational since 1984.

Contours of arguments against nuclear energy

According to Fig (2010), nuclear power has long been questioned for reasons of health, environment, proliferation, expense, opportunity cost and governance. In the health aspect, radioactivity has affected the health of workers in the industry, as well as the general public, particularly when it spreads after an accident such as Chernobyl. Furthermore it is often criticised for its great dependence on subsidies, its exemption from insurance liabilities and for overruns in cost and construction time, as David argues that cost and construction overruns have often been a typical feature of the nuclear industry. While other sources are less radioactive, cheap and affordable.

The experience of nuclear energy development in many countries provides a cautionary tale. Nuclear energy development has often faced serious political opposition from left and right, high costs that no one is willing to absorb as well as changing technology that even some scientists cannot agree on, and risks of waste management. (Yi-chong, 2010:8). Energy issues often pit one group of interests against another. Moreover, energy companies stand to benefit from high energy prices while the end-users affected by the high price of inputs may lose their margins of profit and or even their livelihoods.

The devastating 2011 Fukushima nuclear accident also fuelled the objections to nuclear energy. Tsunami waves generated by the main shock of the Japan earthquake on 11th of March 2011, damaged the backup generators at the Fukushima Daiichi plant. Although all three of the reactors that were operating were successfully shut down, the loss of power caused cooling systems to fail in each of them within the first few days of the disaster. The disaster captured the attention of the public. Indeed as Davies (2013:1) notes that in the months after disaster, some nations announced their decisions to forsake nuclear energy, Germany most prominent among them. This implies that the disaster challenges countries intending to go nuclear to take informed decisions.

Moreover, the nuclear industry is often criticised for its dependence on subsidies, its exemption from insurance liabilities and for overruns in costs and construction time. In South Africa, the nuclear industry is often criticised for resembling the elements of the apartheid regime in decision-making processes. For Fig (2005), there is a tradition of secrecy in the post-apartheid nuclear industry. This tradition undermines the importance of the public consultation, transparent channels of communication and the constitution in decision making process.

In 1991, South Africa concluded two major international nuclear-related agreements, namely the ratification of the NPT (10 July 1991) and the conclusion of a Comprehensive Safeguards Agreement (hereafter the Safeguards Agreement) with the IAEA (16 September 1991). The latter agreement was preceded by the approval of the dismantling of South Africa's nuclear weapons programme by President F W de Klerk in July 1990 and the removal of all highly enriched uranium from the country's nuclear weapons by 6 September 1991 (Van Wyk, 2012).

The South African nuclear procurement plan has provoked different political views. Indeed as Gosam (2017) notes the nuclear programme glows with controversy. According to

Peter Attard Montalto, an emerging market economist, the nuclear programme is Zuma's pet project and is highly interwoven with politics (Gosam 2017). For Professor William Gumede, the nuclear energy programme is being implemented from the patronage point of view. That is, the power to control or the right to privileges (Gosam, 2017).

In a constitutional democracy, a nuclear procurement should be transparent, logical, considered, legal participatory, and unbiased (Gosam 2017). While South Africa is a democratic country, Gosam (2017) acknowledges that Zuma has assumed personal control of the nuclear programme, and it has been characterised by: secret meetings; undisclosed documents and classified financial reports, deceit; damage control exercises; refusal of public consultation; the removal of any government opponents, the most notable of whom was Nhlahla Nene as the finance minister removed by former president Jacob Zuma following his passivity in endorsing the nuclear build. This then drew the attention of Anti-nuclear activists in to questioning these undemocratic ways of communicating the South Africa's nuclear plans.

The question of who will benefit from the nuclear energy is at the heart of the nuclear energy politics in South Africa. In answering the question, a report by the independent researcher Brenda Martin and an African energy scholar, Dr David Fig, noted that in July 2015 Jacob Zuma was a firm advocate of nuclear power supply and has made it clear since 2010 that the nuclear power investment in South Africa is non-negotiable (Gosam, 2017).

The signed agreement between Russia and South Africa provoked a reaction from the policy makers. According to Gosam (2017) policy makers have also expressed grave concern over a 2014 agreement between the two nations indicating that Russia would supply South Africa with nuclear technology on the expense of tax payers' money. These policy makers are concerned about that the agreement which is said to contain clauses that are against the country's national interest, is in conflict with the constitution, and leans heavily in Russia's favour (Gosam, 2017). The deal apparently shows that Russia would benefit through long-term loan repayments while South Africans would carry the burden of cost recovery.

For South Africa's nuclear industry to remain alive, it needs to gain a new momentum in the 21st century, and in post-apartheid South Africa. The industry has to face criticisms of expansion of additional nuclear power plants. Firstly, the development of nuclear energy

program as a cheap, safe and environmentally sound energy crumbled in the 1970s and 1980s due to its impacts on the environment, health and financial aspects. Secondly, the world has entered the new century with problems of debt, contamination and intensified risk to human health (Fig, 2015). Moreover, these problems are then used by anti-nuclear activists to strengthen and justify their oppositional efforts.

After the nuclear disaster in Chernobyl (1986), it seemed that the nuclear industry would be phased out (Fig, 2005). However, many countries continue to have a growing interest in nuclear energy, with South Africa as of those, despite the arguments that it had not delivered safe, clean and cheap power as promised. Even though South Africa's government has insatiable appetite to go nuclear, it is not immune of opposition.

Such conditions is, how does anti-nuclear movement go forward? It has to persuade policy makers that other non-nuclear energy solutions are risky (Fig, 2005). Persuading policy makers would then push the government to follow the paths it had ignored before, particularly transparent communication of the decisions and adhering to the constitutional rules. Fig (2005) argues the industry cannot convince the private sector to invest in new reactors. As such, it has to convince the politicians to fund parastatals, which in actual fact operates on taxpayers' money and it makes it open to public pressure.

Since South Africa is a democratic country, this has to be done when the public is prepared to accept possible risks. If this approach happens to be detrimental to the industry's plans, then it might wittingly or unwittingly seek to operate where democracy is relatively week or absent with the public opinion uninformed or muted (Fig, 2005).

Social movements

One of the tasks of this research report is to conceptualise social movements, in the context of the South African nuclear issue. Organisations opposed to South Africa's nuclear energy programme provide a basis for an analysis of the arguments made on behalf of opposition to nuclear energy.

The concept of "social movement" is conceptualised in various ways by different scholars. For Death (2014: 1217) a social movement refers to a sustained expression of collective action which is undertaken to challenge the elites and change society in a broad or fundamental ways. Voss and Williams (2011: 2) suggest that the significance of social

movements is their potential to build participatory democratic mechanisms for economic, social and political justice.

In the late 1960s, the world was undergoing, deep dramatic transformations (Porta and Diani, 2006:1). These transformations saw the new emergence of social movements such as the American civil rights and anti-war movements; the May 1968 revolt in France, students' protests in Germany, and the early signs of the new women's and environmental movements. (Porta and Diani, 2006:1). In essence, collective movements constitute an extension of the convention forms of political action. Following their interests, organisations and movements have an essential role in the mobilisation of collective resources on which the action is founded (Porta and Diani, 2006:14)

In the nuclear industry, the first notable grassroots opposition to nuclear plants occurred in 1956 over the construction of the Enrico Fermi experimental fast breeder reactor at Lagoona beach, Michigan in the USA. In 1961 a proposed plant at Bodega Head, 50 miles north of San Fransisco, sparked local opposition centred on damage to a unique natural coastal environment and on possible safety hazards arising from the proximity of the site to the San Andreas fault line. (Kasperson, Berk, Pijawka,Sharaf and Wood, 1980)

In France and Germany, nuclear opposition evolved from local opposition in the early 1970s to massive demonstrations and violent confrontations with the police. The courts were significantly involved. The issue also generated hundreds of new citizens' groups: environmental organisations that sought to oppose the construction of nuclear projects and the decision made at governmental levels (Nelkin and Pollak, 1980: 129).

According to Flegel (2003:107) the anti-nuclear movement in Germany is linked to the most important social movements of the 20th century, namely the ecological, the women's and the peace movements. It is structured as a network of like-minded individuals and groups with a collective identity, trying to accomplish a fundamemtal change of the energy system using a multitude of formal and informal advocacy techniques. Their goals include amongst other things the protection of the environment and public safety.

Before decommissioning, the German anti-nuclear arguments were mostly economic. Nuclear energy was considered cheap, reliable and innovative, thus spurring economic growth. It was then made clear that the cost of nuclear energy is far higher than expected, rendering it very expensive (Flegel, 2003: 108). In Germany, anti-nuclear movements started to be equated with various other arguments. Flegel (2003:108) argues that, these

included arguments that the structural conditions of nuclear programmes lead to a concentration of economic power thus diminishing public regulative influence. Nuclear energy brings new challenges for safety at work and the local economy is endangered by nuclear facilities. Consequently, farmers may lose their land and fear contamination of their soil. Nuclear also poses a threat to marine environment. People who rely on fish as their source of food and income fear the death of fish, due to increasing temperatures in water (Flegel, 2003:108).

Ecologically, the German anti-nuclear movement had been concerned with nuclear facilities' potential to threaten the environment. Nuclear power plants have had an influence on water balance and the ground water, by extracting huge water resources. A small nuclear plant in Rheisberg, German, for example needed 290 million litres of water for an installed capacity of only 70MW per day. The water was taken from a lake and put back after use. Thus, upon return the water could be 10 degrees warmer than its original temperature which changed the ecological system as well as the local climate (Flegel, 2003: 108).

Before decommissioning, the German nuclear programme needed a favourable political climate, as this capital-intensive technology require state support and coverage particularly subsidies. Such climate was provided in Germany by government committees as well as public and private experts, who worked in close contact with nuclear corporations. It also requires secrecy, because of civil opposition (2003:108). However, the political climate became much less favourable after Fukushima, contributing to decommissioning

In Hungary, Green Future is a local environmental movement in one of the Budapest's districts, located in the outskirts of the capital. It started off as local the Green club in the district centre in the mid and late 1980s (Pickvance, 1997: 37). The existence of several severe environmental problems in the district, which most of the population was not aware of, provoked the creation of Green future. Those who had more access to information, such as doctors and engineers, gave the first eye-opening talks in the Green club (Pickvance, 1997:37). This attracted a larger and larger audience and led to further recognition of the need for investigation by local people. It was discovered that many firms were heavy polluters in the district and that one of them constituted an especially serious danger to all living nearby (Pickvance, 1997:37).

This drew the attention of the Green Club members. They organised an environmental movement to do something about the appalling situation in the district. Green Future achieved remarkable successes. The major polluting firm was closed down and the local council was given extra money to aid environmental movements. For Pickvance 1997: 38), social movements like Green Future have also taken up other responsibilities which includes among other things educating people, especially young generations to ensure that environmental consciousness will strengthen in the future.

Nuclear energy post-Fukushima

The 2011 Japan earthquake shocked the world. The disaster not only resulted in causalities on a massive scale, but also produced outpourings of fear as people around the world followed news of radiation realised by a nuclear meltdown in Fukushima (Fauzan and Schiller, 2011: 7). For Fauzan and Schiller, (2011: 7), the earthquake and the ensuing tsunami hampered the management of cooling systems in three reactors at the Fukushima Daichii plant after a sudden loss of external power.

The meltdown of the nuclear reactors in Japan, a nation known for its technological discipline and savvy triggered a concern over the safety of nuclear energy around the world. And many believed that if such an accident could occur in Japan, the possibility of similar disaster occurring elsewhere was equally, if not more, likely. Subsequently, public protests and movements erupted on a global scale as the disaster unfolded (Fauzan and Schiller, 2011:7).

As one of the many nations looking to acquire nuclear energy capability, Indonesia has undoubtedly been affected by Fukushima. Indonesian nuclear proponents had faced resistance from civil society groups even before the fall of the authoritarian new order regime (Fauzan and Schiller, 2011: 8). Fukushima has had an impact in their agenda. The continuing Fukushima press coverage facilitated the spread of critical anti-nuclear messages to many grassroots communities. It has significantly spurred deep cleavages of opinion among policy makers (Fauzan and Schiller, 2011:8)

In Indonesia, popular resistance against the nuclear programme surfaced in the 1990s followed by the establishment of several anti-nuclear groups such as the Institute for Anti-nuclear Coordination and Secretariat for Anti-nuclear Information Exchange (SEKIAN), mainly NGOs led by intellectuals. With the support of intellectuals many NGOs began publishing books outlining the critical opposition to nuclear power plants (Fauzan and

Schiller, 2011:14). Many Indonesian anti-nuclear groups such as Greenpeace Indonesia, an anti-nuclear group that brought to the agenda nuclear campaigning capable of bringing the national environmental issues to the attention of local communities (Fauzan and Schiller, 2011:15).

