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**AN ANALYSIS OF SOUTH AFRICA'S  
STATUTORY REGIME PERTINENT TO THE  
RISKS OF HYDRAULIC FRACTURING**

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# Declaration

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I, Ayesha Motala, hereby declare that:

1. this research paper is my own work and I have not copied the work of another student or author;
2. the written work is entirely my own except where other sources are acknowledged;
3. collaboration in the writing of this dissertation or the copying of another student's work constitutes cheating for which I may be excluded from the University; and
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# Abstract

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The production of energy is vital for the survival of mankind –we rely on the supply of energy in all sectors of the economy, ranging from the generation of electricity which ensures the functioning of households and industries, to the manufacturing of petroleum and diesel from fossil fuels.

Energy production largely depends on the burning of fossil fuels, such as coal, which contributes significantly to levels of pollution as well as environmental degradation. The supplementation of coal with the usage of natural gas that is located underground is viewed as being a more environmentally sound method of power generation. Hydraulic fracturing (or ‘fracking’) is the process applied in order to extract natural gas from deep below the earth’s surface. However, speculation has arisen regarding the environmental risks and consequences of the fracking procedure which has caused debate about how environmentally safe this method actually is. Subsequently, the need for legislative and regulatory mechanisms is essential in order to establish applicable procedures that govern hydraulic fracturing and to guarantee that fracking occurs in a manner that is not harmful to the environment, with remedies being available if such harm does transpire.

The Karoo Basin in South Africa is an area facing the implementation of hydraulic fracturing. Currently, various national legislation exists that may govern fracking and its effects, however no distinct statute is available which specifically applies to hydraulic fracturing in its entirety.

This research study will assess the adequacy of South Africa’s current legislative scheme in relation to hydraulic fracturing and its potential polluting effects, while discussing whether the legislative system is suitable in its application or whether it lacks relevance to those ecological ramifications.

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To a man whose valiant efforts have made it possible for all of us to have the right to an education – rest in peace Tata Madiba. Your legacy lives on.

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# Chapter One: Introduction

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## 1.1 Introduction

South Africa is facing a constantly growing energy challenge. Historically, South Africa has always been dependent on coal as a source of electricity with an estimate of 72.1% of the current energy supply being coal-based.<sup>1</sup> Consequently, coal production and consumption leads to air pollution with the electricity sector being responsible for a large amount of greenhouse gas emissions.<sup>2</sup> It has been suggested by the Department of Mineral Resources that a more environmentally friendly method of power generation is the usage of natural gas that is extracted from rocks underground<sup>3</sup> as this gas is believed to be a cleaner source of energy than coal and oil.<sup>4</sup> South Africa's *National Development Plan*<sup>5</sup> promotes the role of gas resources in the energy sector and establishes that by the year 2030, natural gas will begin to supply power production throughout the country.<sup>6</sup>

In order to extract natural gas from deep below the earth's surface, hydraulic fracturing ('fracking') takes place. However, this process poses several risks to the environment, such as water contamination and air pollution, as well as presenting numerous human health concerns.<sup>7</sup>

The Karoo Basin in South Africa is estimated as containing a large technically recoverable resource of natural gas<sup>8</sup> and is an area facing the implementation of hydraulic fracturing. Presently, no legislation exists that governs hydraulic fracturing specifically in its entirety,

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<sup>1</sup>Eskom Revision 11 – Coal in South Africa (last revised: January 2013), available at [http://eskom.ensight-cdn.com/content/CO\\_0007CoalSARev11.pdf](http://eskom.ensight-cdn.com/content/CO_0007CoalSARev11.pdf) (accessed 3rd September 2013).

<sup>2</sup>National Planning Commission, *National Development Plan 2030: Our Future-make it work* (August 2012), at page 201.

<sup>3</sup>Department of Mineral Resources: Report on the Investigation of Hydraulic Fracturing in the Karoo Basin of South Africa (July 2012), at pages 25-26.

<sup>4</sup>J Bocora 'Global Prospects for the Developments of Unconventional Gas' (2012) 65 *Procedia Social and Behavioral Sciences* 436 at 440.

<sup>5</sup>National Planning Commission, *National Development Plan 2030: Our Future-make it work* (August 2012).

<sup>6</sup>*Ibid* at page 177.

<sup>7</sup>J R Nolon and S E Gavin 'Hydrofracking: State Pre-emption, Local Power, and Cooperative Governance' (2013) 63 *Case Western Reserve Law Review* 995 at 996-998; T W Merrill, 'Four Questions about Fracking' (2013) 63 *Case Western Reserve Law Review* 971 at 981-985.

<sup>8</sup>Department of Mineral Resources: Report on the Investigation of Hydraulic Fracturing in the Karoo Basin of South Africa (July 2012), at page 24.

but a number of statutes<sup>9</sup> may apply to the procedures involved in and possible pollution effects of fracking. Since fracking has not yet occurred in South Africa, but is intended to be carried out, it is uncertain whether the current statutory regime is suited to address the various pollution consequences that may arise when fracking does take place.

The purpose of this research paper is to analyse and critique current South African statutes applicable to fracking and its potential risks. The adequacy of the legislation will be discussed in terms of its ability to manage the fracking process and damage to the environment, or whether one specific statute is needed to regulate this practice.

## 1.2 What is natural gas?

Natural gas may be classified as conventional or unconventional gas - the former refers to gas that exists beneath a layer of rock underground that flows freely to the surface once drilled into, while the latter refers to gas that is trapped inside the rock which has low permeability<sup>10</sup>. Natural gas primarily consists of methane<sup>11</sup> and is typically found in low and ultra-low permeability sediments underground.<sup>12</sup> Natural gas may be used as a source of energy for the generation of electricity<sup>13</sup> and it can be used to power motor vehicles,<sup>14</sup> while being a cleaner source of energy production compared to coal and oil and safer than nuclear energy.<sup>15</sup> Some of the environmental benefits of using natural gas include:

- reduced carbon dioxide emissions during combustion as compared to other fossil fuels;
- low particulate emissions which indicates a lower level of air pollution occurring; and

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<sup>9</sup> These statutes are: the National Environmental Management Act 107 of 1998; the National Water Act 36 of 1998; the National Environmental Management: Waste Act 59 of 2008; the Mineral and Petroleum Resources Development Act 28 of 2002; and the Mineral and Petroleum Resources Development Amendment Act 49 of 2008.

<sup>10</sup> H Cooley and K Donnelly, 'Hydraulic Fracturing and Water Resources: Separating the Frack from the Fiction', June 2012, 1 at 8, available at [http://www.pacinst.org/wp-content/uploads/2013/02/full\\_report35.pdf](http://www.pacinst.org/wp-content/uploads/2013/02/full_report35.pdf) (accessed 12th September 2013); P Kotzé, 'Call for Debate on Unconventional Gas Mining to be Broadened – Research Project Sheds New Light on Debate on Unconventional Gas Harvesting' (2013) 12 *Water Wheel: Groundwater Special Edition* 6 at 7.

<sup>11</sup> J S Gaffney and N A Marley, 'The Impacts of Combustion Emissions on Air Quality and Climate – From Coal to Biofuels and Beyond' (2009) 43 *Atmospheric Environment* 23 at 31.

<sup>12</sup> Bocora, note 4 above, at 437.

<sup>13</sup> Econometrix (Pty) Ltd, Karoo Shale Gas Report: Special Report on Economic Considerations Surrounding Potential Shale Gas Resources in the Southern Karoo of South Africa, 2012, at page 16.

<sup>14</sup> J P. Tomain, 'Shale Gas and Clean Energy Policy' (2013) 63 *Case Western Reserve Law Review* 1186 at 1202-1203.

<sup>15</sup> Bocora, note 4 above, at 440.

- gas generation plants require less space as compared to coal generation plants that are of the same capacity.<sup>16</sup>

There are different phases involved in gas production. The first phase is exploration, which involves the assessment of the presence and viability of the resource.<sup>17</sup> Once economic viability has been established, the mining phase commences with the extraction of the gas by hydraulic fracturing.<sup>18</sup> Finally, the post mining phase occurs when gas generation cannot take place anymore and the gas mine is decommissioned.<sup>19</sup>

### 1.3 What is shale gas?

Shale gas is an unconventional natural gas found in shale deposits underground.<sup>20</sup> Shale is a sedimentary rock that is composed of fine particles<sup>21</sup> and has extremely limited permeability.<sup>22</sup> Being a natural gas, shale composes mainly of methane and accessing this gas is difficult due to its low permeability. In order to harvest the gas for production, drilling underground into the rock needs to take place. This technological processesinvolved is referred to as hydraulic fracturing<sup>23</sup> which allows for shale gas to be extracted.

### 1.4 What is hydraulic fracturing?

Hydraulic fracturing commences with the drilling of a well, which occurs by drilling vertically beneath the earth's surface and then rotating the drill once it is deep underground so that it travels in a horizontal direction.<sup>24</sup> The horizontal drilling allows for a wider area of the rock to be penetrated.<sup>25</sup> The wellbore is cased with strong material which is then cemented

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<sup>16</sup>Department of Minerals and Energy, White Paper on the Energy Policy of the Republic of South Africa, 1998, at page 73.

<sup>17</sup> P Kotze, note 10 above.

<sup>18</sup>Ibid.

<sup>19</sup>Ibid.

<sup>20</sup>Econometrix (Pty) Ltd, Karoo Shale Gas Report, note 13 above.

<sup>21</sup>Department of Mineral Resources, note 3 above, at page 17.

<sup>22</sup> M J. De Wit, 'The Great Shale Debate in the Karoo' (2011) 107 *South African Journal of Science* 1 at 2.

<sup>23</sup>Merril, note 7 above, at page 972.

<sup>24</sup> K Robbins, 'Awakening the Slumbering Giant: How Horizontal Drilling Brought the Endangered Species Act to Bear on Hydraulic Fracturing' (2013) 63 *Case Western Reserve Law Review* 1142 at 1143-1144; H Wiseman, 'Regulatory Adaptation in Fractured Appalachia' (2010) 21 *Villanova Environmental Law Journal* 228 at 237.

<sup>25</sup> Robbins, note 24 above, at page 1144.

into place.<sup>26</sup> The casing (piping) prevents the leakage of fluids and maintains the formation of the wellbore.<sup>27</sup> The process of hydraulic fracturing itself entails rock being broken open by applying sufficient pressure through a fluid medium, mainly water, which is mixed with a small fraction of sand as well as chemicals.<sup>28</sup> This mixture, referred to as fracking fluid, is pumped forcefully into the well to create artificial breakages or fractures in the rock to increase permeability and allow for the natural gas trapped inside to escape and subsequently be extracted.<sup>29</sup>

Fracking fluid may contain chemicals such as hydrochloric acid, which helps to initiate cracks in the rock, as well as ethanol which acts as a product stabiliser.<sup>30</sup> Different additives may be used in fracturing operations, which may range from friction reducers to carrier fluids that are used to transfer chemicals into the wellbore.<sup>31</sup> Some of the fracking fluid may flow up the well to the surface once hydraulic fracturing has proceeded– this is referred to as flowback water.<sup>32</sup>

The United States of America has been engaging in hydraulic fracturing since the 1940s.<sup>33</sup> The first incident of hydraulic fracturing took place during 1947 in Kansas and was used to stimulate gas well production.<sup>34</sup> Texas has been actively involved in shale gas extraction when the Barnett Shale was revealed as being a lucrative source of natural gas.<sup>35</sup> Shale gas exploitation has increased during the past decade with the number of gas wells in the USA rising from 18,485 during 2004 to 25,145 in 2007.<sup>36</sup> The Marcellus Shale, which is located

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<sup>26</sup> P Kotzé, 'Hydraulic Fracturing: Adding to the Debate' (2012) 11 *Water Wheel* 16 at 17.

<sup>27</sup> Ibid; Wiseman, note 24 above.

<sup>28</sup> Department of Mineral Resources, see note 3 above, at page 21; Cooley and Donnelly, note 10 above, at page 12; T Fitzgerald, 'Frackonomics: Some Economics of Hydraulic Fracturing' (2013) 63 *Case Western Reserve Law Review* 1336 at 1339.

<sup>29</sup> Department of Mineral Resources, see note 3 above, at page 21; Merrill, note 23 above; Wiseman, note 24 above, at pages 237-238; J Glazewski, *Environmental Law in South Africa*, Service Issue 1, January 2013, at 18-10.

<sup>30</sup> FracFocus – Chemical Disclosure Registry: 'What Chemicals are Used', available at <http://fracfocus.org/chemical-use/what-chemicals-are-used> (accessed 21st November 2013).

<sup>31</sup> An example of a carrier fluid is petroleum distillate, which transports polyacrylamide, a friction reducer, available at <http://fracfocus.org/chemical-use/what-chemicals-are-used> (accessed 21st November 2013); Department of Mineral Resources, see note 3 above, at page 23.

<sup>32</sup> Wiseman, note 24 above, at page 239; Cooley and Donnelly, note 10 above, at page 21.