The organisation began publishing comics summarising its arguments to attract the support of young generations. With reliance to the Fukushima disaster Germany set 2020 as a stop date for operation of all its nuclear reactors. The Italian people too, chose to follow suit and bring an end to their country's nuclear plans (Fauzan and Schiller, 2011:28).

The future of nuclear energy in most countries is likely to be much changed after ramifications of the Fukushima accident are fully considered. Despite the negative impacts of Fukushima disaster there will be safety benefits from the lessons learned (Hore-lacy, 2011: 945). In reaction to the impacts of the Fukushima disaster some Western countries started questioning the safety of their nuclear reactors. The Fukushima disaster affected the health and environmental life owing to high levels of radioactive waste. In Japan, quite a good number of inhabitants living in proximity to the plants had to be evacuated to mitigate issues of radioactive exposure. Many inhabitants lost their lives in connection with the nuclear explosion (Hore-lacy, 2011: 945).

Hore-lacy (2011: 946) argues that there will be more lessons to learn from Fukushima. Apparently, nuclear reactors in every most countries must have post-shutdown cooling reliably to guard against unforeseen dangers of the nuclear, and other vulnerabilities addressed even after most environmental events (Hore-lacy, 2011: 945).

In 2011, the ANC restated its plans for nuclear build three days after the accident in Fukushima. South Africa's nuclear build programme suggests building six nuclear plants to add 9.6MW of capacity to the current national capacity about 40 GW. The programme refers to the 2010-2030 country's electricity plan, the Integrated Resource Plan (IRP) that outlines South Africa's future until 2030. Nuclear power counted as an option to help reduce greenhouse gas emission along with renewable energy (Rennkamp and Bhuya, 2016).

The original IRP was grounded in higher assumptions of economic growth than in reality, which translated in to a higher power supply demand. It also stated clearly the growth assumptions have to be revised in future. The IRP update report revised the lower electricity demand and lower growth assumptions. It established several scenarios taking

alternative electricity generation technologies and prices in to account (Rennkamp and Bhuyan, 2016:4). In relation to nuclear, the updated IRP has recommended the delaying or abandoning the nuclear build programme, if the nuclear build programme does not unfold accordingly (Rennkamp and Bhuyan, 2016:4).

South Africa's Nuclear energy policy

The nuclear energy policy is an important part of this research report because it provides a basis to understanding the government's commitments and ambitions within the energy sector. Energy policies underpin most governments' plans to expand their energy insustries. In 2008, the Department of Minerals and Energy published White Paper for Energy Policy. The policy serves as an embodiment of South Africa's commitment to the expansion of the existing nuclear energy sector. The policy aims to position the South Africa's energy sector in to globally competitive use of innovative technology (DME, 2008: 1).

South Africa's energy-intensive economy largely depends on the exploitation of the country's mineral resources. Coal accounts for over 90% of the total electricity generation capacity particularly because of the abundant coal deposits in the north eastern parts of the country. This resulted in the need to build new nuclear power reactors. The first nuclear power station was built in the Western Cape during the 1980s in order to ameliorate the situation. This nuclear power plants only accounts for 6% of the electricity generated in the country (DME, 2008:6).

According to the DME (2008:6), concerns over increases in the price of coal, reserve exhaustion and global warming as a result of greenhouse gas emissions necessitate a departure from the overreliance on electricity generated from coal. The policy commends nuclear energy as a strategy for a continued fight against greenhouse gas emissions and global warming.

Within the policy DME (2008:7) finds nuclear energy attractive for some reasons. First, South Africa has a sizeable uranium reserves and a vibrant mining industry. Second, the country has a solid regulatory framework, which could facilitate a structured development of the nuclear sector. Third, nuclear energy can be trusted for emitting low carbon as compared to fossil fuels.

The political discourse shaping South Africa's technology decision

The estimated cost of the nuclear build programme in South Africa is the most controversial issue in the current debate around nuclear energy. Many opponents of the nuclear build programme tend to question the affordability of energy generated from nuclear, while the supporters affirm the affordability of the programme. The polarizing debate on cost emerges from the estimates available publicly and the lack of cost assessment for the South African programme (Rennkamp and Bhuyan, 2016: 10).

The contested price tag of South Africa's nuclear energy build programme caused major debates within the government and other energy stakeholder network. Several African National Congress (ANC) internal issues to addressing the late 2000s energy crisis emerged from this issue. The controversial dismissal of Finance Minister, Nhlahla Nene, had its roots in the critical eye on the build programme, among other issues (Rennkamp and Bhuyan, 2016: 11). The previous Minister of Finance, Pravin Gordhan, committed to funding only projects that fall within the budget, while the then president Jacob Zuma stated in his state of the nation speech in February 2016 that procurement will be done on a scale and pace that South Africa can afford.

The Minister of Finance, Nhlanhla Nene stated repeatedly that the nuclear energy will be affordable and it had calculated the cost of the build programme, but cannot release any build cost estimate (Gqirana 2015). The debates on the cost of nuclear closely relate to the power battles internal to the ANC's political authority, as Sovacool and Valentine (2012) put it. In a party system with ANC nearly two-thirds majority, internal opposition creates substantial checks and balances. Traditional opposition work from opposition parties is limited, however, they are unlikely to win a national election and threatened the power position of the ruling elite (Rennkanp and Bhuyan, 2016: 12).

According to Rennkamp and Bhuyan (2016:12), the debate on cost also relates to the concept of 'interventionism'. The proposed new nuclear plants would reportedly be the largest public expenditure in the history of the country. For its success the public procurement will have to correspond to Constitutional rules such as the following: value of money, open and effective competition, ethics and fair dealing, accountability and reporting and inquiry. The rule correspond to the government's Black Economic Empowerment (BEE), which targets disadvantaged groups of individuals, businesses, and local producers (Rennkamp and Bhuyan, 2016: 12). Inequalities in ownership of South

Africa's asset base continue to be a major structural problem, something that this aims to correct.

Job creation is another contested impact of the nuclear build. The pro-nuclear activists use this argument frequently in support of the programme. The debate on job creation questions who the beneficiaries of the jobs created in this programme would actually be. The former Energy Minister, Dipuo Peters, saw job creation potential along the value chain including uranium-mining sector. Yet the controversial Gupta family acquired a uranium mine, but required additional funding to operate it (Rennkamp and Bhuyan, 2016: 13). Greenpeace argues that job creation in nuclear build programme is unlikely, as the technology is highly specialised. COSATU argues along similar lines, the nuclear programme will have minimal effects on South Africa's unemployment crisis.

Safety concerns are contested on. Many nuclear opponents use this argument along three lines. The first refers to the risks of nuclear accidents, which can be caused by human error and natural disasters and make the technology inherently unsafe. NGOs such as Greenpeace argue that there is lack of regulatory capacity to deal with nuclear accidents like Fukushima alongside the lack of nuclear engineers to operate the system safely.

Yet nuclear proponents argue that Koeberg has operated safely for 30 years. Safety and environmental concerns motivated numerous local and international NGOs to engage publicly in the discourse of nuclear energy. Environmental organisations such as Earthlife and Greenpeace produced studies to inform the debate (ELA and Greenpeace).

There are a number of local organisations, including the Koeberg Alaert Alliance and environmental organisation Bantamsklip that tackle the immediate consequences of nuclear power plants near major urban areas. Yet civil society engagement remains largely at the small scale of individual research, publications, and media interviews. There is minimal awareness campaign that brings the possible implications of nuclear energy regarding the cost and safety in to a wider public domain (Rennkamp and Bhuyan, 2016: 14)

The fact of 'social peripheralisation' implies that NGOs are only marginally influential in the political discourse (Rennkamp and Bhuyan, 2016). The South African NGOs are the only substantial component of the coalition of opponents and civil society organisations actively involved in the public discourse on the nuclear programme. Sixteen NGOs represent a population of 55 million people and their focus is mainly on knowledge

production, media outreach and local initiatives but there are no visible nationwide campaign that extends across all provinces and communities (Rennkamp and Bhuyan, 2016: 14). This implies that anti-nuclear activists ought to increase their visibility at a national level to ensure that a larger audience is well informed and that they are well aware of this whole nuclear debate.

Environmental justice in South Africa

Just like in other countries, environmental movements happen in response to environmental injustices and grievances (Death 2014: 1229). Hallowes (2011:1) argues that environmental injustice is evident in South Africa in that the rich receive the major benefits of development while the poor bear the brunt of environmental degradation. In the 2002-2008 reports by GroundWork NGO, Hallowes (2011:1) notes that there are three ways in which environmental injustice is imposed on people. Firstly, people are polluted, and their environments are degraded. Secondly, people are displaced and common resources or public goods are privatised. Lastly, people are excluded from the political and economic decisions that lead to their being polluted or displaced.

Opponents of the nuclear build argue that environmental injustice continues to reproduce itself in the South Africa's nuclear industry. The criticism levelled against the government by some NGOs argue the continuation of environmental injustices in the country. For example, the government's decision to go nuclear seems to undermine public consultation as one of the key elements in decision making processes of issues concerning the public. Moreover, organisations such as ELA argue that the nuclear programme is intended to serve the interest of a small elite while excluding the interests of communities (Collins, 2016). In an environmental context South African communities adjacent to nuclear waste dump site in Namaqualand (Northern Cape), where Koeberg dumps its waste, face the spectre of high levels radioactive waste which poses a threat to their public health. Yet the host province of plants remains least susceptible to the impacts of these radioactive wastes.

For Dawson and Sinwell (2012:3) South Africa is an interesting context in which to contest transformation and problematize resistance, since it is one of the unequal countries in the world and has recently been dubbed the protest capital of the world. In other words, there is evidence of resistance efforts in South Africa. From the late 1990s social movements such as the Anti-Privatisation Forum (APF), the Anti-eviction Campaign (AEC), the

Landless People's Movement (LPM) and Abahlali BaseMjondolo (ABM) forged alliances with community-based organisations in poor communities in order to provide a non-institutional space in which activists could contest the legitimacy of the ANC and fight against the effects of neoliberalism (Dawson and Sinwell 2012:3).

To this day, social movements continue to play a significant role in the fight against environmental and social injustices. The continued efforts of some environmental justice movements in South Africa to stand against the expansion of nuclear energy programme marks the progressive evolution of social movements. ELA, SAFCEI, CANE South Africa, just to mention a few, are among the organisations opposing nuclear energy.

Another strong opponent to nuclear is Coalition against Nuclear Energy (CANE). CANE has been formed as an umbrella group comprising community organizations, residents' associations, NGOs, academic, professionals, unionist, environmentalists and ordinary citizens now grappling with spectre of nuclear developments in their back yards. These actors represent a groundswell of ordinary people who want government to act democratically in seeking alternatives to energy crisis and climate change solutions (CANE, 2007). Furthermore, most of these communities are concerned about the unnecessary and heavily subsidized costs, as well as issues around nuclear safety.

The Koeberg Alert Alliance (KAA), a group of organizations and individuals, are concerned about the nuclear reactors at Koeberg, and opposed to the building of further nuclear reactors at Koeberg (KAA, nd). Anti-nuclear struggles are not necessarily new to South Africa. KAA was initially formed in 1983 and started out as a local campaign against South Africa's nuclear programme, in particular the construction of Koeberg nuclear power station

COSATU is also strongly opposed to South Africa's nuclear energy plans. This is evident in its July 2015 statement which reiterates its concerns as raised by its affiliate, NUM. COSATU's critical view of nuclear point to the notion that South Africa does not have skills and expertise to undertake the nuclear project. As a result the country would have to import experts to meet the skills demand of nuclear energy generation (Mabasa, 2015). In COSATU's view, the introduction of nuclear will have minimal effects on addressing the unemployment crisis of South Africa

A 2012 report by ELA indicates the National Development Plan is opposed to the government's nuclear plan. ELA further notes that "the national development plan for

2030, national planning commission has given a country a view of energy future different from that of the Department of Energy". This difference comes about, primarily, with its position on nuclear power (earhlife.org.za P1).

While DoE is pushing ahead with its large scale nuclear build, the National Planning Commission has raised objections on this 9600mw build, mainly because of its financial consequences. Moreover, the National Planning Commission has pointed out that purchasing new nuclear plants will have great financial risks by spending money that is required for poverty alleviation (earthlife.org.za). In 2016, the Council for Scientific and Industrial Research proposed an electricity mix for the integrated resource plan which excludes nuclear power to 2050 (Wright, Bischof-Niemz, Calitz, Mushwana, van Heerden, Senatla and CSIR, 2016). The CSIR's energy mix proposal received the greatest support from one of the major opposition parties, the Democratic Alliance.