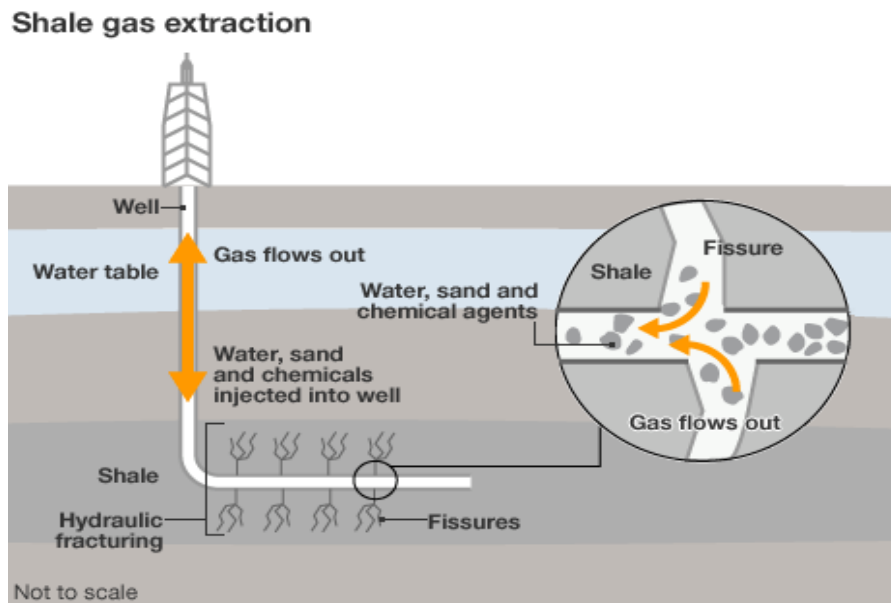
<sup>33</sup> Robbins, note 24 above, at page 1143.

<sup>34</sup> J Adachi, E Siebrits, A Pierce and J Desroches, 'Computer Simulation of Hydraulic Fractures' (2007) 44 *International Journal of Rock Mechanics and Mining Sciences* 739 at 740.

<sup>35</sup> C S. Kulander, 'Shale Oil and Gas State Regulatory Issues and Trends' (2013) 63 *Case Western Reserve Law Review* 1100 at 1102.

<sup>36</sup> L M McKenzie, R Z Witter, L S Newman and J L Adgate, 'Human Health Risk Assessment of Air Emissions from Development of Unconventional Natural Gas Resources' (2012) 424 *Science of the Total Environment* at 79.

beneath some areas of Pennsylvania, West Virginia, Ohio and New York, is becoming an increasingly popular location for shale gas extraction by means of fracking.<sup>37</sup>



**Figure 1: Shale Gas Extraction via Hydraulic Fracturing<sup>38</sup>**

### **1.5 South Africa's approach to shale gas extraction and hydraulic fracturing**

During 2011, applications were lodged by various companies with the Petroleum Agency of South Africa (PASA) for the exploration of shale gas by means of hydraulic fracturing in the Karoo.<sup>39</sup> Applicants included Shell International, Falcon Oil and Gas, and Bundu (also known as Sunset Energy).<sup>40</sup> This ignited an outcry from the public and environmental activists who raised concerns about the threats posed by fracking.<sup>41</sup> In response to immense public opposition, a moratorium on receiving any further applications was imposed by the Department of Mineral Resources<sup>42</sup> and endorsed by Cabinet during April 2011.<sup>43</sup> A Task

<sup>37</sup> B G Rahm *et al*, 'Wastewater Management and Marcellus Shale Gas Development: Trends, Drivers, and Planning Implications' (2013) 120 *Journal of Environmental Management* 105 at 106.

<sup>38</sup> Figure from 'Fracking tests near Blackpool 'likely cause' of tremors', available at <http://www.bbc.co.uk/news/uk-england-lancashire-15550458> (accessed 22nd November 2013).

<sup>39</sup> Glazewski, note 29 above.

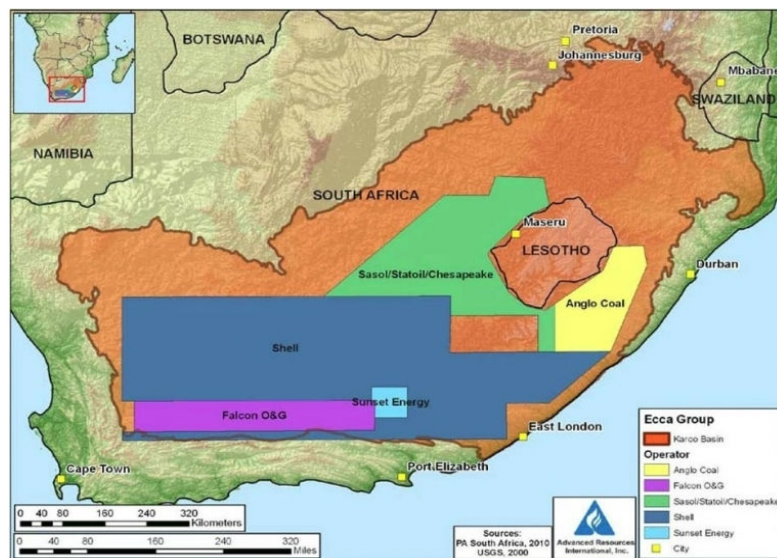
<sup>40</sup> Econometrix (Pty) Ltd, Karoo Shale Gas Report, note 13 above, at page 17; Petroleum Agency of South Africa – Shale Gas: Karoo Basins, available at <http://www.petroleumagencyrsa.com/index.php/home-14/shale-gas> (accessed 22nd November 2013).

<sup>41</sup> Glazewski, note 29 above.

<sup>42</sup> GN 54 in GG 33988 of 1 February 2011.

Team was then appointed to assess the impacts of hydraulic fracturing and make recommendations in this regard.<sup>44</sup> Following the submission and endorsement of the Task Team’s Report<sup>45</sup> during 2012, the moratorium on fracking was lifted.<sup>46</sup>

The proposals for exploration extends to areas across five South African provinces, as indicated in the diagram below.



**Figure 2: Applications by Companies for Shale Gas Exploration in South Africa<sup>47</sup>**

The possibility of shale gas exploration and hydraulic fracturing in South Africa is currently being supported by many government officials. On the 21<sup>st</sup> of August 2013, South Africa’s Deputy President Kgalema Motlanthe told Parliament that mining for shale gas by utilising hydraulic fracturing would be a ‘game changer’ for South Africa’s economy.<sup>48</sup> The usage of natural gas is promoted by the opportunities it presents for energy security and the creation of

<sup>43</sup> Fin24, ‘Cabinet Endorses Fracking Moratorium’, 21 April 2011, available at <http://www.fin24.com/Economy/Cabinet-endorses-fracking-moratorium-20110421> (accessed 21st November 2013); S Hlongwane, ‘Environmentalists, Farmers Rejoice as Cabinet Puts Brakes on Karoo Fracking’, *Daily Maverick*, 21 April 2011, available at <http://www.dailymaverick.co.za/article/2011-04-21-environmentalists-farmers-rejoice-as-cabinet-puts-brakes-on-karoo-fracking/#.Uo9-ncoaJMs> (accessed 21<sup>st</sup> November 2013).

<sup>44</sup> Ibid.

<sup>45</sup> Department of Mineral Resources: Report on the Investigation of Hydraulic Fracturing in the Karoo Basin of South Africa (July 2012).

<sup>46</sup> L Donnelly, ‘Fracking Will Save Us: Cabinet Drops Moratorium’, *Mail & Guardian*, 7 September 2012, available at <http://mg.co.za/article/2012-09-07-cabinet-breaks-ground-on-fracking> (21st November 2013).

<sup>47</sup> Figure from M Simon ‘South African Frackers’ available at <http://www.earthtimes.org/newsimage/frackers-16-Feb-12.jpg> (accessed 22nd November 2013).

<sup>48</sup> J Du Toit, ‘Karoo Fracking Update’, August 2013, available at <http://karoospace.co.za/karoo-fracking-update-august-2013/> (accessed 22<sup>nd</sup> November 2013).

jobs in South Africa, thereby increasing economic activity.<sup>49</sup> South African Minister of Trade and Industry, Mr Rob Davies, has stated that government wanted shale gas exploration in the Karoo to move forward before national elections in 2014.<sup>50</sup>

This favourable approach to fracking has resulted in the gazetting of the *Proposed Declaration for the Exploration for and Production of Onshore Unconventional Oil or Gas Resources or Any Activities Related Thereto Including but Not Limited to Hydraulic Fracturing as a Controlled Activity*<sup>51</sup> by the Minister of Water and Environmental Affairs. The purpose of the Proposed Declaration is to classify hydraulic fracturing as a controlled activity in terms of the National Water Act,<sup>52</sup> thereby requiring a water use licence in terms of the Act.<sup>53</sup>

A further development in South Africa's position on fracking was the gazetting of *Proposed Technical Regulations for Petroleum Exploration and Exploitation*.<sup>54</sup> The purpose of these draft regulations is to supplement South Africa's current regulatory framework and provide standards for the practice of hydraulic fracturing.<sup>55</sup>

These legal developments are indicative of the governmental support for and promotion of shale gas exploitation and hydraulic fracturing in South Africa. However, the gas industry has sparked international and national debate about the potential environmental consequences that may ensue due to hydraulic fracturing. Environmental activists concerned with the risks of fracking argue that the process may lead to the potential contamination of groundwater and surface water resources, as well as causing adverse effects on other environmental components.<sup>56</sup> Air pollution, destruction of biodiversity and issues relating to wastewater management are also included as concerns.<sup>57</sup> In order to prevent, mitigate and remedy any environmental impacts caused by hydraulic fracturing, legislative and regulatory mechanisms

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<sup>49</sup> Western Cape Intra-Governmental Shale Gas Task Team: Interim Report on the Potential Opportunities and Risks Related to Shale Gas Extraction in the Western Cape (August 2012), at page 135.

<sup>50</sup> Du Toit, note 48 above; F Parker, 'Frackers Will Need to Apply for a Water Licence, Says Molewa', *Mail & Guardian*, 3 September 2013, available at <http://mg.co.za/article/2013-09-03-frackers-will-need-to-apply-for-a-water-licence-says-molewa> (accessed 22nd November 2013).

<sup>51</sup> GN 863 in GG 36760 of 23 August 2013.

<sup>52</sup> Act 36 of 1998.

<sup>53</sup> Parker, note 50 above.

<sup>54</sup> GN 1032 in GG 36938 of 15 October 2013.

<sup>55</sup> Ibid.

<sup>56</sup> Glazewski, note 29 above.

<sup>57</sup> A Vengosh, N Warner, R Jackson and T Darrah, 'The Effects of Shale Gas Exploration and Hydraulic Fracturing on the Quality of Water Resources in the United States' (2013) 7 *Procedia Earth and Planetary Science* 863 at 864; S Jenner and A J Lamadrid, 'Shale Gas vs. Coal: Policy Implications from Environmental Impact Comparisons of Shale Gas, Conventional Gas, and Coal on Air, Water and Land in the United States' (2013) 53 *Energy Policy* 442 at 444-448.

need to be stringently applied. If an adequate statutory system governing the different processes involved in fracking exists, then the probability of certain environmental risks occurring may be reduced based on obligatory compliance with legislative standards.

### **1.6 Research question**

The central research question to be answered in this paper is the following: is the current statutory regime in South Africa suitably adapted to regulate fracking and its potential polluting effects? The provisions of the applicable statutes will be examined in order to answer the research problem and to establish whether the legislation applies comprehensively to the risks presented by hydraulic fracturing.

### **1.7 Research methodology**

The research methodology used in writing this research paper is primarily book-based research. Empirical research has not been utilised or conducted. Local and foreign legislation and cases, books and academic articles have been used to lay the foundations for this paper.

### **1.8 Limitations of the study**

This study will include legislative, regulatory and other relevant developments that have taken place over the years which apply to hydraulic fracturing, up to and including information available as at October 2013.

### **1.9 Structure of the research paper**

This paper has been divided into four chapters. Chapter one provides background information on the process of hydraulic fracturing and the current South African approach to fracking. The potential environmental risks presented by hydraulic fracturing are discussed in chapter two, which includes a description of incidents of pollution that have occurred due to fracking. Chapter three critically analyses the adequacy of South African legislative provisions applicable to hydraulic fracturing in relation to the risks discussed in chapter two. Foreign



legislation that has been drafted to regulate fracking will be discussed in chapter four and suggestions will be made concerning the approach South Africa should adopt to address loopholes in local legislation that do not regulate environmental issues linked to fracking.

# Chapter Two: The Environmental Risks of Hydraulic Fracturing

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## 2.1 What are the potential environmental risks and consequences of hydraulic fracturing?

Numerous environmental impacts have been noted as being caused by fracking. The contamination of water resources by fracking fluids is one of the most controversial issues surrounding shale gas extraction.<sup>58</sup> However, this is not the only significant environmental consequence posed by hydraulic fracturing. Flowback, which is the wastewater produced and recovered from the well after fracking takes place, contains fracking fluids as well as chemical components from the shale, metals and organic compounds.<sup>59</sup> This fluid is high in saline and creates issues relating to its disposal as wastewater treatment facilities may not be designed to treat it.<sup>60</sup> Chemical spills during transportation also present a threat to water bodies and the surrounding environment.<sup>61</sup> Hydraulic fracturing requires a vast amount of water during stimulation of the gas well, which may lead to increased pressure on water resources.<sup>62</sup>

It is imperative to examine these potential impacts as they present various environmental challenges that may be addressed legislatively through substantive and procedural provisions.