From the political point of view, South Africa's nuclear plans face serious opposition from the major opposition parties. The 2016 Economic Freedom Fighters' (EFF) statement on the Medium Term Budget clearly indicates its stance on nuclear debate. In EFF's view, handing over the nuclear programme to Eskom places it at the door step of the Gupta criminal syndicate, which currently controls the leadership of Eskom, particularly its CEO Brian Molefe. Following this, the EFF argues that the nuclear build programme must be abandoned.

For the DA, the agreement entered between Russia and South Africa to expand the nuclear industry was without the correct process being followed and raise serious questions relating to potential corruption given the personal involvement of the President. Furthermore, the DA argues that the nuclear project is a project of state capture for personal benefit of the connected few and open doors for corruption (DA, 2017).

South Africa's nuclear court case: the defining moment

The South African nuclear energy court case sits as a defining moment of the polarised nuclear issue. The controversial nuclear energy programme culminated to a point where, in October 2015 ELA together with SAFCEI, launched a court case, with which they sought to challenge the government's decision to contract for new nuclear power plants without debating first in the parliament, thus undermining the democratic process (Peyper, 2017). The case has been pivotal in exposing the government's proposed 1-trillion nuclear deals which they believed were entered into unlawfully and secretly.

ELA and SAFCEI submitted an affidavit to the Western Cape High Court (Collins, 2016). In the affidavit, these organisations argued that the government's agreement with Russia to supply South Africa with multiple nuclear power plants was both unlawful and unconstitutional. Philiphine Lekalakala, the coordinator of ELA, states that "the decision to proceed with procuring these nuclear power plants has occurred without any necessary statutory and constitutional decisions having been lawfully taken" (Collins, 2016).

In response to ELA and SAFCEI, the government opposed the application saying that the nuclear programme was a policy direction adopted by government to establish a self-sufficient nuclear industry for the industrialisation of the country (Collins, 2016).

The final ruling was made in the Western Cape high court by Judge Lee Bozalek who ruled that South Africa's deal with Russia to build nuclear reactors was unlawful, forcing South Africa to go back to its drawing board (Naki and Simnikiwe, 2017).This implies that the government is confronted with challenge of having to start everything afresh if they are unable appeal the ruling.

This includes following proper regulatory processes, environmental impact assessment, respecting the democratic process and considering the constitution. However the question of whether this is the end of the battle cannot be simply answered. The ruling of the judge which favoured the complainants saw the nuclear energy programme halted. To this day, the nuclear energy programme in South Africa is still on hold with no visible signs of pushing ahead with the plans.

Chapter Three:

Research Methodology

In this chapter I discuss data collection method, data analysis process, ethical issues that were used in this research. The interviews were conducted in the following places: Johannesburg and Randburg. A total of ten anti-nuclear activists were interviewed and this figure constituted four independent researchers and six coordinators of NGOs standing opposed to SA's nuclear programme

The research approach utilised in the study is qualitative in nature. Qualitative methodology was the suitable approach to employ in my study because the study involves an in-depth understanding of a particular subject area i.e. an analysis of opposition to nuclear energy programme in South Africa. Bless, Higson-Smith and Sithole (2013: 16) argue that the qualitative approach is an appropriate method to utilise in conducting research if the researcher's goal is to determine what the respondents think about a particular phenomenon or issue. Babbie and Mouton (2001) observe that qualitative research gives a more in-depth description and an understanding of events or actions than just presenting a phenomenon statistically. It is through this approach that I managed to gain an in-depth understanding of the position of different anti-nuclear activists and the arguments they put forward in opposing SA's nuclear energy programme.

Sampling

The study was conducted using a small sample of 10 anti-nuclear activists. Data was collected over the period of three months (October-December 2017). During the interviews I realised that my informants almost provided the same information. I then stopped with the tenth respondent because I had reached the saturation point. In my study, the respondents included anti-nuclear activists (coordinating NGOs) opposing nuclear energy programme, as well as anti-nuclear independent researchers and academics writing on South African nuclear issues. The study only considered respondents who have been senior members of the anti-nuclear groups. It was not that easy to meet my respondents because I had to be patient especially when they asked for rescheduling of meetings due to unexpected commitments that require their valuable time. Most of my respondents were very busy people that I had to meet some only during lunch hours.

Data collection

In this research I utilised two types of qualitative data collection methods. Before conducting the interviews I conducted document analysis which in the process helped me develop additional useful questions that informed the analysis of opposition to nuclear programme in South Africa. Document analysis involves the systematic review of documents such as newspaper articles such as newspaper articles, annual reports of various departments and NGOs, as well as policy manuals (Bowen, 2009:27). In this study, I have reviewed and analysed primary documents whose arguments are anti-nuclear. This included newspaper articles, policy documents, press releases of various organisation, and annual reports of NGOs such as ELA, Greenpeace, NECSA, as well as Trade Unions such as NUM. To substantiate the information gathered on the strength of document analysis I conducted in-depth structured interviews. The interviews were conducted with anti-nuclear activists including those in NGOs, independent researchers and Academics. In order to ensure that I obtain in-depth information I utilised face-to-face open-ended interviews. According to Boyle (2003), open-ended interviews do not restrict the respondents to a few options to choose from but also caters for possibilities the interviewer did not anticipate. The open-ended question provided the respondents with the opportunity to provide detailed meaningful answers using the respondent's own knowledge.

Data analysis

For the purpose of this study I utilised thematic content to analyse the findings. According to Braun and Clarke (2006:79) thematic content analysis is a qualitative analytic method for identifying, analysing and reporting patterns or themes within data. I started analysing my data by collecting primary documents such as newspapers, policy documents and reports then write down the arguments put forward by anti-nuclear activists and NGOs. I studied the arguments in the documents and noted down the important arguments and themes that I came across. Hayes (2000:56) argues that themes can be understood as recurrent ideas or topics which are detected in the scripts being analysed. These themes come up in more than one occasion in a particular set of data. Importantly, emerging themes were then grouped together in to a meaningful way. The themes helped me to summarise data to more understandable findings.

Ethical issues

Research ethics guided the conduct of this study. Informed consent, voluntary participation and confidentiality were three basic ethical considerations that I applied during the duration of the research. As bless et al (2013: 280) argue, the study of research ethics helps to prevent research abuses and assist researchers in understanding their responsibilities as ethical scholars. The ethics helped me to be sensitive of the information that was shared during the interviews.

All of my research interviews were conducted in my respondent's offices that were apparently conducive to confidentiality. I promised my respondents that I would not divulge any shared information unless permission to do so would be granted.

The respondents were provided with a consent form accompanied by a participant information sheet that helped explain what the research was all about so that they could take informed voluntary decisions. The study only started after the researcher received ethical clearance from the Wits Ethics Committee. The informed consent form helped to ensure that the respondent's rights and privacy are fully protected. Respondents were only allowed to sign the informed consent form after going through the participant information sheet.

The research featured only those respondents who chose to be part of the research project out of their will. None of the respondents was forced to take part in the study. The purpose of the study was clearly explained to the respondents to ensure that they had knowledge on what the researcher expected from them.

Chapter Four:

Opposition on Economic Grounds

This chapter discusses the arguments against nuclear energy on economic grounds. In order to conceptualise opposition on economic grounds, I begin this chapter by presenting the sentiments of pronuclear activists arguing for the need to expand the nuclear industry in South Africa.

Pro-nuclear arguments

The pro-nuclear groups consists mainly of government departments, agencies, state owned enterprises, private business as well as few outspoken individuals from Universities. The programme was also supported by most of the ANC leadership under Zuma's leadership. The leading actor in the coalition in support of the nuclear energy programme is the Department of Energy, followed by the NECSA. DoE plays an active role in pushing forward South Africa's nuclear plans. Justifying its position in the energy debate, DoE argues that the nuclear energy programme is cost effective and can be trusted for its potential for baseload generation. DoE further argues that the expansion of the nuclear energy industry would help create job opportunities and develop skills during the erection of the plants as well as ensuring energy security enabling jobs through economic growth elsewhere, and would also have impacts along the supply-chain (Rennkamp and Bhuyan, 2017: 277).

The consulting firms, Starek and Nuclear Africa, as well as universities of North West and Cape Peninsula are institutional homes to a handful of individuals actively putting forward arguments in support of nuclear. These organisations' arguments echo the arguments of other significant pro-nuclear groups supporting the nuclear energy programme because of its supposed contributions to job creation, low carbon emissions, baseload expansion, emissions reduction and economic growth (Rennkamp and Bhuyan, 2017: 278). South Africa's Nuclear Energy Corporation's position in the nuclear energy debate echoes DoE's arguments, arguing for benefits in job creation, industrial development, skills development and energy security (Rennkamp and Bhuyan, 2017:277. NECSA is a state enterprise that has high stakes in the debate, because NECSA is expected to play an important role in the proposed programme. It is charged with the responsibility to undertake and promote research and development in the field of nuclear energy and radiation sciences, and technology (DME, 1998).

The DoE's 2008 Nuclear Energy Policy suggests the expansion of nuclear energy sector with the view that it will contribute significantly to the country's social development and economic growth through the creation and maintenance of jobs. The policy argues that uranium mining alone would create and sustain at least 10,000 additional jobs in the energy sector (DoE, 2008: 31). The earlier DME White Paper on Energy Policy, too, supports the expansion of the nuclear energy sector. The policy calls for the diversification of primary energy sources. The policy suggests that South Africa's electricity generation has to be increased to facilitate economic growth and social progress, while remaining sensitive to climate change (Department of Minerals and Energy, 1998).

The 1998 White Paper for Energy Policy recognises the need for increasing South Africa's generation capacity in order to address the electricity demands. This policy document is not as rigid as the later, 2008 white paper for Energy Policy which enthusiastically promotes the expansion of South Africa's nuclear industry. The White Paper for Energy Policy (1998) notes that "whether the new nuclear capacity will be an option in future will largely depend on environmental and economic merits of other energy sources relative to nuclear, its political and public acceptability" (DoE, 1998). This means that the 1998 energy policy recognises the importance of public participation in decision making processes

Other actors in support of the programme are the state utility Eskom, the Zuma Presidency and the nuclear regulator. Eskom believes that expansion of the nuclear industry would contribute to energy security as well as the reduction of carbon emissions. Former President Jacob Zuma was an influential actor in the polarised nuclear debate. Zuma's arguments for nuclear centred on economic growth and long-term energy security (Rennkamp and Bhuyan, 2017:278).

Opposition to nuclear

As indicated above South Africa's nuclear energy, policy, and the post-apartheid nuclear position triggered a polarised debate. I now present anti-nuclear arguments that centre on economic issues. There are a number of organisations opposed to nuclear energy programmes in South Africa. These organisations consist mainly of NGOs, academics, civil society and professionals opposing the programme. South Africa's opposition to nuclear is led by NGOs such as ELA, SAFCEI, CANE and KAA. SAFCEI and ELA are leading the anti-nuclear groups and which uncovered that the government entered

agreements with Russia to expand the nuclear industry in a non-democratic way. Rennkamp and Bhuyan (2016) provide a list of some organisations actively opposing South Africa's nuclear energy programme:

- EARTHLIFE AFRICA (ELA)
- GREENPEACE AFRICA (GPA)
- COALITION AGAINST NUCLEAR ENERGY (CANE)
- DEMOCRATIC ALLIANCE (DA)
- ECONOMIC FREEDOM FIGHTERS (EFF)
- CONGRESS OF SOUTH AFRICAN TRADE UNIONS (COSATU)
- GROUNDWORK (GW)
- ENVIRONMENTAL MONITORING GROUP (EMG)
- KOEBERG ALERT ILLIANCE (KAA)
- SOUTH AFRICAN FAITH COMMUNITIES ENVIRONMENTAL INSTITUTE (SAFCEI)
- CORRUPTION WATCH (CW)
- GREEN CONNECTION (GC)
- FOSSIL FREE SOUTH AFRICA (FFSA)
- NATIONAL UNION OF MINEWORKERS (NUM)

For many anti-nuclear activists such as ELA, SAFCEI and Greenpeace building new nuclear plants is very costly. These organisations argue that building eight additional new power plants would cost more that the estimated R1 trillion owing to project overruns including the high costs of highly skilled labour. Nuclear poses a threat to a country's economy if it heavily relies on state subsidies to complete its development, especially with the view that the estimated cost is more than the total tax revenue collected annually. As a result, electricity prices might rise and this would affect the poor disproportionately (ELA, SAFCEI and Greenpeace). These arguments were echoed by the research respondents who stated that nuclear energy is an unnecessary expenditure which is not economically

viable. Echoing the sentiments of ELA and SAFCEI, one of my research respondents, a coordinator of an environmental organisation states that:

> "Nuclear energy programme is not economically viable". According to the respondent the project is very costly and takes long to complete. As a result the poor communities with little or no access to electricity might have to wait for longer periods to get access to electricity". For the respondent, South Africa does not have the necessary skilled labour and experts to develop the project without having to import foreign labour. The respondent further argues that the pro-nuclear, particularly the government might need large loans and the government is going to lose money to the construction that they would want to recover in future. For cost recovery purposes, the government through state owned enterprises like Eskom might have to increase electricity prices. The respondent further argues that this is going to affect poor communities that cannot afford electricity even to this day (Respondent E, 20 October 2017).