### 2.1.1 Water contamination

The addition of chemicals to water used in fracking operations amounts to an estimated 1% of the composition of fracking fluid.<sup>63</sup> Although this percentage may seem extremely low, it can represent thousands of litres of chemicals mixed with millions of litres of water used in

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<sup>58</sup> C Johnson and T Boersma, 'Energy (in)security in Poland: the Case of Shale Gas' (2013) 53 *Energy Policy* 389 at 392.

<sup>59</sup> Rahm *et al*, note 37 above.

<sup>60</sup> Vengosh, Warner, Jackson and Darrah, note 57 above, at page 866.

<sup>61</sup> D Rahm, 'Regulating Hydraulic Fracturing in Shale Gas Plays: The Case of Texas' (2011) 39 *Energy Policy* 2974 at 2975-2976.

<sup>62</sup> Jenner and Lamadrid, note 57 above, at page 446.

<sup>63</sup> United States Environmental Protection Agency, Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources: Progress Report (December 2012), at page 15.

fracking operations for gas well stimulation.<sup>64</sup>Fracking fluid therefore presents the possibility of polluting groundwater and surface water.

Groundwater refers to water that lies beneath the earth's surface.<sup>65</sup> Contamination of this water source may occur due to fracking fluids escaping from the wellbore during the production process and entering underground aquifers if the casing of the wellbore is not adequately sealed.<sup>66</sup>This contamination is problematic where groundwater is used for human and animal consumption. Additionally, the pathways (fractures) that are created to extract the natural gas can result in the migration of fracking fluids into groundwater sources via those same pathways.<sup>67</sup> Explosions that may occur underground during fracking can also have an impact on groundwater.<sup>68</sup> Residents in Pennsylvania had to be supplied with bottled water by the gas company conducting hydraulic fracturing in the area after a well explosion underground resulted in the contamination of groundwater.<sup>69</sup>This emphasises the unusable quality of water that has been polluted by fracking fluids, as well as the human health risk posed by such contamination.

In Pavillion, Wyoming, residents have complained over the years about the state of their drinking water.<sup>70</sup> The United States Environmental Protection Agency (EPA) conducted investigations and found toxins in water wells that had likely been caused due to fracking.<sup>71</sup> These investigations and reports are currently being finalised in order to establish definitive conclusions.<sup>72</sup>

Methane from the shale may also leak into soil and underground aquifers if the cement casing of the wellbore is improperly done.<sup>73</sup>High concentrations of methane in water create the risk of explosions or fires.<sup>74</sup>Although it has been argued that methane concentrations are naturally present underground and in water wells, studies have shown high levels of methane in

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<sup>64</sup>Wiseman, note 24 above, at page 238. An illustration of this ratio would be one million litres of water used for fracking with chemical additives being equivalent to ten thousand litres.

<sup>65</sup>Glazewski, note 29 above, at page 16-11.

<sup>66</sup>M L Finkel and J Hays, 'The Implications of Unconventional Drilling for Natural Gas: A Global Public Health Concern' (2013) 127*Public Health*889 at 890; Cooley and Donnelly, note 10 above, at page 17; Johnson and Boersma, note 58 above; Jenner and Lamadrid, note 57 above; Merrill, note 7 above, at pages 984-985.

<sup>67</sup>T Meyers, 'Potential Contaminant Pathways From Hydraulically Fractured Shale to Aquifers' (2012) 50*Groundwater* 872 at 873; Vengosh, Warner, Jackson and Darrah, note 57 above, at page 865.

<sup>68</sup>Jenner and Lamadrid, note 57 above, at page 447.

<sup>69</sup>*Ibid.*

<sup>70</sup>Johnson and Boersma, note 58 above.

<sup>71</sup>*Ibid.*; Rahm, note 61 above, at page 2976.

<sup>72</sup>United States Environmental Protection Agency, Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources: Progress Report (December 2012), at page 170.

<sup>73</sup>Jenner and Lamadrid, note 57 above, at page 446.

<sup>74</sup>Jenner and Lamadrid, note 57 above, at page 447.

groundwater and water wells located within a distance of one kilometre from shale drilling locations.<sup>75</sup>

Chemical spills and leaking fracking fluid increases the potential for the contamination of surface water resources which can be fatal for humans and animals. In Caddo Parish, Louisiana during 2009, fracking fluid leaked into a nearby pasture, killing seventeen cattle.<sup>76</sup> The liable companies involved in the fracking operation were fined \$22,000.<sup>77</sup> The spilling of fracking fluid into a water body in Hopewell Township, Pennsylvania caused a number of fish and amphibian deaths.<sup>78</sup> The company responsible for the incident was fined \$141,175.

The practice of hydraulic fracturing presents some substantial issues relating to water resources. The application of precautionary measures is necessary in order to mitigate the potential environmental effects presented.

### **2.1.2 Flowback and wastewater management**

The storage and disposal of flowback raises contentious environmental concerns. The composition of flowback includes chemicals and other natural compounds,<sup>79</sup> thereby representing large amounts of fluid that needs to be treated or disposed of. This wastewater, which has high levels of salinity,<sup>80</sup> may be stored in reserve pits temporarily, but groundwater contamination may occur if these pits are structurally deficient.<sup>81</sup>

Another option is for flowback to be transported to waste water treatment plants to be purified, however, these plants may not be sufficiently equipped to treat the contaminants present in flowback fluid which results in the discharge of harmful substances into the environment.<sup>82</sup> Flowback that has been treated through a brine treatment facility still produces an extremely salty effluent.<sup>83</sup> The Monongahela River in Pennsylvania receives discharges

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<sup>75</sup>Ibid; Vengosh, Warner, Jackson and Darrah, note 57 above, at page 865; AFP 'Fracking Raises Risk of Fouling Water', *News24*, 24 June 2013, available at <http://www.news24.com/Green/News/Fracking-raises-risk-of-fouling-water-20130624> (accessed 5th September 2013).

<sup>76</sup>Rahm, note 61 above, at page 2976.

<sup>77</sup>Ibid.

<sup>78</sup>Ibid.

<sup>79</sup>Rahm *et al*, note 37 above.

<sup>80</sup>Vengosh, Warner, Jackson and Darrah, note 57 above, at page 866.

<sup>81</sup>Cooley and Donnelly, note 10 above, at page 23.

<sup>82</sup>Finkel and Hays, note 66 above; Cooley and Donnelly, note 10 above, at pages 24-25.

<sup>83</sup>Vengosh, Warner, Jackson and Darrah, note 57 above, at page 866.

from waste water plants that treat fracking fluid, which primarily caused the total dissolved solids levels in the water to surpass drinking water criteria during 2008 and 2009.<sup>84</sup>

The capacity of water treatment facilities to handle flowback is a technical challenge which requires proper assessment. According to the 2011 *National Green Drop Report*,<sup>85</sup> 38.6% of South Africa's waste water treatment plants are in a critical state, while 17.4% of plants have very poor performance.<sup>86</sup> With a water treatment system that is already lacking in performance, the state of South Africa's sewage plants needs to be revised urgently before fracking commences.

Incidents of untreated flowback being dumped into water resources have taken place. XTO Energy Inc., a large holder of natural gas reserves in the United States of America, is facing criminal charges for dumping nearly 60,000 gallons of wastewater from fracking wells into the environment which resulted in pollution of a stream.<sup>87</sup> During July this year, XTO agreed to a settlement with the United States Environmental Protection Agency to pay a \$100,000 civil penalty to the federal government for its actions.<sup>88</sup>

Wastewater flowback may also be injected into wells deep underground, however this enhances the risk of the occurrence of earthquakes.<sup>89</sup> Residents in Arkansas who experienced earthquakes linked to the underground disposal of flowback entered into settlement agreements with the companies who engaged in this method of disposal.<sup>90</sup>

These scenarios show that flowback is one of the elements of hydraulic fracturing that requires legislative regulation to ensure that its impacts on the environment are avoided. The imposition of fines where environmental damage has been caused due to flowback is a remedy that serves as a form of deterrence for fracking operatives.

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<sup>84</sup>Finkel and Hays, note 66 above; Cooley and Donnelly, note 10 above, at pages 24-25.

<sup>85</sup> Department of Water Affairs, 2011 Green Drop Report, available at [http://www.dwaf.gov.za/dir\\_ws/GDS/Docs/DocsDefault.aspx](http://www.dwaf.gov.za/dir_ws/GDS/Docs/DocsDefault.aspx) (accessed 20th November 2013).

<sup>86</sup>Ibid at page 14.

<sup>87</sup> W Kennedy, 'Exxon Charged With Illegally Dumping Waste in Pennsylvania', 11 September 2013, available at <http://www.bloomberg.com/news/2013-09-11/exxon-charged-with-illegally-dumping-waste-water-in-pennsylvania.html> (accessed 16th September 2013).

<sup>88</sup>*United States of America v. XTO Energy*, case no. 4:2013cv01954 (2013).

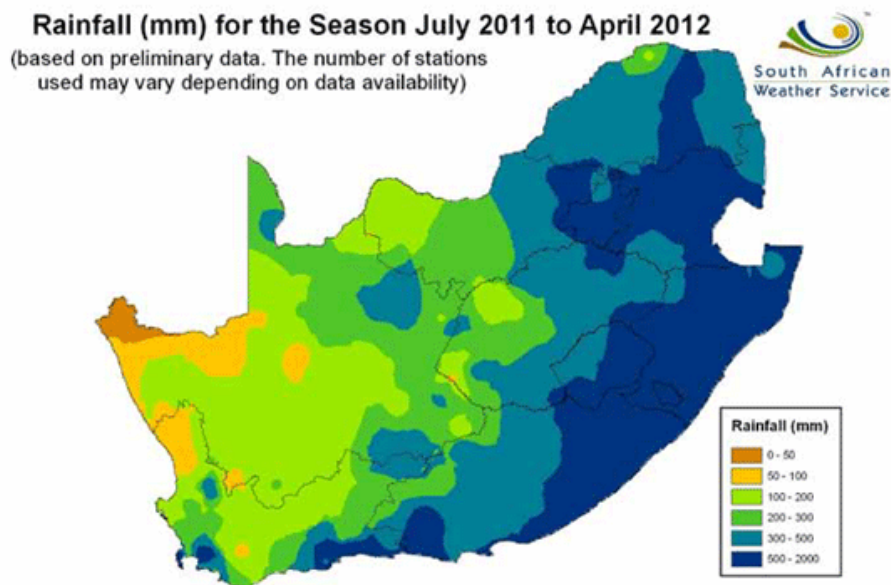
<sup>89</sup> Cooley and Donnelly, note 10 above, at page 24.

<sup>90</sup> M Rosenberg, 'Arkansas Homeowners Settle Suit Charging Fracking Wastewater Caused Quakes', *Planet Ark*, 29 August 2013, available at <http://www.planetark.com/enviro-news/item/69610> (accessed 4th September 2013).

### 2.1.3 Water Use

Hydraulic fracturing requires an immense amount of water during well stimulation. Figures for water used in fracking operations can reach up to millions of litres required per well.<sup>91</sup> Each well may require between 2,300 000 gallons (8,706 447 litres) and 3,800 000 gallons (14,384 565 litres) of water.<sup>92</sup> The total water use per well in the Marcellus Shale amounts to 3,880 000 gallons (14,687 398 litres), while the water use in the Barnett Shale amounts to 2,700 000 (10,220 612 litres).<sup>93</sup>

These figures signify the impact fracking can have on water resources due to the high quantities required to conduct fracturing. This is an essential aspect that water scarce countries should consider before engaging in hydraulic fracturing. South Africa, as a water stressed country, has low levels of rainfall and a hot climate.<sup>94</sup> The following diagram depicts the amount of rainfall received in South Africa during July 2011 and April 2012.



**Figure 3: Rainfall levels in South Africa during July 2011 and April 2012<sup>95</sup>**

<sup>91</sup>United States Environmental Protection Agency, Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources: Progress Report (December 2012), at page 14.

<sup>92</sup> Cooley and Donnelly, note 10 above, at page 15; Jenner and Lamadrid, note 57 above, at page 446.

<sup>93</sup> Jenner and Lamadrid, note 57 above, at page 446.

<sup>94</sup> Department of Water Affairs, National Water Resource Strategy: Second Edition, June 2013, at page 6.

<sup>95</sup> Figure found at <http://www.gov.za/images/aboutsa/rainfall-map.gif> (accessed 22nd November 2013).

With South Africa being the thirtieth driest country in the world, the management of limited water resources therefore should include consideration of the need for economic growth, the need for people to have access to water, as well as the capacity of those water resources to meet such needs without being endangered.<sup>96</sup> The sourcing of copious amounts of freshwater for fracking may be challenging in areas like the Karoo, which is a dry region.<sup>97</sup> Alternatives, such as the use of salt water, should be considered by companies wishing to commence shale gas extraction in South Africa so as to ease the burden already placed on freshwater bodies.