Another respondent, an independent researcher, believes that nuclear energy is an unnecessary expenditure and further states that:

> "Nuclear energy project would be a dangerous investment for South Africa. He also explains that nuclear energy is unnecessary expenditure that would bankrupt South Africa". For the respondent, the project would largely depend on subsidies to run the development of the plants mainly from the government. According to the respondent these subsidies would be obtained from the state money which is largely generated from tax. As a result employees maybe expected to pay more in order to satisfy the economic needs of the construction process. The respondent argues that the pronuclear want to put South Africa in to debts that they cannot pay back by themselves. They would require assistance from the government. The respondent believes that the nuclear programme will not benefit all South Africa as the country (Respondent F, 23 October 2017).

The above narratives reflect the contours of arguments against nuclear energy on economic grounds. The narratives concur with other studies which note that the negative economic impacts of nuclear energy. Nuclear energy, Winkler (2017) argues, needs to be considered exceptionally carefully given that the required financial commitment is roughly equal to the total South African annual tax revenue. As a result the government will depend

on loans for financing the programme. Rosatom has suggested a nuclear build financing option that effectively amount to it providing a loan to South Africa's government. Loan repayments would have devastating long term effects on the public and the economy as a whole. High cost associated with the project would cripple the country economically (Winkler, 2016).

The proponents of nuclear believe that generating electricity from nuclear power can contribute to the creation of jobs. Anti-nuclear groups such as COSATU and NUM are not convinced by this claim. These two organisations contend that the expansion of nuclear energy will be accompanied by job losses as a result of the demand for highly skilled labour required in constructing of new nuclear power plants as opposed to labour in the mining sector which is highly diversified (Williams, 2015).

My analysis finds out that the estimated cost of nuclear energy forms the basis for arguments on economic grounds. It reveals that the cost of nuclear energy in South Africa extends beyond the country's annual budget. This implies that the government would require loans to run the development of its nuclear industry. Cost has been quoted by almost all of my respondents as one of the reasons nuclear energy could be deemed unviable for South Africa.

Many anti-nuclear organisations and activists argue that the programme is an unnecessary expenditure for the country. Government should unpack all the operational, maintenance and additional cost of the nuclear industry expansion in a detailed public economic impact assessment. Furthermore, anti-nuclear activists argue that the government must consider renewable sources as an alternative to dirty coal and nuclear energy because they are cheap, safe and easy to install. Renewable energy such as Solar, wind and hydropower require not complex technology to install and as a result they might not need highly skilled labour as compared to nuclear.

For Greenpeace (2011), renewable sources are cost effective and can positively contribute to South Africa's electricity generation. The organisation suggests that South Africa needs a transition to renewable energy because this transition would open up new opportunities in skills development, manufacturing and infrastructure development. South Africa does not have the labour skills required to construct nuclear power plants. As such commitment to renewable is a better solution

An energy transition based on renewable energy technologies will create a green economy based on green jobs for South Africans. The organisation argues that renewable energy provides an alternative to dirty coal and the expensive nuclear power construction. First the organisation believes renewable sources are efficient and not take protracted periods to construct and install. Secondly, renewable energy sources are cheap and affordable. And lastly the organisation believes that, as an alternative, renewable energy sources are cleaner strategies for reducing carbon emissions than nuclear power (CANE, 2007).

For KAA, the estimated cost of the additional new nuclear build, R1trillion could be spent on renewables than taking a risks and invest on this expensive technology. Renewables are cheap and affordable. For example, KAA argues that a 100MW wind farm can be built for less than R2billion, and could be completed with the period of three years. Renewable energy create long term jobs than nuclear energy. Is there a need to leave the next generations with the legacy of toxic radioactive waste?. KAA warns that there is no need to leave South Africa's future generations with the legacy of toxic radioactive waste when the country has cleaner, cheap and faster sources of energy such as wind, solar, and hydropower.

The World Economic Forum (WEF) as well echoes the arguments put forward by anti-nuclear activists. The WEF believes that many millions of people can now generate their own electricity and access power off-grid courtesy of the rapid development of small-scale renewable technologies such as solar. The WEF further argues that the falling price and the growing accessibility today means renewable energy projects and electricity from these sources can be led by the consumers themselves rather than vested in centralised state and corporations.

Chapter Five:

Opposition on Political Grounds

The chapter presents, analyse and integrate the findings of the study to empirical literature. Politically, the greatest concern of anti-nuclear activists is corruption. The construction of nuclear plants is considered to be a mega-project deemed as a significant investment, and as being highly complex organisationally and technically. It is also understood as having long-lasting effects on the economy, society and the environment (Overy, 2017). For Overy (2017), international experience shows that mega-projects such as nuclear energy projects are targets for corruption. The corruption is linked to their size, complexity and longevity which create thousands of contractual links between the costumer, contractor, sub-contractor, co-ordinating project offices each of which present an opportunity for corruption. One of my research respondent, an academic actively involved in the anti-nuclear struggle argues that South Africa's plan to expand nuclear industry ignored due process. The respondent states that:

> "The deal between Russia and South Africa to expand the nuclear industry was entered into unlawful and unconstitutional. The respondents argue that the nuclear deal is shrouded in secrecy. The people of South Africa were not fully and openly consulted to take part in the decision making processes". According to the respondent, former president Jacob Zuma, fights very hard to see his ambitions coming true, that is the expansion of the nuclear industry. The respondents argue that it is clear that the president seeks to benefit from the project and enrich his personal interests. The respondent also indicates that they find it hard to trust a person with a 'bad' reputation. The president has been involved in corruption issues. He utilised the state money to develop his homeland Nkandla using the state money. With this in mind, the respondent argues that the organisation anticipate further corrupt activities in the project. The respondent also argues that the close ties between the Gupta brothers and president Jacob Zuma is motivated by the nuclear deal and the possibility to benefit economically from the project (Respondent A, 3 October 2017).

Another respondent, a representative of an environmental organisation states that:

> "SA's nuclear energy programme is surrounded by corruption". Furthermore, the respondent indicates that the government acted unlawful and unconstitutional in endorsing the construction of additional nuclear plants. According to the respondent the nuclear project is a very corrupt decision that was taken amongst those who stood a chance to benefit. Another argument put forward by this respondent point to the notion that the government has overlooked the constitution and defied the democratic principles which require the government to consult the public, and provide them with detailed information in relation to nuclear energy. The respondent argues that the government withhold the information about nuclear because they do not want the public to know the true cost of the project as well as the disadvantages. He indicates that the government is fixated with the benefits of nuclear that they have come to ignore the negative impacts of the project (Respondent B, 6 October, 2017).

The above narratives correspond well with some of the studies that have noted corruption surrounding nuclear energy programmes. Allied to this is the potential problem of central government involvement. Energy projects are most likely managed by government and, by necessity afford senior public officials' discretionary powers over projects (Overy, 2017).

For Overy (2017), nuclear energy construction projects are very problematic as governments can use issues of national security to restrict the public and even parliamentary oversight. In South Africa, apartheid era legislation such as the national Key points Act 1980 could be used to withhold information of any new nuclear plant being constructed (Overy, 2017). This is an act of the Parliament of South Africa that provides for the declaration and protection of sites of national strategic importance against sabotage, as determined by the Minister of Police (previously known as the Minister for Safety and Security) since 2004 and the Minister of Defence before that. The South African nuclear industry is might not to build nuclear power plants by itself and lacks the necessary information on the technically complex of construction processes. This means that the vendor can be confident that the buyer is not fully aware of all the features

and financing needs of the power plant, creating opportunities for graft by the vendor (Overy, 2017).

The secrecy around cost and procurement of the South African energy programme reaches geopolitical dimensions. The nuclear technology will require technology transfer from international companies. South Africa has already shown some interest and made attempts to enter agreements with the Russians. Rennkamp and Bhuyan (2017:285) argue that these companies are typically an essential component of international nuclear procurement.

A crucial thread in this saga involves the Shiva uranium mine. The mine originally belonged to a company called Uranium One (UO), a subsidiary of Russia's Rosatom which is the main vendor in the South African-Russian agreement. The company was then sold to Oakbay Resources in 2010, a company controlled by members of the politically-connected Gupta family and the former president's son, Duduzane Zuma, in a deal that greatly surprised economists (Winkler, 2016). This positioned the Zuma and Gupta families to create a direct link to Rosatom, and position themselves for lucrative supply contracts for new plants.

The lack of transparency surrounding the process, coupled with the history of corruption in South African mega-projects such as the Arms Deal, has made the whole programme seem suspicious to the broader public (Winkler, 2016). Collins (2015) argues that the government did not consider public participation to be of importance in endorsing nuclear plans. The government undermined most of the provisions most of the existing nuclear energy policy such as the promise that decision-making processes would be transparent and public consultation considered. Anti-nuclear activists argue that the government undermines the importance of public opinion and transparent communication. All of my research respondents state that:

> "Nuclear energy programme was discussed secretly". For the respondents not all the necessary stakeholders were consulted. The respondents argue that the consultation process was very selective that it precluded the public. According to the research respondents, the government did not consider public participation accordingly. The respondents indicate that the nuclear energy programme is going to benefit only those who have political resources (the power to influence decisions

in influential in policy making, such as former president Jacob Zuma (Respondent A, B, C, D, E, F, G, H, I and J, 2017/2018).

Anti-corruption and the opposition groups suspect that the Russians are part of the decision-making relevant to South Africa's nuclear deal. The urgency for passing the deal has become apparent after a delegation comprising the Russian military, police and intelligence allegedly entered the country via Mozambique to persuade President Jacob Zuma to appointing David Mahlobo as the energy minister. Mahlobo is believed to be the 'Russians' eyes and ears in the South African government. He is suspected of having close ties to the Russians and could possibly act in their favour (Sperchman, 2017).

Even before the latest 2017 president Zuma's Cabinet reshuffle, it is alleged that secret meetings between the Russian delegation and President Jacob Zuma ensued. Russians have been involved in subverting democracies all over the world. Even Corruption watch, an anti-nuclear organisation involved in the anti-nuclear struggle, believes that Russia has a reputation of being involved in subverting democratic processes in other countries (Speckman, 2017).

Despite the mounting opposition to the deal, former president Jacob Zuma appears determined to get the process on the go before his term as a president of ANC ends in December. For example when he appointed one of his closest allies, David Mahlobo, to the energy portfolio. He put him in one of the portfolios that plays a significant role in decision-making processes relevant to the procurement of the nuclear programme. (Winkler).

Mahlobo, was expected to release a new energy report in record time which of course would favour Zuma's decision and plans. For some, the new energy plan will be biased towards nuclear. Anti-nuclear commentators foresaw heightened public lobbying which could include verbal attacks on nuclear critics as already initiated by the president (Winkler, 2017).

Anti-nuclear activists suspect that South Africa's nuclear energy programme is being pushed forward to satisfy personal interests of the few at the expense of the majority. The close relationship between Zuma and the Gupta brothers is also of great concern to anti-nuclear activists. For opponents of nuclear programme, the Zuma-led government reshuffle is informed by the view that many members of the parliament would endorse the nuclear plans (Winkler, 2017).

State capture is another idea that we can use to understand Zuma's advocacy of the nuclear build. This involves the systematic takeover of state institutions by presidential allies and the resulting exploitation of institutions for commercial advantage and profit by his benefactors (Winkler, 2017). In his state and politics in Africa: The politics of the belly Bayart (2009:235) called this condition a situation in which 'Goats eat where they are tethered'. This means that some members of society who hold political positions take advantage of their positions to enrich their wealth.

Winkler (2016) argues that South Africa's nuclear programme is an integral part of the major recent controversy surrounding state capture. This was highlighted, for example by, the shocking dismissal of the Finance Minister Nhlanhla Nene replaced by Malusi Gibaba, a nuclear build sceptic.

The Gupta family can exercise extraordinary influence over some parastatals and related government policy. More than a dozen people linked directly or indirectly to the family and its closest allies, too, can exercise control over parastatals dealing with energy issues. The network's access to the state calls in to question the integrity of the appointment process, for which the Public Enterprises Minister Lynne bears the major responsibility (Sole, Mckune and Brummer, 2016).

The Gupta's long-term associate and business partner has had direct connections with five company directors of Eskom alone (Sole, Mckune and Brummer, 2016).

Winkler (2017) argues that the way in which the nuclear deal surfaces easily tells who is likely to benefit from the programme. In his view, the people who are likely to benefit from the nuclear build are those who have links to the Shiva Uranium Mine and this includes Gupta brothers, Zuma's son Duduzanea and then Zuma himself.

Responding the critics of nuclear plans, Zuma slams these critics as 'foreign agents' a concept used by the Russian government to attack anti-nuclear groups. Zuma argues that those who stand against his nuclear build plan are working together with people outside the country and the ANC. He alleges that anti-nuclear groups are under 'imperialist' international influence (Matlakala, 2017).

The arguments by many anti-nuclear activists such as Greenpeace, ELA, SAFCEI, NUM conflict with the nuclear energy policy 2008 which is formulated in such a way it supports the government's commitment to nuclear industry. For example, the white paper for

energy policy (1998) states that the government will ensure that the decisions to construct new nuclear power stations are taken within the context of an integrated energy policy planning process with due consideration given to all legislation and the process subject structured participation and consultation with all stake holders". Given this critical policy provision, one notes that the anti-nuclear groups indeed revealed government's tendencies to ignore sufficient public participation, transparency and openness.

Furthermore, the Nuclear Energy Policy (1998:8) states that "The white paper on energy policy provides that decisions to expand the nuclear industry should be done in more inclusive transparent manner".

That is, there is a need for a continued involvement of the people in decision making processes. Yet we learn from newspaper articles writing on nuclear issue that the South African government's plans were done secretly and ignored transparent ways of communicating the plans. This is to say not all the necessary information was brought forward for citizens to know in order to make informed decisions regarding their positions in the plan (Collins, 2015). Moreover, there is a widespread public belief that the nuclear procurement plan happened in secret behind closed doors.

The politics of parties

The whole nuclear controversy offers potential opportunity to opposition parties. With the increasing evidence of individuals benefiting from the state's money opposition parties have found another spot to exploit. The two leading opposition parties, the DA and the EFF, expressed their strong criticism of the nuclear programme. Their supporters and civil society in general have demonstrated their capacity for mobilisation around specific issues (Winkler, 2017). So the growing momentum of anti-nuclear movements continues to challenge the state's approach.

Political parties argue against the proposed nuclear energy programme in South Africa. The opposition parties use the nuclear energy issue as an opportunity to weaken the ruling party, the ANC led by Zuma. DA is actively involved in the anti-nuclear struggles and strives to bring the issue to the South African political landscape for public scrutiny (DA, 2016 and EFF, 2015).

The DA argues that the nuclear deal is corrupt, mainly supported by Zuma and some of members of the ANC. For DA, the nuclear energy programme in South Africa is going to

benefit a few, particularly Zuma and the Gupta family, and disadvantage the majority (Democratic Alliance, 2017).

The opposition parties argue against the nuclear energy programme because of lack of transparency in the policy process and the prospect of corruption. The opposition parties also point to secrecy surrounding the cost of the programme as well as the controversial appointment of Mahlobo. According to the DA, the government ignores the Promotion of Access to Information Act (Democratic Alliance, 2017).

The organisation argues that the nuclear deal requires parliamentary participation. The organisation demands that the government should update and amend five key pieces of legislation/regulations. These are the Integrated Resources Plan; electricity pricing path; the procurement regulations (the Preferential Procurement Policy Framework Act, 2000); the framework agreements; and changes to the Energy Act 2008 to allow different funding models (Democratic Alliance 2017).

The DA rejects the proponent's claim that the project is motivated by a genuine desire to secure South Africa's energy future in the most cost-effective and sustainable way. The DA believes that the nuclear deal was prioritised because Zumas, Guptas and ANC elites might make millions supposedly out of bribes and tenders. Making reference to Nkandla and Zuma's corruption charges, the DA's opposition to the project finds resonance. In other words the DA presumes the president continued corrupt activities with the erection of the project. In this regard the DA sees a close relation between corruption and the nuclear deal (Democratic Alliance, 2016). Echoing the sentiments of the DA, one of my respondents, a representative of a trade union, states that:

> "South Africa's nuclear industry expansion is meant to benefit a small number of individuals particularly those influential in the decision-making processes". The respondent argues that the project would not be in the best interest of the majority (Respondent C, 2 November 2017).

The DA tells us about the reputation of Rasotom, Russia's state owned company which is agreement with South Africa in relation to the construction of new nuclear power plants. The DA points out that the Rasotom can be criticised for over-time, overruns and over budget in most projects it has ever started in other countries (Democratic Alliance, 2016).

Some countries such as Indonesia and Vietnam even cancelled their contracts with Rosatom for new nuclear build yet South Africa is not being as decisive (Fig, 2016). Given this, the main concern of anti-nuclear groups would be the country's reluctance to learn from international experiences related to nuclear cost.

Moreover, DA calls for the government's consideration of feasibility of the project through an extensive economic impact assessment. The organisation is strongly opposed to the government's plan for economic reasons; the deal is unaffordable to the economy at large (Democratic Alliance, 2017)

On the other hand, the DA fights against nuclear energy programme in a more political way. The DA is ready to use every legal and parliamentary tool at their disposal to ensure that the generations to come will not be drowning in a massive debt that shall compromise the future of South African economy (Democratic Alliance, 2017). The DA argues that the most effective immediate ways to stop the nuclear project is to stand against all projects related to the programme and vote out the ANC government in 2019.

The EFF complements DA's concerns about the nuclear deal. The EFF alleges that a Gupta-led faction of the ANC has already received bribes for nuclear build programmes. Mbuyiseni Ndlozi, an active member of EFF, argues that the preliminary estimated cost (1trillion Rand) will have negative impacts on the economy. He further argues that the estimated cost is more than the annual budget of the state (Ndlozi, 2015).

The United Democratic Movement (UDM), another opposition party in South Africa does not support the government's decision to build additional new nuclear power plants. It has presented alternative minerals in its minerals and energy proposals that it phase out nuclear energy and replace it with renewables (Holomisa, 2017).

Recently, the UDM has welcomed the court ruling in favour of anti-nuclear activists. The UDM under Bantu Holomisa, argues that the nuclear industry expansion would have punished the poor of the poor. Holomisa argues that the ruling of the judge is a good lesson for the government and challenged the government to understand and accept that accountability and transparency are non-negotiable constitutional dictates (Holomisa, 2017). Consequently, the UDM challenges the government to stop putting forward personal interests and those of their party ahead of the people of South Africa.

Arthur Chien, VP of Talesun energy, echoes the arguments of Greenpeace. Chien reportedly believes that renewable energy may be the best solution to job creation in the country, and as he foresees the need for renewable energy will increase in the near future. He also believes that renewable energy is an alternative to move from fossil fuels, the largest carbon emitters and nuclear energy as the most expensive source of energy (Jooste, 2014). Renewable energy sector in South Africa can be trusted for its potential to create many jobs as compared to energy sourced from nuclear. Renewable energy sources can be localised and as a result many South Africans can benefit through getting employed. Green energy has the potential to provide jobs that require a considerable number of basic skills as compared to nuclear that requires expertise in operation. This means potential semi-skilled job-seekers would stand a chance.

Many anti-nuclear groups foresee corrupt activities associated with the project. Hurtmut Winkler, an anti-nuclear activist argues that the Zuma-led government reshuffled Cabinet repeatedly as a way of driving the pro-nuclear agenda. South Africa saw ministers being reshuffled particularly those whose positions were important in endorsing the nuclear procurement deal. Former Finance Ministers, Nhlahla Nene and Pravin Gordhan were under severe pressure from Zuma supporters, being viewed as an impediment by those who stood to benefit from the expansion of the nuclear industry (Winkler, 2017). Both were ousted, and replaced with allies Des van Rooyen (2015) and Malusi Gigaba (2017).

Anti-nuclear activists suspect that the changes made in the energy portfolio with the former Ministers being replaced by Nkhensani Khubayi and then Mhlabo (both in 2017), were influenced by pro-nuclear proponents (Winkler, 2017).

Drawing from these arguments, one may argue that the one of the explanations for SA's nuclear development controversy is the wide gap between secrecy and public consultation. There decisions around the expansion of nuclear precluded public participation. The government ignored following necessary steps in order to meet lawful and constitutional requirements. The arguments that transparency is never given full play while secrecy becomes the government's tool to go ahead with its decisions and shield the project from public scrutiny.

In October 2015, ELA and SAFCEI saw the need to involve the court after realising that the government was planning for the procurement of additional nuclear power plants in secret (Collins, 2015).

In ELA and SAFCEI's view, the government's plan did not follow the necessary statutory process and constitutional decision-making routes (Collins and Robison, 2016).

The major concern was that the processes of nuclear deal decision-making including the signing of agreements with Russia and the Section 34 determination to procure nuclear power ignored the requirements for lawful and constitutional administrative decision-making (SAFCEI nd) The nuclear court case have brought the governments' plans to expand its nuclear industry to public scrutiny. The judge's ruling, enlightened the people's understanding of the undue process that was followed by the government in the expansion of its nuclear industry.

As Winkler argues, 'the narrow public support and downright hostility in some quarters to a nuclear build has already effectively stalled local construction plans. (Winkler, 2012).

Anti-nuclear groups and activists argue that the nuclear energy programme has ignored public consultation which is an important element in decision making process of issues that concern the citizens. Many of these anti-nuclear groups the suspect the project will benefit the Gupta family, Jacob Zuma and his son. They argue that these three proponents of nuclear might have received bribes in order to catalyse the procurement process. Thus the contested price tag of the nuclear build programme have, according to Brummer (2015) caused major debates with the government and energy stakeholder network.

The court ruled that the South African nuclear energy programme and the agreements entered into with Russia were unlawful and unconstitutional (SAFCEI nd). The nuclear court case victory has brought the government's plan to public scrutiny. The court case havd an influence in the public's opinion towards nuclear. The decision of the judge saw the government's plan being halted. However, even after the judge's ruling, pronuclear activists made attempts to revive the government's plan.

Politically, the main concerns of anti-nuclear activists are corruption and negligence of the democratic process. For some anti-nuclear activists, South Africa's nuclear energy programme can be viewed as a part of state 'capture'. In this study, it was found that anti-nuclear activists believe that nuclear energy was meant to satisfy Zuma and the Gupta interests at the expense of tax payers.

Chapter Six:

Opposition on environmental grounds

This chapter presents, analyse and integrate the findings of my study dealing with opposition to the proposed expansion of nuclear power in South Africa on environmental grounds. Nuclear energy is criticised as unsafe and as having long term negative impacts that are the consequence of the nuclear fuel cycle. This includes the threat radioactive waste poses to people's health and the environment. Nuclear energy arguably poses serious challenges to the environment, marine life as well human health (Greenpeace, 2011). Echoing the sentiment, one of my respondents, a representative of an environmental organisation, states that:

"Nuclear energy poses significant challenges to the environment" The respondent further also explains that their organisation is concerned with the radioactive waste which does not have a long-term storage and solution. The respondent indicates that nuclear energy has greater negative impacts to communities adjacent to the plants and those who work on site. In case accidents happen the people near the plants see their land and water sources being contaminated which in turn affects marine life (Respondent G, 13 November 2017).

Another respondent, an academic actively involved in the anti-nuclear struggle argues in the same lines and states that:

> "Nuclear energy is likely to contaminate the land particularly if accidents happen". Making reference to Fukushima nuclear plant accident the respondent indicates that many people lose their lives during nuclear accidents. The possible accidents also pose a threat to agricultural practices such as farming. The respondent argues that the land of the farmers gets contaminated and this affects the health of farm products. The respondent also argues that the lives of fish and other organisms living in the water get affected as the water becomes contaminated as well as the changes in water temperature. Another respondent, too, argues that the problem of finding long term storage of the high level radioactive waste renders nuclear energy unsustainable. The respondent argues that building additional nuclear plants when a long term solution to the waste produced from Koeberg 1 and 2 would not a good idea" (Respondent H, December 2017).

The above narrative echoes the sentiments of some nuclear activists. For Kivi (2017), water cooling systems used to keep the nuclear power plant from overheating poses a serious threat to marine life. The system uses a lot of water. The cooling system pulls large amounts of water from the see and oceans. First, fish are in advertently captured in the cooling system intake and consequently get killed. Secondly, after the water is used to cool the plant it is returned to the ocean or river. The water that is returned is approximately 25 degrees warmer than the water was original. This warmer water kills some of the species of fish and plant life (Kivi, 2017).

This has been the case in the United States of America. For example, in the case of the United States, the 2012 Union of Concerned Scientists clearly explains the environmental impacts of nuclear energy. The union reveals that the process of nuclear energy generation requires large amounts of water. Significant amounts of water are required in the events where rectors overheat and are used by the cooling system (Union of concerned scientists, 2012). In this case large amounts of water are drawn from rivers, oceans and lakes. As a result Marine life gets affected when the nuclear plants draw water from natural resources in which fish and other wildlife get caught in the cooling system water intake (Union of Concerned Scientists, 2012).