#### 2.1.4 Impacts on land

The fracking process requires the development of infrastructure such as the construction of roads to allow for trucks and earthmoving equipment to operate.<sup>98</sup> Development can cause the disruption of habitats and ecosystems and result in environmental degradation.<sup>99</sup> An increase in traffic<sup>100</sup> of transport vehicles and the movement of equipment can cause damage to dirt roads and the surrounding environment.<sup>101</sup>

The forceful injection of fracking fluid underground may trigger seismic events<sup>102</sup> which can be caused due to the injections stimulating fissures in the rock that already exist.<sup>103</sup>

Environmental impact assessments (EIAs), a fundamental tool used to assess potentially significant environmental effects that may be caused by development,<sup>104</sup> is a means of investigating whether shale gas extraction is congruent to the importance of environmental protection.

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<sup>96</sup> Department of Water Affairs, National Water Resource Strategy: Second Edition, June 2013, at page 6.

<sup>97</sup> Department of Mineral Resources, see note 3 above, at page 41; Kotzé, note 26 above, at page 19.

<sup>98</sup> Wiseman, note 24 above, at page 239.

<sup>99</sup> Jenner and Lamadrid, note 57 above, at page 447.

<sup>100</sup> Robbins, note 24 above, at page 1152.

<sup>101</sup> Department of Mineral Resources, see note 3 above, at page 49.

<sup>102</sup> Department of Mineral Resources, see note 3 above, at page 50.

<sup>103</sup> Ibid; N Starkey, 'Pumping Water Underground Could Trigger Major Earthquakes, Says Scientists', *The Guardian*, 11 July 2013, available at <http://www.theguardian.com/science/2013/jul/11/fracking-water-injection-major-earthquakes> (accessed 22nd November 2013).

<sup>104</sup> M Kidd, *Environmental Law*, 2<sup>nd</sup> ed, 2011, at 235.

### 2.1.5 Decommissioning of mines and well closure

Pyrite, also known as ‘fool’s gold’, forms sulphuric acid when it is exposed to water or air.<sup>105</sup> During mining operations, water that has entered the mining area is removed.<sup>106</sup> Failing to dewater a mine once mining activity has ended can result in acid mine drainage.<sup>107</sup> Acid mine drainage occurs when pyrite interacts with the water in an abandoned mine, which causes the water to become very acidic.<sup>108</sup> Due to the water not being drained out of the mine, the water levels rise and the highly acidic water can lead to pollution of groundwater and surface water.<sup>109</sup>

During 2002, acid mine drainage decanted in the West Rand of Johannesburg and into the Robinson Lake resulting in the lake’s pH level being 2.6, indicating extremely high levels of acidity.<sup>110</sup>

Abandoned mines that are not properly monitored subsequent to their decommissioning create a high potential for pollution. South Africa is currently faced with a major water pollution problem because of acid mine drainage.<sup>111</sup>

In light of the environmental harm caused by acid mine drainage, questions arise as to whether hydraulic fracturing will follow the same route and contaminate water due to closed gas wells not being rehabilitated and appropriately monitored. Consequently, if this should transpire, it will exacerbate water pollution risks that already exist. Thus, well closure has to adhere to strict standards and practices to avoid generating pollution of water resources.

## 2.2 Summary

The risks associated with fracking that have been discussed illustrate the potential environmental dangers of shale gas extraction. Impacts on water resources and land, as well as the challenges relating to disposal of flowback are highlighted as some of the main

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<sup>105</sup> J D Wells *et al*, ‘Terrestrial Minerals’ in HA Strydom and ND King (eds), *Fuggle and Rabie’s Environmental Management in South Africa*, 2<sup>nd</sup>ed, 2009, 513 at 535.

<sup>106</sup> Glazewski, note 29 above, at page 17-8.

<sup>107</sup> Ibid; Department of Water Affairs, Acid Mine Drainage: Long Term Solution Feasibility Study, available at <http://www.dwaf.gov.za/Projects/AMDFSLTS/default.aspx> (accessed 23rd November 2013).

<sup>108</sup> Kidd, note 104 above, at page 95.

<sup>109</sup> Department of Water Affairs, Acid Mine Drainage: Long Term Solution Feasibility Study, note 107 above; Glazewski, note 106 above.

<sup>110</sup> Kidd, note 108 above.

<sup>111</sup> Ibid.; De Wit, note 22 above, at page 7.



concerns surrounding fracking. These potential dangers may be minimised if the hydraulic fracturing process is regulated and supervised in accordance with legislative and procedural requirements. The governing statutes therefore need to be suitably adapted to manage these risks and their effects.

# Chapter Three: Analysis of South Africa's Current Statutory Regime Applicable to Hydraulic Fracturing and its Potential Environmental Risks

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Legislation that is adopted by spheres of government provides legal principles, legal obligations, and liability for non-compliance and contravention, which may be enforced by the judicial authority or other relevant competent authority.<sup>112</sup> The Constitution of the Republic of South Africa, 1996, designates 'environment' as being an area of concurrent national and provincial legislative competence,<sup>113</sup> which allows for authorities at both these levels to enact laws that focus on the safety of the environment.<sup>114</sup>

A number of statutes have been promulgated in this regard, which includes the National Environmental Management Act<sup>115</sup> (NEMA); the Mineral and Petroleum Resources Development Act<sup>116</sup> (MPRDA); the National Water Act<sup>117</sup> (NWA) and the National Environmental Management: Waste Act<sup>118</sup> (NEMWA).

These legislative provisions will be discussed in relation to the pollution risks and other environmental impacts contemplated by hydraulic fracturing, as well as the procedural requirements involved in undertaking shale gas extraction.

## 3.1 The Constitution of the Republic of South Africa, 1996

The Constitution, as the supreme law of the Republic, requires the obligations entrenched in it to be fulfilled.<sup>119</sup> Chapter two of the Constitution provides for a Bill of Rights, which

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<sup>112</sup> A du Plessis, 'Understanding the Legal Context' in A Paterson and L J. Kotze (eds), *Environmental Compliance and Enforcement in South Africa: Legal Perspectives*, 2010, 11 at 12-13.

<sup>113</sup> Part A, Schedule 4 of the Constitution of the Republic of South Africa, 1996.

<sup>114</sup> M Kidd, *Environmental Law*, 2<sup>nd</sup> edition, 2011, at 35.

<sup>115</sup> Act 107 of 1998.

<sup>116</sup> Act 28 of 2002.

<sup>117</sup> Act 36 of 1998.

<sup>118</sup> Act 59 of 2008.

<sup>119</sup> Section 2 of the Constitution, 1996.

contains a set of fundamental human rights that are to be respected and protected by the state.<sup>120</sup>

Section 24 is the cornerstone for environmental protection and establishes the right of South Africans to a safe environment by declaring that:

everyone has the right –

- (a) to an environment that is not harmful to their health or well-being; and
- (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –
  - (i) prevent pollution and ecological degradation;
  - (ii) promote conservation; and
  - (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development<sup>121</sup>.

This provision directly relates to the need for environmental management through legislative and regulatory mechanisms, while recognising the need for economic development through sustainable means.<sup>122</sup> The Supreme Court of Appeal declared the importance of this constitutional right in the case of *Director: Mineral Development, Gauteng Region v Save the Vaal Environment*<sup>123</sup> where the Court stated that

our Constitution, by including environmental rights as fundamental, justiciable human rights, by necessary implication requires that environmental considerations be accorded appropriate recognition and respect in the administrative processes in our country.<sup>124</sup>

Corresponding to the duty laid down in Section 24, the South African legislature has enacted the NEMA,<sup>125</sup> NEMWA,<sup>126</sup> NWA<sup>127</sup> and MPRDA<sup>128</sup> which provide for the protection of

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<sup>120</sup>Section 7 of the Constitution, 1996.

<sup>121</sup>Section 24 of the Constitution, 1996.

<sup>122</sup>*Fuel Retailers Association of Southern Africa v Director General: Environmental Management, Department of Agriculture, Conservation and Environment, Mpumalanga Province* 2007 (6) SA 4 (CC) at para 45.

<sup>123</sup>1999 (2) SA 709 (SCA).

<sup>124</sup>*Ibid* at para 20.

<sup>125</sup>Note 114 above.

<sup>126</sup>Note 117 above.

<sup>127</sup>Note 116 above.

<sup>128</sup>Note 115 above.

environment before, during and after the completion of certain activities and developments that may have impacts on the environment.<sup>129</sup>

### 3.2 The National Environmental Management Act 107 of 1998 (NEMA)

The NEMA was assented to during 1998 and commenced during January 1999.<sup>130</sup> The Act, as the principal statute that gives effect to Section 24 of the Constitution, establishes various principles to be considered for decision-making on matters that affect the environment.<sup>131</sup> The Act defines ‘environment’ as

the surroundings within which humans exist and that are made up of-

- (i) the land, water and atmosphere of the earth;
- (ii) micro-organisms, plant and animal life;
- (iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and
- (iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.<sup>132</sup>

This definition encompasses all aspects of the environment which are included within the ambit of the Act’s provisions that aim to prevent the impact of human activities on environmental resources.

‘Pollution’ is defined in Section 1 of the Act as

any change in the environment caused by-

- (i) substances;
- (ii) radioactive or other waves; or
- (iii) noise, odours, dust or heat,

emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.

Section 2 of NEMA establishes principles that are applicable to the decisions of public bodies that may significantly affect the environment and serve as guidelines for those public

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<sup>129</sup> L Feris, ‘Environmental Rights and Locus Standi’ in A Paterson and L J. Kotze (eds), *Environmental Compliance and Enforcement in South Africa: Legal Perspectives*, 2010, 129 at 133.

<sup>130</sup> Glazewski, note 29 above, at page 7-6.

<sup>131</sup> Long title, Act 107 of 1998.

<sup>132</sup> Section 1 of Act 107 of 1998.

institutions to consider when making such decisions.<sup>133</sup> This section makes provision for the application and consideration of the precautionary principle, as contained in Section 2(4)(a)(vii) of the Act, which states that ‘sustainable development requires the consideration that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions.’

The principles also include that pollution or degradation of the environment is prevented, or minimised and remedied<sup>134</sup> and that waste is re-used, recycled or disposed of in a responsible manner.<sup>135</sup> The polluter pays principle also appears in Section 2, which entails that a person responsible for causing pollution is liable for the costs of remedying such pollution, environmental degradation and consequent adverse health effects, as well as costs for preventing any further pollution.<sup>136</sup>

The NEMA principles provide a detailed framework for the implementation of environmental management during developmental activities<sup>137</sup> and should be considered by the competent authority when deciding whether to grant authorisations in respect of gas extraction and hydraulic fracturing.<sup>138</sup> As guidelines, the principles are wide-ranging and incorporate aspects relevant to the potential risks associated with fracking.

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<sup>133</sup>Section 2(1) of Act 107 of 1998.

<sup>134</sup>Section 2(4)(a)(ii) of Act 107 of 1998.

<sup>135</sup>Section 2(4)(a)(iv) of Act 107 of 1998.

<sup>136</sup>Section 2(4)(p) of Act 107 of 1998.

<sup>137</sup>Glazewski, note 29 above, at page 7-9.

<sup>138</sup>In terms of Section 37(1) of the MPRDA, the NEMA principles in Section 2 apply to all prospecting and mining operations and matters relating to those operations.

### **3.2.1 The relationship between NEMA provisions on mining, exploration and production activities, the National Environmental Management Amendment Act<sup>139</sup> (NEMAA) and the Mineral and Petroleum Resources Development Amendment Act<sup>140</sup> (MPRDAA).**

Before analysing the NEMA provisions applicable to the protection of the environment from potential harm caused by fracking activities, the implications of the NEMAA and MPRDAA need to be considered.<sup>141</sup>

On the 7<sup>th</sup> of June 2013, the MPRDAA commenced operation.<sup>142</sup> This commencement has several implications for NEMA and the MPRDA. During 2008, NEMA was amended to align the environmental requirements in the MPRDA with NEMA provisions and create one environmental system for mining related activities.<sup>143</sup> Although the 2008 NEMAA commenced during 2009<sup>144</sup> the operation of the provisions relating to mining related activities was suspended in terms of Section 14(2).

Section 14(2) of the NEMAA states that

any provision (in the Amendment Act) relating to prospecting, mining, exploration and production and related activities comes into operation on a date 18 months after the date of commencement of –

(a) Section 2 (of the Amendment Act); or

(b) the Mineral and Petroleum Resources Development Amendment Act, 2008,

whichever date is the later.

As Section 2 of the Amendment Act already commenced in 2009 (excluding mining related provisions), the NEMAA provisions on mining, exploration and production activities will only come into effect 18 months after commencement of the MPRDAA. With the MPRDAA having commenced on 7<sup>th</sup> of June 2013, the date on which these NEMAA sections will commence is the 7<sup>th</sup> of December 2014. However, the commencement of certain amended provisions of the MPRDAA has been suspended to the 7<sup>th</sup> of December 2014,<sup>145</sup> which is the

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<sup>139</sup>Act 62 of 2008.

<sup>140</sup>Act 49 of 2008.

<sup>141</sup>Research conducted and supplied directly by Ms M. Lewis and Professor E. Couzens, School of Law, University of KwaZulu-Natal, 2013.

<sup>142</sup>GN 14 in GG 36512 of 31 May 2013.