In May 2017, Engineering News reported that the Cape Town drought crisis was associated with the large amounts of water consumed by Koeberg power plant. Koeberg consumes about 1 300 kilolitres of water a day in the ventilation system on the plant. The plant uses 7 million kilolitres of seawater (Engineering News, 2017). The plant also uses underground water a day. This water crisis has reached the attention of the Koeberg station who reportedly admitted that initiatives needs to be put in place in order to reduce water consumption. Presumably, the water consumption level will increase with the implementation of the proposed additional plants. The Koeberg power plant is to some extent dependent on municipal water to meet its needs. (Engineering News, 2017)

Other anti-nuclear activists such as Greenpeace, argue that nuclear energy poses risks to marine and wild life because water to cool the reactors is drawn directly from the sea or lakes, and often returned far hotter. Finding lasting solutions to radioactive waste also a great concern to many industries, as the environment then becomes vulnerable to contamination (Greenpeace USA, 2011). High level radioactive waste is stored in the reactor pools (on site) and can remain dangerous for a long period of time.

Eskom claims that nuclear is safe source of energy as it does not emit CO2 and other greenhouse gases. This claim proves to be highly contested. While Eskom claims that nuclear energy is safe, non-profit organisation such as Earthlife and Greenpeace contend that nuclear waste is lethal and nuclear plants are dangerous when accidents happen.

To support their arguments, these organisations make reference to the catastrophic events that occurred in Chernobyl in 1986 and the recent nuclear accident that occurred in Fukushima, Japan in 2011 (SAFCEI and ELA, nd). Echoing the sentiments of Earthlife Africa and South African Faith Commission Environmental Institute, one of my research respondents states that:

> "Nuclear energy is unsafe particularly if accidents happen". The respondent argues that the nuclear energy fuel cycle has long term negative impacts for the environment. The respondent further argues that nuclear energy power plant uses large amounts of water when the reactor overheat and as a result this may affect marine life. The respondent's argument also point to radioactive waste. The respondent argues that nuclear energy industries face the problem of finding a long-term radioactive way to store high level radioactive waste. For respondent the decision to expand the South Africa's nuclear energy is irrational especially because the country still struggles to find long term storage of the radioactive waste already produced by the existing plants (Respondent I, 21 November 2017).

Nuclear energy also produces CO2 emissions in the upstream processes. For example, an anti-nuclear activist, Kivi (2017) notes that nuclear energy has been called a cleaner source of energy because the power plants do not release carbon dioxide. While this could be true, it is deceiving. Arguably, nuclear power plants may not emit CO2 during operation, but large amounts of CO2 are emitted during other activities related to building or running plants. Nuclear power plants use uranium as a fuel. The process of mining uranium releases high amounts of CO2 in to the environment (Kivi, 2017).

Greenpeace Africa believes the environmental impact assessment has and is still failing to properly assess the impacts of the proposed project of the additional power. For Greenpeace (2017), pushing forward and implementing the nuclear plans will serve to undermine the environmental rights of both the present and future generations.

ELA's coordinator, Makoma Lekalakala, argues that the Department of Environmental affairs has now neglected safeguarding the environmental rights of South African citizens.

According to Lekalakala, this became evident when the department authorised the construction of nuclear plants in spite of public opposition. Makoma suspects that the Department has chosen to follow the recommendations of a flawed environmental impact assessment. She argues that the recommendations were based on out-dated information and assumptions that are not justifiable (Greenpeace 2017).

Matavire (2017) notes that the Thyspunt Alliance, another anti-nuclear organisation, is pleased with Eskom's decisions to abandon building a proposed new nuclear plant at Duynefontein, near Koeberg in Cape Town. The main argument points to the unavailability of safe storage for high level waste. For example, the spokesperson of KAA, Peter Becker, points out that all the spent fuel at the plant is kept right at the plant. About 1.2 million kilograms of high level waste is kept there. He argues that the country has no plans for what to do with the waste. It is irresponsible to build another reactor when the county does has not yet found a solution to the waste from the existing reactors. The question of where the waste that will be produced by the proposed additional reactors be stored is of great concern to anti-nuclear activists (Matavire, 2017).

Radioactive waste management is a challenge to many nuclear industries. The KAA has long criticised the nuclear industry for some reasons, nuclear waste management as one of them. The major concern for KAA relates to the nuclear waste. KAA is mainly concerned about the low level radioactive waste dumped in the Vaalputs though the people around Vaalputs were not even consulted. This means that public acceptance of the declaration of Vaalputs as the dumping site was never fully considered (KAA, nd)

Koeberg alliance alert opposes the nuclear energy programme for ignoring the possible nuclear accidents that may occur as a result of unsafe or improper storage of the waste (KAA, nd).

It also comes out that many workers in the nuclear industry are afraid to speak out for they are afraid of losing their jobs (Greenpeace USA, 2011). These are issues of power and control. In 2011 green peace USA on South African nuclear industry reported that nuclear industry employees who suffer from the consequences of their occupation continued to struggle on for compensation. It may be argued that the nuclear industry had neglected the health conditions of its employees (Greenpeace USA, 2011).

In South Africa as reported by Greenpeace, more than 500 seriously ill former workers at Necsa's Pelindaba comlex have struggle and raised their concerns around occupational

health compensation with regard to their health conditions. Conditions that have happened in connection with radioactive waste. (Greenpeace, 2011). The workers in the nuclear industry at the Vaalputs nuclear waste dump site and Koeberg nuclear power station have raised concerns in regard to the causes of their illness. Those who continued to work in the nuclear industry in spite of the challenges posed to their health by the radioactive waste remained silent and reluctant to air their concerns and health related grievances in fear of losing their jobs (Greenpeace, 2011).

Fuelling this debate is South Africa's workers' claim that they joined the nuclear industry without knowledge about risk of radiation and chemical exposure (Greenpeace, 2011). According to the 2011 Greenpeace Africa report, some workers reported that they were never given safety training or protective clothing as a way of mitigating the impact of radioactive waste.

In general terms, the 2011 Greenpeace Africa report argues that there seems to be no solution in sight to the problem of disposing high-level nuclear waste. In the case of South Africa, the organisation further argues that South Africa has not yet developed one. The organisation questions South Africa's plan to expand its nuclear industry even though a solution to radioactive waste produced by the existing plants have not yet been found.

Due to lack of a concrete solution to the radioactive waste from Koeberg, the industry places its waste in storage ponds, something that will be become even worse with the expansion of the nuclear programme with the same waste situation being replicated at the potential chosen sites for the new plants. The Koeberg nuclear industry had promised to remove the waste cooling off in 10-15 years but nothing had been removed to this date (Greenpeace USA, 2012)

Radioactive waste may be the greatest challenge of South Africa's nuclear industry. The NUM as well points to the lack of a plan as one of criticisms of the proposed new nuclear build in South Africa. They argue that South Africa does not have plan in place to dispose its nuclear waste. This raises the question of what would happen to the waste that would be produced by the additional nuclear plants if there is no solution to the waste produced by the two plant in Koeberg 1 and 2 (COSATU, 2015). Given this, the NUM stands strongly opposed to the construction of new nuclear plants in South Africa (COSATU, 2015)

Prior to 2001, the South African government had no national policy developed to regulate the disposal of nuclear waste (White Paper on Energy Policy, 1998). This then raises a

question of how decisions are made prior to selecting a dumping site as well as the factors at play in considering a place to be a suitable, safe site for dumping radioactive waste. In the absence of this national policy, however, the question of what was considered when selecting Vaalputs in Namaqualand as a nuclear waste dumping site as well as what guided the government's decisions is of great concern.

On the behalf of the squid industry, Greg Christy raises a concern about the consequences the plant would have for marine life and fishermen working in proximity to the proposed plant. The project would have affected about 2500 fishermen jobs thereby increasing levels of unemployment in the area (Rogers, 2017)

Thyspunt is one of the areas that host one of the important cultural landscapes in South Africa, in particular the Khoi people's heritage site. In this regard anti-nuclear activists welcome the abandonment of Thyspunt as the then prospective site for nuclear power plant that would have destroyed this important cultural landscape. Besides the cultural heritage issue, concerns have included the notion that Thyspunt is a fragile dune wetland that is sensitive to flooding which makes vulnerable to earthquakes and tsunami, environmental catastrophes that supposedly led to the Fukushima nuclear accident (Rogers, 2017).

The environmental impact of nuclear power include among others mass evacuation which involves social relief of distress as a solution particularly if an accident happens. The nuclear accident sterilises the agricultural land, economic dislocation and extensive contamination of the land and sea (Rogers, 2017).

Anti-nuclear activists and groups have realised the importance of collaborating their efforts to oppose the nuclear programme as a collective unit. The government is facing ferocious collective opposition from the coalition of constituted of different anti-nuclear groups and activists. The name of the main Collaboration is Coalition Against Nuclear Energy (CANE). CANE's primary goal is to strengthen opposition to nuclear through collective efforts that welcome any individual, anti-nuclear group, professional, civic activist, to contribute their efforts to stop the government's plan to expand its nuclear industry. This national coalition also demands the government's commitment to public participation in the energy planning (CANE, 2007).

The Coalition's arguments complement the demands of other anti-nuclear groups such as SAFCEI and Earthlife Africa. The national coalition against nuclear energy, too, argues

that the government's plan to expand the nuclear industry does not seem to respect democratic decision making regarding the proposed additional plants. CANE does not support the government's honour of the sentiments enshrined in the 2008 White Paper for Energy Policy yet it proposes that the government should look at other environmentally sustainable energy options. Cane further argues that the government should consider other alternative sources and avoid forcing the country in to a nuclear future (CANE, 2007).

Furthermore, CANE points out that the government has attempted to prevent most South African from accessing or understanding the dangers associated with nuclear in details. According to Cane the nuclear industry ignored an informed public debate and public participation supposedly to minimise interference to its decision-making processes relative to the expansion of nuclear energy (CANE, 2007). Although pro-nuclear groups, such as Eskom, the government and Necsa believe that nuclear energy could be a solution to climate change and high levels of carbon emission, Cane stands firmly opposed to this idea.

Pro-nuclear activists such as Dr David Moore argue that nuclear energy could be the best alternative to dirty coal. As a pronuclear activist, he believes that nuclear is the best source for meeting energy demand. Moore supports nuclear energy because he believes that it is cleaner than energy generated from fossil fuel. Not only does he believe that nuclear energy is clean but also argues that nuclear energy is more sustainable that other energy sources such as fossil fuel (University of North West press release, nd). In his opinion, nuclear plants are the best options for meeting energy requirements and needs. He strongly believes that energy sources such as wind and solar are intermittent, and the energy produced on windy and sunny days cannot be stored cost-effectively when there is no wind or sun. Proponents of nuclear energy believe that nuclear energy produces little CO2 as compared to energy sourced from fossil fuel. They note that nuclear energy produced during the nuclear cycle only represents 2 % of the total amount produced by fossil fuel power plants (NWU, nd).

Nuclear energy is considered an important source of energy by both the Energy Department and nuclear energy policy. In 2008, the Department of Energy provided for the expansion of the nuclear industry. The 2008 white paper for Energy Policy supports the expansion of South Africa's nuclear industry. The policy serves as an embodiment of the South Africa's commitment to the further development and expansion of the existing nuclear energy sector in coordinated manner (DoE, 2008:6).

Reducing global warming and greenhouse gas emissions are enshrined within the policy as triggering the need to mitigate over-reliance on coal. Concerns over increases in the price of coal, reserve exhaustion and global warming, partly as a result of greenhouse gas emissions and other atmospheric pollutants, necessitate a departure from the over-reliance on electricity generated from coal (DoE, 2008:7).

The White Paper on Energy Policy recognises nuclear energy as a strategy to mitigate greenhouse emissions and global warming. It states that nuclear is an important low carbon emission source of electricity generation compared to fossil fuels (DoE, 2008: 7).

Contrary, renewable energy sources are suggested by anti-nuclear activists as an alternative energy source. Renewable energy unlike coal and nuclear power is considered to be an ideal source of energy generation, because it is recognised as clean and safe (Park and Ohm, 2013).

In 2013 Park and Ohm conducted a comparative study to find out what factors influenced the support of nuclear energy before and after Fukushima in Japan in 2011. Public attitudes towards renewable energy changed after the accident, and renewable energy gained trust because of the risks associated with nuclear and coal (Park and Ohm, 2013).

While anti-nuclear activists lobby for the expansion of new nuclear power plants, anti-nuclear groups such as Greenpeace Africa argue for renewables as an alternative. Supporting its arguments, Greenpeace argues that South Africa energy sources from wind and biomass to some of the best solar resources in the world. For Greenpeace it is important to harness these resources if addressing climate change is a priority. Renewables are much quicker to install and easy to finance (Greenpeace, 2011).