<sup>143</sup>Long Title, Act 62 of 2008.

<sup>144</sup>Proclamation No.27 in GG 32156 of 24 April 2009.

<sup>145</sup>Research conducted and supplied directly by Ms M. Lewis and Professor E. Couzens, School of Law, University of KwaZulu-Natal, 2013; In terms of Section 94 (2) of the MPRDAA, the following sections that

same date of operation for the NEMAA mining amendments. Any provision of the MPRDAA which conflicts with any NEMAA provision relating to mining, exploration and production activities will lapse with effect from 7<sup>th</sup> December 2014.<sup>146</sup>

Additionally, further amendments were proposed by the NEMAA in Section 13. These amendments, which are contained in the Schedule attached to the Act, propose to transfer power to the Minister of Environmental Affairs in respect of environmental matters relating to mining, which is currently held by the Minister of Mineral Resources.<sup>147</sup> The Minister of Mineral Resources, in terms of Section 24C (2A) of NEMA, is currently designated as the competent authority responsible for granting environmental authorisations for mining, exploration, production and related activities.<sup>148</sup> However, Section 13 of the NEMAA stipulates that these amendments to transfer power will only come into effect 18 months after the date on which the provisions on mining related activities come into effect in terms of Section 14(2). Those mining related provisions are to operate from the 7<sup>th</sup> of December 2014; thus, the amendments affected by Section 13 will only commence 18 months after this date (which is the 7<sup>th</sup> of June 2016). Consequently, the Minister of Mineral Resources will still be the competent authority to grant environmental authorisations until June 2016. This presents a conflicting situation where the Minister of Mineral Resources is designated as the authority to approve applications for environmental authorisations, as well as being the authority responsible for the promotion of mining activities.

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are amended will come into operation on the date contemplated in Section 14(2) of the NEMAA: 5A(a), 16(1), 16(4)(a), 16(4)(b), 17(1)(c), 18(2)(c), 18(3)(c), 19(2)(e), 22(1)(a), 22(4)(a), 22(4)(b), 22(5), 23(1)(d), 24(2)(b), 24(3)(c), 25(2)(e), 27(2), 27(5)(b), 27(6)(b), 32(3), 35(2)(a), 38A, 43(4), 43(6), 45(1), 47(1)(c), 74(4), 75(1)(c), 79(4), 81(2)(c), 81(3)(c), 83(4), 86(2)(d), 93(1)(b) and 106(1).

<sup>146</sup> Research conducted and supplied directly by Ms M. Lewis and Professor E. Couzens, School of Law, University of KwaZulu-Natal, 2013; Section 94(3) of Act 49 of 2008.

<sup>147</sup> Section 24C (2A) of Act 107 of 1998.

<sup>148</sup> Section 24C (2A) was introduced by Section 3 of the National Environmental Management Amendment Act 8 of 2004.

## **3.2.2 NEMA provisions applicable to shale gas extraction and hydraulic fracturing aimed at preventing environmental harm**

### **3.2.2.1 Environmental authorisations**

Chapter five of the NEMA, entitled ‘Integrated Environmental Management’, provides for the application of environmental management tools to ensure the management of environmental impacts of activities.<sup>149</sup> The key management tool used to assess likely impacts on the environment is the environmental impact assessment (EIA) system. Section 24 of the NEMA governs the environmental authorisation process and provides requirements for the implementation of such process.

Section 24(1) of the Act creates the duty to consider, investigate, assess and report the potential consequences for or impacts on the environment posed by listed or specified activities. These findings must be submitted to the competent authority or the Minister of Mineral Resources.<sup>150</sup>

Sections 24(2) and 24D of the Act allow the Minister of Water and Environmental Affairs to identify and list activities that may not commence without environmental authorisation from the relevant authority. During 2010, Listing Notices were published detailing activities that required environmental authorisations. Listing Notice 1<sup>151</sup> details activities which require a basic assessment to be conducted,<sup>152</sup> while Listing Notice 2<sup>153</sup> contains activities that require the completion of a scoping and environmental impact report (S&EIR).<sup>154</sup>

Chapter 6 of the MPRDA regulates petroleum exploration and production, with Sections 69 to 90 detailing the application procedure for various permits and rights. Listing Notice 2<sup>155</sup> indicates that any activity requiring an exploration right or the renewal of such a right in terms of Sections 79 and 81 of the MPRDA requires a S&EIR.<sup>156</sup> Any activity requiring a production right or the renewal of this right in terms of Section 83 and 85 of the MPRDA is

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<sup>149</sup>Section 23(1) of Act 107 of 1998.

<sup>150</sup>Section 24(1) of Act 107 of 1998; The Act refers to the competent authority as the Minister of Minerals and Energy. However, the Department of Minerals and Energy was split during 2010 into two separate departments, namely the Department of Mineral Resources and the Department of Energy. The competent authority responsible for regulating mining activities nationally is the Minister of Mineral Resources.

<sup>151</sup>GNR 544 in GG 33306 of 16 June 2010.

<sup>152</sup>In terms of Regulation 20(1) of the Environmental Impact Assessment Regulations (GNR 543 in GG 33306 of 18 June 2010).

<sup>153</sup>GNR 545 in GG 33306 of 16 June 2010.

<sup>154</sup>In terms of Regulation 20(2) of the Environmental Impact Assessment Regulations (GNR 543 in GG 33306 of 18 June 2013).

<sup>155</sup>GNR 545 in GG 33306 of 16 June 2010.

<sup>156</sup>Activity number 21 of Listing Notice 2.



also listed<sup>157</sup>. Additionally, activities that require a reconnaissance permit under Section 74 of the MPRDA is also contained in Listing Notice 2.<sup>158</sup> Therefore, applicants for these permits or rights (under the MPRDA) will be required to conduct a S&EIR before such permits or rights may be granted. These provisions will apply to applications for shale gas extraction and the necessary environmental authorisation by a competent authority (which is the Minister of Mineral Resources as discussed above in 3.2.1) is required in order for the activity to take place.

Commencing a listed activity without prior environmental authorisation from the competent authority is an offence in terms of Section 24F.<sup>159</sup> A person convicted of this offence is liable on conviction to a fine not exceeding R5 million or to imprisonment for a period not exceeding ten years, or to both the fine and imprisonment.<sup>160</sup>

### **3.2.2.2 Procedure for environmental authorisation**

Section 24(4) of NEMA requires that the procedures used must, in the application for environmental authorisation, ensure that a description of the environment that is likely to be significantly affected by the proposed activity is contained in the application.<sup>161</sup> Procedures involved must also ensure the investigation of the potential impacts on the environment posed by the activity and the assessment of those impacts.<sup>162</sup> The investigation of mitigation measures to keep adverse impacts at a minimum must be included in the procedure.<sup>163</sup>

These prerequisites allow for possible environmental harm to be analysed prior to the activity taking place. This prevents the likelihood of potentially unsafe activities being undertaken without first giving attention to environmental conditions. This safeguard ensures that any environmental risk presented by shale gas extraction and fracking is examined and reported to the authority responsible for issuing environmental authorisations.

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<sup>157</sup> Activity number 22 of Listing Notice 2.

<sup>158</sup> Activity number 23 of Listing Notice 2.

<sup>159</sup> Section 24F(1)(a) read with Section 24F(2).

<sup>160</sup> Section 24F(4).

<sup>161</sup> Section 24(4)(a)(iii) of Act 107 of 1998.

<sup>162</sup> Section 24(4)(a)(iv) of Act 107 of 1998.

<sup>163</sup> Section 24(4)(b)(ii) of Act 107 of 1998.

An applicant for environmental authorisation must appoint an independent environmental assessment practitioner (EAP) to manage the application.<sup>164</sup> A scoping report (required for activities in Listing Notice 2) that is prepared by the EAP and submitted to the competent authority must contain a description of the environment that may be affected by the activity and the environmental issues and potential impacts that have been identified.<sup>165</sup> The scoping report must also include details of the plan of study for the environmental impact assessment that is to follow.<sup>166</sup> The competent authority may reject the scoping report if it does not contain this material information.<sup>167</sup> If the report is accepted, the EAP may then commence with the EIA and prepare the environmental impact report (EIR).<sup>168</sup>

The EIR must include the following: a detailed description of the proposed activity;<sup>169</sup> a description of the environment and the manner in which physical, biological and social aspects of the environment may be affected by the activity;<sup>170</sup> an assessment of each identified potentially significant impact<sup>171</sup> and; a draft environmental management programme which must comply with Section 24N of NEMA.<sup>172</sup> If the EIR does not substantially comply with these requirements, then it must be rejected by the competent authority.<sup>173</sup> However, an EIR that is rejected by the authority in order for amendments to be made by the applicant may then be amended and resubmitted for consideration.<sup>174</sup>

Environmental authorisation is granted once the EIR has been accepted, however, in terms of Section 24P of the Act, the Minister of Mineral Resources (as the competent authority in terms of Section 24C (2A) of NEMA) may only issue an environmental authorisation for mining related activities if the applicant has also made financial provision for the rehabilitation and management of environmental impacts of the proposed activity.<sup>175</sup> By requiring the submission of financial provision prior to the granting of the environmental authorisation, the rehabilitation of environmental impacts caused by mining, production or

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<sup>164</sup> Regulation 16(1) of the Environmental Impact Assessment Regulations (GNR 543 in GG 33306 of 18 June 2010).

<sup>165</sup> Regulation 28(1)(e) and (g).

<sup>166</sup> Regulation 28 (1)(n).

<sup>167</sup> Regulation 30 (1)(c)(i).

<sup>168</sup> Regulation 31(1).

<sup>169</sup> Regulation 31 (2)(b).

<sup>170</sup> Regulation 31(2)(d).

<sup>171</sup> Regulation 31(2)(l).

<sup>172</sup> Regulation 31(2)(p).

<sup>173</sup> Regulation 34 (2)(b).

<sup>174</sup> Regulation 34(2)(b)(ii) read with Regulation 34(4)(a).

<sup>175</sup> Regulation 35(1)(a) read with Regulation 35(4) and Section 24P(1) of NEMA. It must be noted that Section 24P was inserted by Section 8 of the NEMAA of 2008 and will only commence 18 months after the MPRDAA (which came into effect on 7<sup>th</sup> June 2013), which will be the 7<sup>th</sup> of December 2014.

related activities is guaranteed. This security measure certifies that those impacts will be addressed and that sufficient financial resources are in place to undertake remedial measures.

This two-fold process allows for the comprehensive analysis of potential environmental risks associated with hydraulic fracturing, which includes impacts on land and water<sup>176</sup>. By conducting the S&EIR, the threat of environmental harm presented by the proposed activity may be minimised or prevented. By requiring financial security, the ability to rehabilitate the environment that has been affected by the activity is ensured.

Section 24N(1A) of NEMA provides that the Minister of Mineral Resources<sup>177</sup> must require an environmental programme (EMP) to be submitted by the applicant before considering the application for environmental authorisation where that application concerns mining, exploration, production and related activities. A detailed description of the contents of the EMP are laid down in Section 24N(2). All environmental impacts must be managed by the holder of a right or permit under the MPRDA, who has been granted environmental authorisation, in accordance with the approved EMP.<sup>178</sup> Additionally, the holder must rehabilitate the environment that has been affected by the mining or prospecting operations and is responsible for any environmental damage or pollution that has resulted from those operations.<sup>179</sup>

Section 24N creates obligations on the holders of a right or permit under the MPRDA, which will include those companies granted rights to conduct shale gas extraction. This provision allows for rehabilitation of the environment and creates liability for pollution or environmental damage that has been caused by shale gas extraction.

Section 24R(1) of NEMA expands on liability and provides that the holder of a right or permit under the MPRDA remains responsible for any environmental liability until the

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<sup>176</sup>As per the definition of 'environment' in Section 1 of NEMA.

<sup>177</sup> The Act refers to the competent authority as the Minister of Minerals and Energy; however, the competent authority responsible for regulating mining activities nationally is now the Minister of Mineral Resources.

<sup>178</sup> Section 24N(7)(c)(i) of Act 107 of 1998. It must be noted that Section 24N of NEMA was inserted by Section 8 of the NEMAA of 2008 and will only commence 18 months after the MPRDAA (which came into effect on 7<sup>th</sup> June 2013), which will be the 7<sup>th</sup> of December 2014.

<sup>179</sup> Section 24N(7)(e) and (f).

Minister or Mineral Resources issues a closure certificate in terms of Section 43 of the MPRDA.

### **3.2.2.3 NEMA provisions relating to remediation of environmental damage**

Section 28 of NEMA places a duty of care on landowners, a person in control of land, and a person who has a right to use land, who causes or has caused significant pollution or degradation of the environment, to take reasonable measures to prevent that pollution or degradation from occurring, continuing or recurring.<sup>180</sup> Where such harm cannot be avoided or stopped, then reasonable measures must be taken to minimise and rectify the pollution or degradation.<sup>181</sup> Section 28(1) has retrospective application and applies to significant pollution or degradation that arises or is likely to arise at a different time from the actual activity that caused the contamination.<sup>182</sup>

Reasonable measures to be undertaken include measures to:

- investigate, assess and evaluate the impact on the environment;
- cease, modify or control any act, activity or process causing the pollution or degradation;
- contain or prevent the movement of pollutants or the causant of degradation; or
- remedy the effects of the pollution or degradation.<sup>183</sup>

Failing to undertake reasonable measures may result in the issuing of a directive to commence taking such measures and to complete them before a specified date<sup>184</sup>.

Section 28(14) provides that no person may

- (a) unlawfully and intentionally or negligently commit any act or omission which causes significant or is likely to cause significant pollution or degradation of the environment;
- (b) unlawfully and intentionally or negligently commit any act or omission which detrimentally affects or is likely to affect the environment in a significant manner; or

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<sup>180</sup> Section 28(1) read with Section 28(2).

<sup>181</sup> Section 28(1).

<sup>182</sup> Section 28(1A).

<sup>183</sup> Section 28(3).

<sup>184</sup> Section 28(4).

(c) refuse to comply with a directive issued under Section 28.

Section 28(15) creates liability for contravention of Section 28(14). Any person who fails to comply with the latter provision is guilty of an offence, and liable on conviction to a fine not exceeding R1 million or to imprisonment for a period not exceeding 1 year or to both such fine and imprisonment. The imposition of these penalties is viewed as a deterrent for committing environmental harm.

The obligations in Section 28 will rest on companies involved in hydraulic fracturing who cause environmental degradation. Liability may then ensue in respect of Sections 28(14) and (15) for acts or omissions that cause significant pollution or affects the environment considerably.

#### **3.2.2.4 Compliance and enforcement**

- Environmental Management Inspectors

In order to maintain legislative compliance, the provisions of NEMA are enforced by environmental management inspectors (EMI's).<sup>185</sup> The Minister of Water and Environmental Affairs may designate EMI's to enforce NEMA or a specific environmental management Act.<sup>186</sup> EMI's may, within their mandate, investigate an act or omission where there is reasonable suspicion that it may constitute an offence or breach of the law they are designated to enforce.<sup>187</sup> Inspectors are granted wide powers in terms of Section 31 which includes the power to seize items,<sup>188</sup> the power of inspection,<sup>189</sup> and the power to search vehicles and vessels.<sup>190</sup>

EMI's have the authority to conduct routine inspections and enter premises without a warrant in order to ascertain compliance with legislation, a permit or an authorisation.<sup>191</sup> If there are reasonable grounds for believing that legislation, a permit or an authorisation has not been complied with, the inspector may issue a compliance notice setting out steps that must be

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<sup>185</sup>Section 31A.

<sup>186</sup> Section 31B read with Section 31D.

<sup>187</sup> Section 31G(1).

<sup>188</sup>Section 31I.

<sup>189</sup> Section 31H.

<sup>190</sup>Section 31J.

<sup>191</sup> Section 31K(1).

fulfilled within the time period stated in the notice.<sup>192</sup> It is an offence for failing to comply with this notice, and a person may be liable on conviction to a fine not exceeding R 5 million or to imprisonment for a period not exceeding ten years or to both such fine and imprisonment.<sup>193</sup>

EMI's are important as they may detect non-compliance with environmental statutes and environmental authorisations issued under the Act. EMI's, commonly known as the 'Green Scorpions',<sup>194</sup> have achieved some major successes in this regard. The number of EMI's has increased from 1399 during 2011/12 to 1705 in 2012/13, with inspectors situated in various departments around the country.<sup>195</sup> Concerning the criminal enforcement activities by inspectors, 1818 arrests were made during the 2012/13 period as compared to 1339 during the previous period.<sup>196</sup>

Although EMI's play a crucial role in terms of their powers of inspection in order to ensure that legislative and conditional requirements for certain activities are being complied with, EMI's are not authorised to enforce NEMA provisions in respect of mining, exploration or production activities. Amendments to NEMA, which were gazetted during August 2013<sup>197</sup>, grants the Minister of Mineral Resources the power to designate environmental mineral resource inspectors<sup>198</sup> for the compliance monitoring and enforcement of provisions of NEMA and the NEMWA which are implemented by the Minister.<sup>199</sup> Environmental mineral resource inspectors are granted the same powers as EMI's that are necessary for the inspector's mandate.<sup>200</sup> Thus, any non-compliance with the environmental authorisation may be investigated by the inspector(s) and failure to rectify that non-compliance will result in the imposition of a penalty. Environmental mineral resource inspectors will play an important role when shale gas extraction commences in South Africa as they are responsible for enforcing environmental compliance which will help to curb possible environmental harm from occurring or aggravating.

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<sup>192</sup> Section 34L(1) read with Section 34L (2) and (4).

<sup>193</sup> Section 34N(1) read with Section 34N(3).

<sup>194</sup> F Craigie, P Snijman and M Fourie, 'Environmental Compliance and Enforcement Institutions' in A Paterson and L J. Kotze (eds), *Environmental Compliance and Enforcement in South Africa: Legal Perspectives*, 2010, 65 at 95.

<sup>195</sup> Department of Environmental Affairs, National Environmental Compliance and Enforcement Report 2012/13, 2013, at page 5.

<sup>196</sup> Ibid at page 9.

<sup>197</sup> National Environmental Management Laws Amendment Bill: GN 854 in GG 36765 of 16 August 2013.

<sup>198</sup> Section 31BB inserted by Section 5 of the Bill.

<sup>199</sup> Section 31D (2A) inserted by Section 6 of the Bill.

<sup>200</sup> Section 31D (3) substituted by Section 6 of the Bill.

- Judicial authority

The South African judiciary is tasked with the responsibility to interpret environmental statutes, prosecute offenders who have contravened environmental laws, and laying down precedents that may be applied in the future.<sup>201</sup> Judgments have been passed that demonstrate the application of NEMA's provisions.

In the matter of *Vaal Environmental Justice Alliance v Company Secretary of Arcelormittal South Africa Limited*<sup>202</sup> the Court noted that Section 24 of the Constitution, 1996 encourages public campaigns and that a civil society organisation is entitled to protect and exercise the rights of the public by seeking information that will allow for the assessment of impacts by activities on the environment.<sup>203</sup>

The imposition of penalties for contravening NEMA provisions was illustrated in *State v Golfview Mining (Pty) Ltd*<sup>204</sup>. The accused pleaded guilty to contravening Section 28(14)(a) of NEMA by: mining within a wetland; engaging in inadequate pollution control and; failing to separate clean and dirty water at the mining site.<sup>205</sup> The accused also pleaded guilty to commencing listed activities without the necessary environmental authorisations in terms of Section 24F of NEMA.<sup>206</sup> The penalty imposed for these contraventions was R1 million, which was suspended for five years on condition that the accused not commit the same contraventions during the period of suspension.<sup>207</sup>

In *State v Nkomati Anthracite (Pty) Ltd*,<sup>208</sup> the accused, a registered mining company, pleaded guilty to contravening Section 24F(1) of NEMA by undertaking listed activities without the necessary environmental authorisations<sup>209</sup> and was fined R1 million.<sup>210</sup> Although

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<sup>201</sup> A du Plessis, 'Understanding the Legal Context' in A Paterson and L J. Kotze (eds), *Environmental Compliance and Enforcement in South Africa: Legal Perspectives*, 2010, 11 at 34.

<sup>202</sup> *Vaal Environmental Justice Alliance v Company Secretary of Arcelormittal South Africa Limited; Arcelormittal South Africa Limited*, case no. 39646/12 (unreported), South Gauteng High Court, 10 September 2013, available at <http://cer.org.za/wp-content/uploads/2013/09/VEJA-v-AMSA-SGHC-10-Sept-2013.pdf> (accessed 20th September 2013).

<sup>203</sup> Ibid at para 15-16.

<sup>204</sup> Case no. 462/04/2009 // ESH 82/11, Ermelo Regional Court.

<sup>205</sup> Ibid, *Golfview (Pty) Ltd Plea and Sentence Agreement*, at pages 4-5, available at <http://cer.org.za/virtual-library/plea-and-sentence-agreements/s-v-golfview-mining-pty-ltd> (accessed 20th September 2013).

<sup>206</sup> Ibid at pages 6-7.

<sup>207</sup> Ibid at page 11.

<sup>208</sup> Case no. SH 412/13 (unreported), Nelspruit Regional Court, 28 August 2013, *Plea and Sentence Agreement* available at <http://cer.org.za/virtual-library/plea-and-sentence-agreements/s-v-nkomati-anthracite-pty-ltd> (accessed 16th September 2013).

<sup>209</sup> Ibid at pages 4-5.

<sup>210</sup> Ibid at page 10.

the imposition of the fine was suspended, Nkomati Anthracite was ordered to pay R4 million to the Department of Environmental Affairs' Environmental Management Inspectorate for environmental rehabilitation and the execution of the EMI's enforcement duties.<sup>211</sup>

The successful prosecution of companies who have failed to comply with provisions of NEMA provides a guideline for addressing pollution and environmental degradation that may occur as a consequence of hydraulic fracturing. Additionally, companies who fail to obtain the required authorisation before commencing with any listed activity applicable to shale gas extraction may be penalised.

### **3.2.2.5 Summary**

Section 24 of NEMA specifies the procedures involved for environmental authorisations required for activities that are likely to have impacts on the environment. The various conditions that are required to be fulfilled serve as a precautionary measure to proposed activities that may have a detrimental environmental effect. Section 24 also imposes certain responsibilities concerning rehabilitation that must be met by holders of rights under the MPRDA. Thus, NEMA provides the fundamental framework for the consideration of environmental concerns in light of proposed activities and will be applied to environmental authorisations required for hydraulic fracturing. The provisions that have been discussed allow for potential environmental risks to water and land to be assessed before shale gas extraction is authorised. Furthermore, environmental management inspectors have the power to enforce NEMA and take measures to address non-compliance. Section 28 contains a duty of care that is imposed upon anyone who causes pollution or degradation to the environment and creates the offence for intentionally or negligently causing such harm. A person responsible for the commissioning of such an offence is subject to the imposition of the prescribed penalties, as demonstrated above.

Although NEMA does not specifically make provision for the contamination of water resources or issues relating to waste disposal in terms of mining related activities or hydraulic fracturing, these gaps are augmented by the MPRDA, NWA and NEMWA which will be discussed below.

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<sup>211</sup>Ibid.



### **3.3.1 The Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA) and the Mineral and Petroleum Resources Development Amendment Act 49 of 2008 (MPRDAA)**

The principal Act that governs the exploration for and production of natural gas in South Africa is the MPRDA. The purpose of the MPRDA is to provide equitable access to South Africa's mineral and petroleum resources while giving effect to Section 24 of the Constitution by ensuring that these resources are developed in an ecologically sustainable manner.<sup>212</sup>

Section 1 of the Act defines 'petroleum' as

any liquid, solid hydrocarbon or combustible gas existing in a natural condition in the earth's crust and includes any such liquid or solid hydrocarbon or combustible gas, which gas has in any manner been returned to such natural condition, but does not include coal, bituminous shale or other stratified deposits from which oil can be obtained by destructive distillation or gas arising from a marsh or other surface deposit.

Shale gas, as a natural gas, will fall under this definition and is therefore categorised as petroleum in terms of the Act.

Chapter 6 of the Act entitled 'Petroleum Exploration and Production' governs the application for and granting of permits and rights related to petroleum resources. These provisions will apply to applications for shale gas extraction.

Section 70 of the MPRDA allows for the Minister of Mineral Resources to designate an organ of state or agency belonging to the State to perform the functions under Chapter 6. The Petroleum Agency of South Africa (Pty) Ltd (PASA) was appointed during 2004 as the designated agency<sup>213</sup> and is responsible for promoting the onshore exploration and production of petroleum and receiving applications thereto.<sup>214</sup>

Shale gas extraction begins by applying for a technical co-operation permit which allows for desk based research to be conducted, followed by the application for an exploration right, and finally, a production right.<sup>215</sup> Sections 76 to 78 of the MPRDA regulate applications for technical co-operation permits which must be lodged with PASA and accepted by the

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<sup>212</sup>Section 2.

<sup>213</sup>GN 733 in GG 26468 of 18 June 2004.

<sup>214</sup>Section 71.

<sup>215</sup>Econometrix (Pty) Ltd, Karoo Shale Gas Report, note 13 at page 17.

Minister of Mineral Resources.<sup>216</sup> Shell, Falcon Oil and Gas, and Bundu have been granted technical co-operation permits,<sup>217</sup> but in order to assess the viability of shale gas reserves in the Karoo, exploration will have to be conducted.

Section 79(4) states that if the application for an exploration right is accepted by the designated agency, then the agency must notify the applicant, in writing, to consult with any affected parties and submit an environmental management programme (EMP) in terms of Section 39. The EMP must establish information concerning the environment that will be affected to determine remedial measures and provide a description of how pollution or environmental degradation will be remedied.<sup>218</sup> The environmental impacts of the proposed prospecting or mining must be investigated in the EMP.<sup>219</sup> The Minister must grant the exploration right if she has approved the EMP that has been submitted.<sup>220</sup> This specific requirement is embodied in Section 5(4) of the Act, which declares that

no person may prospect for or remove, mine, conduct technical co-operation operations, reconnaissance operations, explore for and produce any mineral or petroleum or commence any work incidental thereto without –

- (a) an approved environmental management programme or approved environmental management plan;
- (b) a reconnaissance permit, prospecting right, mining right, mining permit, technical co-operation permit, exploration right or production right; and
- (c) notifying and consulting with the landowner or lawful occupier of the land in question.