Renewable energy is mature, ready and can be deployed at a large scale, playing an important role in reducing carbon emission. Building up clusters of renewable micro grid in remote areas will be central in providing sustainable electricity to over 2 million households in this country for whom access to electrify is presently denied (Greenpeace, 2011).This means that the process of distributing electricity from renewable sources can be democratised and can reach out to disadvantaged rural and remote communities with ease.

Anti-nuclear groups argue that renewable energy sources are an alternative to coal and nuclear plants. In its 2016 annual report Greenpeace suggests that South Africa should

shift away from coal in to a mix of renewable energy as well as exploring opportunities to increase renewable energy investments. They further ague that ensuring that renewable as an alternative requires the removal of investment barriers in renewable energy in South Africa. In other words they suggest that South Africa must seriously consider and recognise renewable energy long-term investment plans (Green Peace 2015). Echoing the sentiments of Greenpeace, one of my respondents states that:

> "South Africa should alternatively resort to renewable sources of energy because they pose little or no threat on the environment". The respondent also states that renewable energy sources are cheap, affordable and least dangerous compared to energy generated from nuclear. Job creation can be achieved for South Africans (Respondent J, 12 December 2017).

This narrative concurs with studies which argue that renewable energy is should be considered an alternative to dirty and nuclear power. The CANE echoes the arguments of Greenpeace for renewables as suggested alternative. CANE suggests that available renewable energy and energy efficiency technologies are cheaper, faster, and cleaner technologies to address carbon and should be given full consideration in attempting to address south Africa's energy demands as well as addressing excessive carbon emission (CANE, 2007). In other words they reject the government's claim that nuclear energy could be the leading solution to carbon emission.

Anti-nuclear activists and groups have certain objectives in relation to nuclear energy programme. The CANE, an organisation consisting of different anti-nuclear groups and activists, clearly outlines the objectives of the anti-nuclear groups. It presents a collective view (Coalition against nuclear energy, 2007).

Through collaboration, networking research and action, anti-nuclear groups seek to promote a culture of human rights, democracy and the rule of law in terms of the nuclear policies. They seek to ensure that nuclear decisions are taken on the basis of transparent accountable and participatory governance of energy policy. This implies that the government is expected to involve public participation in its decision-making process so that informed decisions are taken. Anti-nuclear groups expects the government to be accountable for plans, decisions and actions that have implications for the future. With regard to policy-making, the government should employ a participatory approach that will enable all stake-holders to take part in the formulation of the policy (CANE, 2007). The

CANE counters government propaganda on nuclear and encourages informed and educated public debate where research forms the basis of decision making.

Most importantly, the anti-nuclear groups seek to provide the South African public with the necessary information that has been withheld from the people concerned. This involves the nuclear industry's attempt to prevent South Africa citizens from questioning or fully understanding the dangers, risks associated with nuclear energy.

These organisations utilise campaigns, media and research to bring to the people all the information they need in order to understand the dynamics of pursuing the nuclear route. The anti-nuclear groups aim to protect the constitutional rights of the citizens that are supposedly eroded by the nuclear power build. To achieve these objectives these organisations intend to seek and utilise legal measures in order to support and strengthen people's access to justice, ensuring that the nuclear debate is under legal scrutiny (CANE, 2007).

CANE provides a forum for civil society that probably coordinates efforts to oppose nuclear energy developments in South Africa. This collaboration strengthens and brings together all anti-nuclear groups and activists in order to collectively challenge the government's decision.

The study finds out that nuclear energy is criticised for the negative impacts associated with the nuclear fuel cycle. Environmentally, the greatest concern of anti-nuclear activists is the impact radioactive waste has on the environment. The problem of finding long-term storage for the radioactive waste lies at the heart of anti-nuclear arguments. The anti-nuclear arguments favour the protection of marine life. Many anti-nuclear activists such as Greenpeace have featured in their arguments the impacts nuclear has on marine life particularly fish and other living organisms inhabiting seas. In my study anti-nuclear activists including respondents have made reference to the Fukushima nuclear power plant accident as one of the reasons for doubting the safety of nuclear energy. The accident has triggered negative attitude towards safety of nuclear energy.

Many anti-nuclear activists argue that nuclear is unsafe. Anti-nuclear organisations such as ELA, SAFCEI, NUM, and Greenpeace are concerned with the impact of nuclear energy on the environment. Anti-nuclear activists argue that nuclear energy has the potential to contaminate land and water. A 2011 report by Greenpeace argues that nuclear energy produces radioactive waste which poses a threat to people's health and the environment.

Many anti-nuclear activists argue that the world struggles to find long-term storage for nuclear waste. Arguably, it might not be rational to continue expanding South Africa's nuclear industry while a solution to high-level radioactive waste has not been found.

Chapter Seven:

Conclusion

The main aim of this study was to provide an analysis of opposition to nuclear energy programme in South Africa, focusing on anti-nuclear groups and activists participating in the anti-nuclear struggle. The in-depth structured interviews and document analysis helped the researcher answer the objectives of the study and unpack the arguments put forward by anti-nuclear activists opposed to nuclear energy. Document analysis and face-to-face helped me find out the factors that drives resistance to nuclear energy programme in South Africa.

The study contends that the South African nuclear energy programme is a controversial issue characterised of the proponents and anti-nuclear groups. The study put more emphasis on examined anti-nuclear organisations and activists because there is very little literature on this topic. It was important to discuss pro-nuclear arguments in my study as this gives the reader a picture of what anti-nuclear organisations and activists are concerned about. The proponents of South Africa's nuclear energy programme argue that nuclear energy has the potential to contribute to the country's energy security. They further argue that nuclear energy would create jobs for South Africans. The proponents of nuclear energy also contend that nuclear energy is the best and safe source of energy that does not produce high levels of carbon emissions. It can be used as an alternative to coal, the biggest carbon emitter around the world (see Rennkamp and Bhuyan, 2016).

Anti-nuclear activists and organisation argue points contrary to pronuclear groups. The study finds out the anti-nuclear groups oppose the nuclear programme for political, economic and environmental reasons. In the economic perspective anti-nuclear groups and activists argue that nuclear energy is an unnecessary expenditure. They further argue that nuclear energy is a very costly project that would bankrupt South Africa. Furthermore, they contend that South Africa cannot afford to finance the project by itself. It is going to largely depend on loans and subsidies for the financial needs of the project. The study also finds out that the estimated cost of nuclear is, according to anti-nuclear groups over the country's annual budget and exceeds the annual revenue, mainly collected in the form of tax. That is the estimated cost of the project is far more than the annual collected tax revenue. Anti-nuclear activists argue that nuclear energy would bankrupt the country's economy (see Winkler, 2016).

On the political perspectives, the study finds out that anti-nuclear activists view the nuclear energy programme as a project vulnerable to corruption. The plan to expand the South Africa's nuclear industry was unlawful and unconstitutional (see SAFCEI and ELA). Some Anti-nuclear activists and organisations argue that the project is meant to benefit a few individuals while disadvantaging the majority.

Environmentally, the key argument put forward by anti-nuclear activists point to the radioactive waste management and accidents associated with nuclear power plants. Anti-nuclear activists argue long-term management of radioactive waste remains a challenge for many countries. The study finds out that people's opinion towards nuclear have changed following the meltdown of a reactor that resulted to deaths, evacuation of thousands of people as well as the contamination of land and water.

Renewable energy sources are considered to be an alternative to coal and nuclear energy. Many anti-nuclear activists recommend renewable energy sources such as wind, solar, hydropower. It is argued that renewable energy is cheap, clean and affordable. In other words renewable energy would do little or no harm to the country's economy. Instead it would help create job opportunities that could be democratised. Many South Africans would find job in renewable energy industry because it does not require highly and complex labour (see Greenpeace, 2011)

Jacob Zuma's presidency was one of the biggest supporters of nuclear energy in South Africa. Very recently Jacob Zuma has been recalled as the president of the ANC and replaced by Cyril Ramaphosa. Zuma's resignation from the presidency might bode well for the anti-nuclear activists. Moreover, his resignation might weaken the efforts he had allegedly made to realise South Africa's nuclear expansion. With his controversial cabinet reshuffles, Zuma strove to find a suitable candidate in key ministries, one who would favour his plans. The change in the presidency might mean change of the government's position in the nuclear energy debate.

The newly appointed president Cyril Ramaphosa has already signalled his opposition to Jacob Zuma's plan to expand nuclear. Speaking to the WEF, Ramaphosa stated that "we have excess power right now and we have no money to go for a major nuclear plant building", (World Economic Forum on the 26th of January 2018 in Davos, Switzerland (Ramaphoisa, 2018). Ramaphosa's position in the nuclear energy debate bodes well. Given how controversial South Africa's nuclear energy issue is and how it's strongly

opposed, the question of whether this is the end of the battle is of serious concern. Yet the judge's ruling over the nuclear court case, Zuma's recall and president Ramaphosa's position in the nuclear debate might be the fate of South Africa's nuclear plans.

References

Beck, U., 1997. Global risk politics. In: M. Jacobs, ed. Greening the millennium? The new politics of the environment. Oxford: Blackwell, 18 – 33.

Bless, C., Higson-Smith, C and Sithole, S.L. 2013. Fundamentals of social research methods: an African perspective. Cape town: Juta and Company Ltd.

Bowen, G.A. (2009) "Document Analysis as a Qualitative Research Method", Qualitative Research Journal, Vol. 9 Issue: 2, pp.27-40

Boyle, K. J. 2003. Introduction to revealed preference methods. A primer on non-market valuation

Braun, V. and Clarke, V. 2006. 'Using thematic analysis in psychology', Qualitative Research in psychology, 3 (2). pp 77-101.

Bretschger, L. and Zhang, L. 2017. "Nuclear Phase-out Under Stringent Climate Policies: A Dynamic Macroeconomic Analysis", Energy journal, 38(1), 164-194

Brummer, S. (2015). 'Nuclear price tag set Nene against Jacob Zuma'. *Mail & Guardian*, 18 December. Available at: http://mg.co.za/article/2015-12-17-nuclear-price-tag-set-nene-against-jacob-zuma.

Bryman, A. 2004. *Social Research Methods.* New York: Oxford University Press.

Coalition Aagainst Nuclear Energy. 2007. 'National Coalition to oppose Nuclear expansion in South Africa', CANE. Available at: www.cane.org.za

Cohen, M and Burkhardt, P. 2017.'Zuma possibly tagertting a nuclear revival with cabinet reshuffle', Business report. Accessed on 07.Nov.2017. Available on: www.iol.co.za/business-report/zuma-possibly-targeting-a-nuclear-revival-with-cabinet-reshuffle.

Collins, F. 2015. "Earthlife Africa goes to court to halt SA's bid for nuclear power", Times Live. (Available at: http://www.timeslive.co.za/scitech/2016/12/13/Earthlife-Africa-goes-to-court-to-halt-SAs-bid-for-nuclear-power).

Collins, F. 2016. "Earthlife Africa goes to court to halt SA's bid for nuclear power", Times Live. (Available at: http://www.timeslive.co.za/scitech/2016/12/13/Earthlife-Africa-goes-to-court-to-halt-SAs-bid-for-nuclear-power). Accessed: 15/03/2017

COSATU (2015). 'COSATU Statement on the Introduction of Nuclear Energy', COSATU Press Statement, 31 July.

David, H. 2011. Toxic futures: South Africa in the crisis of energy, environment and Capital. Scottsville: University of KwaZulu-Natal press.

Davies L.L. 2011. Beyond Fukushima: Disasters, Nuclear Energy, And Energy Law, Brigham Young University Law Review

Dawson, J.I. 1996. Eco-nationalism: Anti-nuclear Activism and National Identity in Russia, Lithuania, and Ukraine. London: Duke University Press

Dawson, M.C and Sinwell, L. 2012. An edited book. Contesting Transformation: Popular Resistance in the Twenty-First Century. New York: Pluto press

Death, C. 2014. 'Environmental Movements, Climate Change, and Consumption in South Africa', Journal of southern africa studies, 40 (6), 1215-1234

Democratic Alliance. 2016. Minister Joemat-Pettersson: nuclear procurement process has stalled. http//www.da.org.za/2016/04/minister-joemat-pettersson-nuclear-procurement-process-has-stalled/

Department of energy. 1998. White paper for energy policy. Republic of South Africa

Department of Energy. 2007. Republic of south Africa: Pretoria

Department of Minerals and Energy. 2008. Nuclear energy policy for the Republic of South Africa. DME, Pretoria

Democratic Alliance. 2016. Minister Joemat-Pettersson: nuclear procurement process has stalled. http//www.da.org.za/2016/04/minister-joemat-pettersson-nuclear-procurement-process-has-stalled/

Duffey, R.B., 2005. Sustainable futures using nuclear energy. Progress in Nuclear Energy 47, 535–543.