Contravening Section 5(4) is an offence, and a person convicted is liable to a fine not exceeding R100 000 or to imprisonment for a period not exceeding two years, or to both the fine and imprisonment.<sup>221</sup> The holder of an exploration right must comply with the requirements of the approved EMP.<sup>222</sup> This ensures that any impacts caused by the exploration activity will be managed accordingly. However, it must be noted that Section 5(4) of the MPRDA is deleted by Section 4(d) of the Mineral and Petroleum Resources Development Amendment Act 49 of 2008 (the MPRDAA), and Section 5A is inserted in the principal Act after Section 5, which now requires an environmental authorisation prior to

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<sup>216</sup> Section 76 read with Section 77.

<sup>217</sup> Note 210 above.

<sup>218</sup> Section 39(3)(a) and (d).

<sup>219</sup> Section 39(3)(b).

<sup>220</sup> Section 80(1)(c).

<sup>221</sup> Section 98(a)(i) read with Section 99(1)(a).

<sup>222</sup> Section 82(2)(d).

conducting prospecting, mining, exploration or production activities. The following is inserted by Section 5A:

no person may prospect for or remove, mine, conduct technical co-operation operations, reconnaissance operations, explore for and produce any mineral or petroleum or commence with any work incidental thereto on any area without an environmental authorisation.<sup>223</sup>

The MPRDAA seeks to align the environmental authorisation process for exploration and production related activities with the requirements laid down in Chapter 5 of NEMA.<sup>224</sup> Environmental authorisation in terms of the MPRDAA means the authorisation by a competent authority, in terms of Chapter 5 of NEMA, of a listed activity or specified activity.<sup>225</sup> However, the commencement of this amendment has been suspended and will only come into operation on the 7<sup>th</sup> of December 2014.<sup>226</sup>

The final stage in the application process is the application for a production right. During the production process, hydraulic fracturing is carried out. In terms of the principal Act, if the application is granted by PASA, then the applicant must notify and consult with interested and affected parties, conduct an environmental impact assessment (EIA) and submit an environmental management programme for approval.<sup>227</sup> The EIA must contain a scoping report and an environmental impact report.<sup>228</sup> One of the requirements for the granting of the production right by the Minister is if the production will not result in unacceptable pollution, ecological degradation or damage to the environment.<sup>229</sup> Additionally, the right only comes into effect on the date on which the EMP is approved<sup>230</sup> and the holder of the right is obliged to comply with the requirements set in the EMP.<sup>231</sup>

Section 38(1) of the Act creates various obligations on holders of an exploration or production right.<sup>232</sup> A holder must manage all environmental impacts in accordance with the approved EMP<sup>233</sup> and is responsible for any environmental damage, pollution or ecological degradation

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<sup>223</sup> Section 5A(a) inserted by Section 5 of the MPRDAA.

<sup>224</sup> Long Title, Act 49 of 2008.

<sup>225</sup> Definition of 'environmental authorisation' inserted by Section 1(g) of the MPRDAA.

<sup>226</sup> Section 94 (2) of the MPRDAA.

<sup>227</sup> Section 83(4) of the MPRDA..

<sup>228</sup> Regulation 48 of the Mineral and Petroleum Resources Development Regulations, 2004 (GNR 527 in GG 26275 of 23 April 2004).

<sup>229</sup> Section 84(1)(c).

<sup>230</sup> Section 84(5).

<sup>231</sup> Section 86(1)(d).

<sup>232</sup> Section 38(1) refers to holders of prospecting or mining rights. In terms of Section 69(2) this means holders of exploration or production rights for purposes of Chapter 6.

<sup>233</sup> Section 38(1)(c)(i).

as a result of exploration or production operations.<sup>234</sup> Failing to manage environmental impacts in terms of the EMP is an offence,<sup>235</sup> and a person convicted of this offence is liable to a fine not exceeding R500 000 or to imprisonment for a period not exceeding ten years or to both such fine and imprisonment.<sup>236</sup> However, Section 38 of the MPRDA is repealed by Section 31 of the (MPRDAA), with Sections 38A and 38B being inserted. Section 38A, which will come into operation on the 7<sup>th</sup> of December 2014,<sup>237</sup> provides that the Minister of Mineral Resources is the responsible authority for implementing environmental provisions in terms of NEMA which relate to prospecting, mining, exploration or production activities. Section 38B, which is yet to come into operation on a date still to be proclaimed<sup>238</sup>, provides that an environmental management plan or programme which has been approved in terms of the MPRDA before and at the time of the coming into effect of NEMA, shall be deemed to have been approved, and an environmental authorisation issued in terms of NEMA.<sup>239</sup> Furthermore, Section 38B(2) grants the Minister the power to direct the holder of a right, permit or older right, to upgrade the environmental management plan or programme to address deficiencies therein in order to prevent unacceptable pollution or degradation of the environment that may be caused by prospecting, exploration or production activities.

Section 58(a) of the MPRDAA amends Section 80 of the principal Act by providing that the Minister must grant an exploration right if the Minister has issued an environmental authorisation. Furthermore, if an application for an exploration or production right is accepted by the designated agency, then the applicant must submit relevant environmental reports required in Chapter 5 of NEMA.<sup>240</sup> The holder of a production right must comply with the conditions of the environmental authorisation.<sup>241</sup> However, the amendments that provide for the submission of environmental authorisations under NEMA have not yet come into effect and will only commence operation on the 7<sup>th</sup> of December 2014 in terms of Section 94(2) of the MPRDAA.

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<sup>234</sup> Section 38(1)(d).

<sup>235</sup> Section 98(a)(iii).

<sup>236</sup> Section 99(1)(c) read with Section 98(a)(iii).

<sup>237</sup> As per Section 94(2) of the MPRDAA.

<sup>238</sup> Proclamation No. 17 in GG 36541 of 6 June 2013.

<sup>239</sup> Section 38B(1) of the MPRDAA.

<sup>240</sup> Section 79(4)(b) amended by Section 57(d) of the MPRDAA; Section 83(4)(b) amended by Section 61(d) of the MPRDAA.

<sup>241</sup> Section 86(2)(d) amended by Section 64(b) of the MPRDAA.

Section 84(5) of the Principal Act is amended by no longer requiring the approval of an EMP before a production right is granted. The amended Section states that a production right that is granted becomes effective on the effective date.<sup>242</sup>

A controversial aspect surrounding environmental authorisations appears in Section 13 of the NEMAA, which proposes to change the competent authority responsible for authorising mining related activities. The Amendments seek to transfer such powers from the Minister of Mineral Resources to the Minister of Water and Environmental Affairs. However, due to the delay of the commencement of these Amendments, the Minister of Mineral Resources will remain as the competent authority responsible for processing environmental authorisations until June 2016.<sup>243</sup> This is far from ideal – the Department of Mineral Resources faces capacity constraints in implementing the MPRDA alone;<sup>244</sup> thus, if Amendments to the MPRDA come into force and align the environmental authorisation process with NEMA provisions, the Department will be challenged with greater constraints.<sup>245</sup> Additionally, it is suggested that the Department of Mineral Resources lacks the adequate expertise to assess applications for environmental authorisations as well as the capacity to monitor and enforce compliance for violations of authorisations, which is more suited to the Department of Environmental Affairs.<sup>246</sup>

Due to the invasive nature of mining related activities, the MPRDA contains provisions that include the consideration of the environment during and after those activities. However, the Act does not specifically include the protection of water resources from impacts caused by exploration or production operations in its scope, nor does it place restrictions on the amount of water used during those operations. The storage and disposal of waste produced by activities is also not provided for. The Act does not make any provision for the process and impacts of hydraulic fracturing. Shortfalls may be addressed by additional existing environmental legislation, such as the NWA and NEMWA.

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<sup>242</sup> Section 84(5) amended by Section 62(d) of the MPRDAA.

<sup>243</sup> See discussion in 3.2.1.

<sup>244</sup> L Peyper, 'DMR Concedes Constraints Impeded MPRDA', *Miningmx*, 2 August 2013, available at <http://www.miningmx.com/page/news/markets/1632241-DMR-concedes-constraints-impeded-MPRDA#UpXXlcoaJMt> (accessed 24<sup>th</sup> November 2013).

<sup>245</sup> Centre for Environmental Rights, 'MPRDA Amendment Bill: Some Progress, but Environmental Authorities' Hands Still Tied', 10 February 2013, available at <http://cer.org.za/news/mprda-amendment-bill-some-progress-but-environmental-authorities-hands-still-tied> (accessed 24th November 2013).

<sup>246</sup> *Ibid.*

Although the Mineral and Petroleum Resources Development Regulations<sup>247</sup> were published during 2004, they do not include significant provisions relating to the exploration of petroleum. As a result, the Proposed Technical Regulations for Petroleum Exploration and Exploitation<sup>248</sup> were gazetted during October 2013.

### **3.3.2 Mineral and Petroleum Resources Development Amendment Bill, 2013**

The Mineral and Petroleum Resources Development Amendment Bill was introduced by the Minister of Mineral Resources in the National Assembly during June 2013.<sup>249</sup> The Bill introduces substantial changes to the statutory framework applicable to shale gas extraction and hydraulic fracturing, which includes changes to provisions of the MPRDA as well as the amendments contained in the MPRDAA which commenced during June 2013.

Section 46 of the Bill amends Section 70 of the MPRDA by providing for the Regional Manager(s) as being the authority responsible for processing petroleum exploration and production applications, instead of an agency or organ of state designated by the Minister. The Regional Manager must promote the exploration and production of petroleum<sup>250</sup> and applications for technical co-operation permits<sup>251</sup>, exploration rights<sup>252</sup> and production rights<sup>253</sup> must be lodged with the Regional Manager.

Section 48 of the Bill inserts Section 71A into the principal Act and provides that the Minister shall appoint a public entity to receive, maintain and evaluate geological or geophysical information relating to petroleum that is submitted in terms of Section 88, and to bring to the Minister's notice any information regarding exploration and production of petroleum which is likely to be of use or benefit to the State.<sup>254</sup>

Section 78(1) of the principal Act is amended by Section 52 of the Bill and provides that the holder of a technical co-operation permit has the exclusive right to apply for an exploration right in respect of the area to which the permit relates. Thus, the holder no longer has the exclusive right to have the exploration right granted.

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<sup>247</sup> GNR 527 in GG 26275 of 23 April 2004.

<sup>248</sup> GN 1032 in GG 36938 of 15 October 2013.

<sup>249</sup> Explanatory Summary of Bill: GN 567 in GG 36523 of 31 May 2013.

<sup>250</sup> Section 71 of the MPRDA amended by Section 47 of the Bill.

<sup>251</sup> Section 76 of the MPRDA amended by Section 50 of the Bill.

<sup>252</sup> Section 79 of the MPRDA amended by Section 53(a) of the Bill.

<sup>253</sup> Section 83 of MPRDA amended by Section 58 of the Bill.

<sup>254</sup> Section 71A(2) inserted by Section 48 of the Bill.

Section 53(f) substitutes Section 79(4)(b) of the MPRDA by requiring the applicant to apply for an environmental authorisation and to submit environmental reports required in terms of Chapter 5 of NEMAA. Section 79(4)(c) is inserted by Section 53(e) of the Bill. The provision states that if the Regional Manager accepts the application for an exploration right, then he or she must notify the applicant, in writing, to apply for a licence for the use of water in terms of the relevant legislation. This ties in with the sustainable use of water resources as the issuing of water licences allows for the authority to monitor water use.

A crucial change to the principal Act is contained in Section 54 of the Bill. This section inserts Section 80(7) and provides that the State has a right to a free carried interest in all new exploration rights, with an option to acquire a further interest on specified terms through a designated organ of state or state owned entity, as determined by the Minister.

Additional obligations are placed on holders of exploration rights. Section 56 of the Bill inserts Section 82(2)(g) which places an obligation on the holder of the right to relinquish a contiguous portion of the area (to which the right relates) when applying for the renewal of an exploration or production right, unless the holder proves that he or she is in a position to explore the entire exploration area or her or she has made a discovery in respect of that area. The holder is also required to pay royalties in respect of petroleum that he or she removed or disposed of during the course of exploration operations.<sup>255</sup> If a discovery is made in an exploration area, the holder of the right must notify the Minister of that discovery; submit an appraisal programme; and apply for an environmental authorisation and submit environmental reports required in terms of Chapter 5 of NEMA.<sup>256</sup>

The holder of an exploration right may only remove and dispose for his own account, petroleum that is found in the course of exploration operations conducted in such quantities as may be required to conduct tests on the petroleum, or to identify or analyse it.<sup>257</sup> The holder conducting tests that involve producing petroleum shall not, without prior written permission of the Minister, remove such petroleum for his own account, subject to conditions as the Minister may determine.<sup>258</sup> A person who applies for such permission must obtain an environmental authorisation if it has not been obtained in terms of Section 79(4)(b).<sup>259</sup>

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<sup>255</sup> Section 82(g) and (h) inserted by Section 56 of the Bill.

<sup>256</sup> Section 82(3) inserted by Section 56(c) of the Bill.