Du Venage, G. 2017. 'South Africa's nuclear dilemma', The National. (Available at: http://www.thenational.ae/business/energy/south-africas-nuclear-dilemma. Accessed 3/03/2017

du Duvenage, W. 2017. 'Time for sanity and clarity on SA's nuclear energy plans', daily maverick. Accessed: www.daily maverivck.co.za

Earthlife (2007). 'The Following Submission Provides Ten Reasons that Earthlife

Africa Cape Town Is Opposed to Nuclear Energy'. Earthlife Africa, Cape Town.

Earthlife Africa Gauteng. (nd). Nuclear Energy. Accessed: www.earhtlife.org.za

EFF. 2016. 'The EFF statement on the medium term budget policy statement'. http://www.effonline.org/copy-of-14-oct-16-eff-on-the-state-

Engineering news. 2017. 'koeberg aims to ease cate town's water woes through desalinationation'. Engineering news Avalilable at: www.engineeringnews.com

Eskom. 2015. Integrated report. Available at: www.eskom .co.za'

Fauzan, A.U. and Schiller, J. 2011. After Fukushima: The rise of resistance to Nuclear Energy in Indonesia. German Asian Foundation

Fig, D. 2004. Uranium road: questioning South Africa's nuclear direction. Johannesburg: Heinrich Boll Foundation

Fig, D. 2010. Nuclear energy rethink? The rise and the demise of South Africa's pebble bed modular reactor, ISS paper 210.

Fig, D., 2007. Technological choices in South Africa: ecology, democracy and development. In: Buhlungu, S., Daniel, J., Southall R and Lutchman, J eds. State of the Nation 2007. Cape Town: HSRC Press, 226 – 224.

Flegel, T. 2003. 'Public protests against nuclear power in German', International Atomic Energy Agency. IAEA, 2003.

Francois, B. 1993. The state in Africa: The politics of the Belly in Africa. 2nd ed. Longman

Gosam, L. 2017. Zuma, the Guptas and the Russians: the inside story, Business live. (Available at: https://www.businesslive.co.za/rdm/politics/2017-01-18-zuma-the-guptas-and-the-russians--the-inside-story/) Accessed on 24/04/2017

Gottschalk, K. 2017. 'Zuma's allies are once again gung-ho about nuclear. Will they get their way?', the conversation. Available at: /theconversation.com/zumas-allies-are-once-again-gung-ho-about-nuclear-

Greenpeace Africa. Nd. The risks of nuclear investments in South Africa. Accessed: www.greenpeace.org/africa/en/campaigns/Climate-change/No-Nuclear-Campaign

Greenpeace USA. 2011. 'The true cost of nuclear energy in South Africa', GreenpeaceUS. Available at: www.greeenpeace.org/africa/global

Greenpeace. 2015. 'Embracing change, shaping the future', Annual report. Available at: http://www.greenpeace.org/africa/Global/africa/publications/Annual%20Reports

Gqirana, T. (2015). 'Nuclear build will be affordable'. *Mail & Guardian*, 1 September. Available at: http://mg.co.za/article/2015-09-01-nuclear-build-will-be-affordable

Holomisa, B. 2017. 'Nuclear deals: Western Cape High Court judgement is an indictment of a Government involved in sneaky deals' UDM media statements. Available at: http://udm.org.za/nuclear-deals-western-cape-high-court-judgement-indictment-government-involved-sneaky-deals

Hallowes, D. 2011. Toxic futures: South Africa in the Crisis of Energy, Environment and Capital

Hore-lacy, I. The future of nuclear energy post Fukushima, Energy and Environment, Vol. 22 (7), pp. 945-947

Jooste, K. 2014. 'Renewable energy sector holds the key to job creation in South Africa. Cape Business news Available at: www.cbn.co.za

Kasperson, R.E., Berk, G., Pijawka, D., Sharaf, A.B and Wood, J. public opposition to nuclear energy: Retrospect and Prospect, science, technology and human values, 5 (31), 11-23

Kivi, R. 2017. 'How does nuclear energy affect the environment?', Sciencing. Available at: sciencing.com/nuclear-energy-affect-environment-4

Mabasa, k. 2015. 'Our concerns over govt's nuclear build plans – COSATU', politics web accesed: http://www.politicsweb.co.za/news-and-analysis/our-concerns-over-govts-nuclear-build-plans--cosat

Matavire, M. 2017. 'Thyspunt activists celebrate Eskom's plan to abandon the site', Fin24. Available at: www.fin24.com/Economy/thyspunt-activists-celebrate-as-eskom-abandons-nuclea

Matlakala, G. 2017. "Zuma slams critics of his nuclear plan, 'Foreign agents', Business report IOL. Available at: www.iol.co.za/capetimes/news/zuma-slams-critics-of-his-nuclear-plan-foreig

Mariam, J. and Robinson, M.E. French nuclear energy policy, Geographical Associations, 66 (4), 300-303

Naki, E and Simnikiwe, H. 2017. 'Nuclear deal ruling just another Bump in the road, say experts', The Citizen.

Ndlozi, M.Q. (2015). 'EFF urges the South African government to strongly consider Germany's advice on nuclear energy'. Johannesburg: Economic Freedom Fighters. Available at: http://effighters.org.za/eff-urges-the-south-african-government-to-strongly-consider-germanys-advice-on-nuclear-energy/ (accessed on 1 March 2016).

Njobeni, S. 2017.'Environmental Affairs approves Eskom's construction of SA's next nuclear power station', Business Report IOL. Available at: www.iol.co.za/business-report/environmental-affairs-approves-eskoms-construction-of-sas-next-nuc

Neuman, WL. 2003. *Social Research Methods,* fifth edition. Boston: Library of Congress Cataloguing.

Overy, N. 2017. 'How SA's nuclear plant build could fuel corruption', Business day. Accessed from: www.businesslive.co.za

Pegels, A. renewable energy in South Africa: Potentials, barriers and options for support, energy policy 38 (2010) 4945-4954.

Peyper, L. 2017. 'Zuptas left in a bind? Court sets aside nuclear deal with Russia, other countries', BizNews. http://www.biznews.com/briefs/2017/04/26/zuptas-nuclear-deal-russia/

Porta, D.D and Diani, M. 2006. 2nd. Social Movements: An Introduction. Sydney: Blackwell publishing.

Pickvance, K. 1997. Social movements in Hungary and Russia: the case of environmental movements, European sociological review, 13 (1) 35-54

Ramaphosa, C. 2018. 'no money for nuclear, says ramaphosa',TimesLive. Accessed on: www.timeslive.co.za/politics/2018-01-26-no-money-for-nuclear-says-ramaphosa/

Rennkamp, B and Bhuyan, R. 2016. The social shaping of nuclear energy technology, Wider Working 2016/2019

Rogers, G. 2017. 'jubilation as nuclear vetoed for thyspunt', HeraldLife. Available at: http://www.heraldlive.co.za/news/2017/10/17/jubilation-nuclear-vetoed-thyspunt

Robinson, M. 2016. 'Nuclear case founding affidavit', Daily Maverick. Accessed: www.daily maverick.co.za.

Ritzer, G. 2011. The Sociological Theory. 8th ed. New York: Mcgraw-Hill Companies, Inc.

Sharonova, Y.M. 2016. 'nuclear energy status in Russia: Historical perspectives and contemporary perspectives', Journal of Humanities and Social Science, Vol. 21 (9) pp. 37 to 46

Skarnekark, Allard, G., S Ekberg and Nordlund, A. 2009. A unique masters programme in combined nuclear technology and nuclear chemistry, at chalmers university of technology, Sweden, American Institute of physics

Sovacool, B.K., and S.V. Valentine (2010). 'The socio-political economy of nuclear energy in China and India'. *Energy*, 35: 3803–13.

Sole, S., Mckune, C. and Brummer S. 2016. The 'Gupta owned' state enterpries, Mail&Guardian. Available at: mg.co.za/article/2016-03-24-the-gupta-owned-state-enterprises

South African faith commission environmental institute (nd). 'Nuclear campaign', SAFCEI. Accessed: www.safcei.org.za

Speckman, A. 2017. 'All Eyes on nuclear amid claim of secret Russian Talks', BusinessDay. Available at: www.businesslive.co.za/bd/national/2017-10-22-all-eyes-on-nuclear-plan-amid-claim-of-secret-russian-talks/

Union of concerned scientists. 2012. UCS EW Energy-water database V1.3. www.ucsusa.org/ew3database.

Van der Zaan, B.C.C., 2002, "Nuclear Energy: Tenfold Expansion or Phase-out?", Technological Forecasting and Social Change, 69, 287-307.

Van vyk, J. 2013. "South Africa's SAFARI From nuclear weapons to nuclear medicine", Africa Insight, 43(2), 1-13

Voss, K and Williams, M. 2011) 'the local in the global: rethinking social movements in the new millennium', Democratisation, 19 (2), 352-377

Wei, M., Patadia, D and Kammena, D.M. 2009. 'Putting Renewable Efficiency to Work: how many jobs can the energy industry generate in the US?', Energy policy 38 (2010) 919-931

Winkler, H. 2016. 'Zuma, the guptas and south Africa's r1trillion nuclear plans', The conversation. Available at: www.theconversation.com

Union of concerned scientists. 2012. UCS EW Energy-water database V1.3. www.ucsusa.org/ew3database.

Williams, R. 2015. 'Renewable energy sources for development', Environmental Law, 4 (38) 89-97

Winkler, H. 2016. 'The state capture controversy has influenced South Africa's nuclear build, The Coversation. Available at: theconversation.com/how-the-state-capture-controversy-has-influenced-south-africas-nuclear-build-58879

Winkler, H. 2016. Zuma, the Guptas and South Africa's R1 trillion nuclear plans, the conversation. Accessd on www.conversation .com

Winkler, H. 2017. 'The SA government hasn't given up the fight for nuclear', The Citizen. Accessed: citizen.co.za

World Nuclear News. 2017. 'South African minister recognises nuclear future', 17 October. Available on: http://www.world-nuclear-news.org/NP-South-African-minister-recognises-nuclear-futur

Wright,J.G., Bischof-Niemz,T, Calitz, J., Mushwana, C., van Heerden, R., Senatla, M and CSIR. 2016. 'CSIR proposes electricity mix for IRP 2016 which excludes nuclear power', Daily Maverick. Available at: www.dailymaverick.co.za/article/2017-05-02. Accessed on: 31/07/2017

Appendix A: Participant information sheet

My name is Risimati Elia Chauke and I am a MA student in sociology at Wits University, doing a masters research report titled *Forging resistance: Analysis of opposition to nuclear energy in South Africa*. The main objective of the study is to analyse opposition to nuclear energy focusing on anti-nuclear groups/activists opposing nuclear energy. I would like to invite you to participate in the research due to your active role in the anti-nuclear struggle

Participation in this research will entail, being interviewed by me, at the time and place convenient for you. The interview will last for approximately 45 minutes. Participation is voluntary, and no person will be advantaged or disadvantaged in any way for choosing to participate or not participate in the study. The study does not provide you with any material benefits yet your participation in this project will add value to the knowledge production process. The interview material will not be seen by any person not concerned, and will only be processed by me. You may refuse to answer any question you would prefer not to, and you may choose to withdraw from the study at any point. Please ask any questions that you may have before agreeing to be part of the study. The study is undertaken for purely academic purposes, it does not involve collecting data on behalf of any local authority or political party. The information you may share is going to be part of the research report, and after the completion of the report a copy will be sent to Wits University in partial fulfilment of Master of Arts degree in sociology. Your confidentiality will be respected and I will not use your name in any reports, unless you explicitly indicate you would like your name used. The raw data generated from this study will be strictly kept confidential. Research records will be kept in a password-protected file. Your participation in this study would be greatly appreciated. If you agree to participate, please sign the separate consent form

Sincerely, Elia

Appendix B: Informed consent Form

University of Witwatersrand

Consent Form for interview

I..... Consent to being interviewed by Chauke Risimati Elia for his study titled Forging resistance: Analysis of opposition to nuclear energy in South Africa

I understand that:

Participation in this interview is voluntary

I may refuse to answer any questions I would prefer not to

I may withdraw from the study at any time

No information that may identify me will be included in the research report, and my responses will remain confidential.

My signature below indicates that I have decided to voluntarily participate in the study, and that I have read and understood the necessary information in relation to the study.

- I confirm that I have read and understood the information sheet for the above and what my contribution will be YES/NO
- I have been given an opportunity to ask questions (face-to-face, via email) YES/NO
- I agree to take part in the study YES/NO
- I understand that my participation is voluntary and that I can withdraw from the study at any time without giving any reason YES/NO

Name of participant:.....

Signature.....

Date.....