<sup>257</sup> Section 82A inserted by Section 57 of the Bill.

<sup>258</sup> Section 82A(2) inserted by Section 57 of the Bill.

<sup>259</sup> Section 82A(3) inserted by Section 57 of the Bill.

### **3.3.3 Proposed Technical Regulations for Petroleum Exploration and Exploitation, 2013<sup>260</sup> (Proposed Regulations)**

The Proposed Technical Regulations, which were drafted under the auspices of the MPRDA, purport to supplement gaps that have been identified in the current regulatory scheme.<sup>261</sup> The Regulations are welcomed as they explicitly provide standards and thresholds for hydraulic fracturing. Although regulatory mechanisms cannot completely prevent environmental harm from ensuing, the Regulations could, when they are finalised, provide precautionary measures to be applied to fracking.

Regulation 3 requires an environmental impact assessment for exploration or production activities that could have an impact on natural resources. The potential environmental impacts of the activities over their full life cycle must be assessed.<sup>262</sup> This will include an assessment of the impacts posed by hydraulic fracturing as it is used during production operations.

Regulation 4 requires the holder of an exploration or production right ('holder') to assess the geology of the area prior to well design and submit a geological overview report to PASA. Before conducting hydraulic fracturing, the holder must assess the risk of seismicity that may be caused by fracking and submit a risk assessment report and mitigation measures to the Council for Geoscience for approval.<sup>263</sup> Gas wells must be tested by pre-fracturing injection tests to identify the behaviour of the formation, and hydraulic fracturing must then be modified.<sup>264</sup> This procedure is designed to prevent and minimise the risk of earthquakes occurring that may result from fracking.

Holders of an exploration or production right are required to design and construct sites in a manner that will prevent the contamination of the environment from spills to ground surface.<sup>265</sup> Containment systems must be used where chemicals and flowback are stored.<sup>266</sup>

Chapter 3 of the Proposed Regulations aim to avert the possibility of water contamination by fracking fluids by prescribing standards for gas well design and construction. These standards are imperative and must be applied strictly so as to prevent the leaking of fracking fluids into

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<sup>260</sup> See note 248 above.

<sup>261</sup> Chapter 1 of the Proposed Regulations.

<sup>262</sup> Regulation 3(1).

<sup>263</sup> Regulation 6(1).

<sup>264</sup> Regulation 6(6).

<sup>265</sup> Regulation 8(1) and (2).

<sup>266</sup> Regulation 8(4).



water resources. Regulation 11(1) places a duty on the holder to ensure that a well is designed and constructed in a manner that will prevent the migration of petroleum and other fluids into any other formation and prevent pollution of useable groundwater. Casing standards are laid down which stipulate the type of casing that must be used, requirements for the manner in which it must be installed, and different methods for testing casing.<sup>267</sup> These provisions ensure that acceptable criteria are met in order to minimise the possible migration of fracking fluid into groundwater.

A well examination scheme must include aspects relating to hydraulic fracturing, such as groundwater isolation and independent well examination.<sup>268</sup> In terms of Regulation 23(2), PASA may appoint an independent person to undertake well examination at the cost of the holder of the exploration or production right. This enables the assessment of the adequacy of the gas well in relation to the requirements discussed above.

Regulation 26 prohibits the commencement of hydraulic fracturing operations before obtaining the necessary authorisations and permits, which includes a water use licence in terms of the NWA. This corresponds with the *Proposed Declaration for the Exploration for and Production of Onshore Unconventional Oil or Gas Resources or Any Activities Related Thereto Including but Not Limited to Hydraulic Fracturing as a Controlled Activity*<sup>269</sup> which intends to classify hydraulic fracturing as a controlled activity under the NWA, thereby requiring a water use licence. Regulation 41(1) requires the holder to indicate the supply source of water that will be used in fracking operations and the water usage volume. This allows for the monitoring of water use.

The Regulations provide measures for the protection of water resources from contamination caused by fracking. Gas well sites that utilise fracking may not be located within one kilometre of a water well, water resource, perennial stream or wetland.<sup>270</sup> In addition to minimising the risk of groundwater pollution caused by fracking fluids, this provision also reduces the risk of methane migrating into water sources. Fracking operations must be monitored and if indications are made that fracking fluid or flowback is migrating upwards from the well, then the holder must notify PASA immediately and suspend fracking until

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<sup>267</sup> Regulations 12 to 20.

<sup>268</sup> Regulation 23(1).

<sup>269</sup> GN 863 in GG 36760 of 23 August 2013.

<sup>270</sup> Regulation 38(2) and (4).

remedial action has been completed.<sup>271</sup> Measures to control storm water runoff must be implemented to prevent the transportation of pollutants to water resources.<sup>272</sup> Any spillage of fracking fluid or flowback must be cleaned up immediately and spills that exceed fifty litres must be reported to PASA.<sup>273</sup>

The Regulations provide requirements for the transportation and storage of fluids. Transportation of hazardous fluids must be carried out in line with relevant legislation<sup>274</sup> (which would be the NEMWA) and fracking fluids and flowback must be stored in above-ground tanks until they are removed for disposal.<sup>275</sup> Reserve pits may only be used for the temporary storage of flowback and only when there is incapacity to store higher than expected volumes of flowback.<sup>276</sup> Regulation 34(5) prescribes construction standards for reserve pits.

Waste management is included in the Regulations. Waste fluids (flowback) must be disposed of at a waste disposal facility and underground disposal is prohibited in terms of Regulation 41(1). Additionally, the discharging of fracking fluid and flowback into surface water or a water drainage system is prohibited.<sup>277</sup>

The Proposed Regulations encompass a precautionary approach and adequately address the potential environmental risks that may develop due to hydraulic fracturing. However, a major deficit is that the Regulations do not create offences for non-compliance. Additionally, the Regulations are proposed to be adopted under the MPRDA instead of being promulgated under environmental legislation, such as the NEMA, NWA and NEMWA, which has been formulated to specifically regulate the environmental effects of activities. The Regulations do not specifically refer to these statutes to address the consequences of hydraulic fracturing, nor does it prescribe that legislative penalties under these statutes are to be imposed for causing pollution or environmental degradation. The penalties for contravention of environmental legislation are far stricter than penalties imposed in the MPRDA and serve as a form of deterrence for committing unauthorised and prohibited acts.

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<sup>271</sup>Regulation 30 (4) and (5).

<sup>272</sup>Regulation 39(1).

<sup>273</sup>Regulation 43.

<sup>274</sup>Regulation 33(2).

<sup>275</sup>Regulation 34(2).

<sup>276</sup>Regulation 34(4).

<sup>277</sup>Regulation 34(11).

### 3.3.4 Summary

The MPRDA is the central statute that governs applications for and the granting of rights and permits to conduct shale gas extraction. The requirement for the submission and approval of an EMP for an exploration and production right allows for the potential environmental impacts of shale gas extraction to be investigated prior to such activities being conducted. Environmental impacts are required to be managed in accordance with the EMP – this is a precautionary tool that provides parameters to be met by holders of exploration and production rights in order to protect the environment from the potential effects of shale gas extraction and hydraulic fracturing. However, the Act does not contain detailed environmental provisions in respect of the specific impacts that may occur due to fracking. The Proposed Technical Regulations do attempt to address environmental concerns by requiring an EIA for exploration and production activities that could impact natural resources. This would include conducting an EIA for fracking. The Regulations also prescribe standards for gas well construction and the management of water and waste involved in hydraulic fracturing. However, the Regulations are drafted in terms of the MPRDA and do not directly make provision for the application of the NEMA, the NWA (other than requiring a water use licence under the Act), or the NEMWA. A more balanced approach would be to align the Regulations with the applicable environmental legislation so that precautionary measures and adequate penalties may be imposed for fracking.

The provisions of the MPRDAA intend to coordinate the environmental authorisations for shale gas extraction and production with Chapter 5 of NEMA, which does provide a more suitable approach for the assessment of potential environmental impacts associated with hydraulic fracturing. However, these amendments have not yet come into effect, so the requirements under the principal Act (that is, the MPRDA) will apply until the amendments commence.

Furthermore, the fact that the Minister of Mineral Resources is to remain the competent authority responsible for approving environmental authorisations for exploration and production activities until June 2016 creates an incongruous situation. The promotion and protection of the environment is mandated to the Department of Water and Environmental Affairs, while the Department of Mineral Resources is responsible for promoting mining related activities that allow access to mineral resources. Being the competent authority responsible for fulfilling both these requirements, the Minister of Mineral Resources is faced

with the predicament of balancing both these duties without giving preference to only one of them. This conflict is exacerbated by the lack of capacity and expertise of the Department of Mineral Resources to effectively assess applications for environmental authorisations and implement those authorisations.

### 3.4 The National Water Act 36 of 1998 (NWA)

The purpose of the NWA is to ensure that South Africa's water resources are protected and used in ways that meet the basic human needs of present and future generations and reduce and prevent their pollution and degradation.<sup>278</sup> The Act defines a 'water resource' to include a watercourse, surface water, estuary, or aquifer.<sup>279</sup>

#### 3.4.1 Water Use

Section 38 of the NWA allows for the Minister of Water and Environmental Affairs to declare certain activities as controlled activities. This allows for the regulation of activities that have a detrimental impact on the environment. A controlled activity may not be undertaken unless authorised under the Act.<sup>280</sup> The *Proposed Declaration for the Exploration for and Production of Onshore Unconventional Oil or Gas Resources or Any Activities Related Thereto Including but Not Limited to Hydraulic Fracturing as a Controlled Activity*<sup>281</sup> which were gazetted during August 2013, intends to classify fracking as a controlled activity, which will require a water use licence.<sup>282</sup>

A water use licence must specify the water use for which it is issued and the conditions subject to which it is issued.<sup>283</sup> The responsible authority (either a catchment management agency or the Minister of Water and Environmental Affairs) may issue a notice directing a person who contravenes a condition in the licence to take action to rectify that contravention.<sup>284</sup> A responsible authority who receives an application for a water use licence may conduct its own investigation on the likely effect of the proposed licence on the protection, conservation and management of the water resource.<sup>285</sup>

It is an offence to use water without the necessary water use licence in terms of Section 151(1)(a) of the Act. Thus, commencing with hydraulic fracturing operations without the required authorisation under the NWA will be an offence. A person guilty of this offence is liable, on the first conviction, to a fine or imprisonment for a period not exceeding five years,

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<sup>278</sup>Section 2 of the NWA.

<sup>279</sup>Section 1.

<sup>280</sup>Section 37(2).

<sup>281</sup> GN 863 in GG 36760 of 23 August 2013.

<sup>282</sup> In terms of Section 21(e), a water use includes engaging in a controlled activity declared under Section 38(1).

<sup>283</sup> Section 28(1)(a) and (d).

<sup>284</sup>Section 53(1).

<sup>285</sup> Section 40(2)(b).

or to both the fine and imprisonment.<sup>286</sup> In the case of a second or subsequent conviction, the guilty party is liable to a fine or imprisonment for a period not exceeding ten years, or to both such fine and imprisonment.<sup>287</sup> In *Golfview Mining (Pty) Ltd*<sup>288</sup> the accused contravened the NWA by wrongfully and negligently using water in a manner not permitted by the Act and was sentenced to a fine in addition to being ordered to pay R1 million to the Water Research Commission.<sup>289</sup> In the case of *State v Nkomati Anthracite (Pty) Ltd*<sup>290</sup> the accused pleaded guilty to four counts for contravention of Section 151(1)(a) of the NWA and was sentenced to a fine of R1 million.<sup>291</sup>

A large number of mines in South Africa operate without a valid water use licence under the NWA.<sup>292</sup> It is suggested that these violations occur due to the delay of processing licences by the Department of Water Affairs combined with the fact that mining licences are granted prior to the application for and granting of water use licences.<sup>293</sup> This presents a significant environmental issue as impacts on water resources caused by mining activities are unregulated and any remedial measures will not be enforced especially if there is no knowledge of the water use that is being undertaken. In practice, the procedure for authorising a water use licence for hydraulic fracturing (discussed above) needs to be implemented in a manner that ensures the application for the licence is processed timeously to prevent unlawful water use. This is essential because fracking uses large amounts of water and such usage must be approved before fracking activities commence.

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<sup>286</sup>Section 151(2).

<sup>287</sup>*Ibid.*

<sup>288</sup>*S v Golfview Mining (Pty) Ltd*, case no. 462/04/2009 // ESH 82/11, Ermelo Regional Court.

<sup>289</sup>*Golfview (Pty) Ltd Plea and Sentence Agreement*, at pages 11-12, available at <http://cer.org.za/virtual-library/plea-and-sentence-agreements/s-v-golfview-mining-pty-ltd> (accessed 20th September 2013).

<sup>290</sup>Case no. SH 412/13 (unreported), Nelspruit Regional Court, 28 August 2013, *Plea and Sentence Agreement* available at <http://cer.org.za/virtual-library/plea-and-sentence-agreements/s-v-nkomati-anthracite-pty-ltd> (accessed 16th September 2013).

<sup>291</sup>*Ibid* at page 5 and 10.

<sup>292</sup>G Morgan, 'Fifty Three Mines Operating Without a Water Licence', 20 March 2012, DA Newsroom/ Press Releases, available at <http://www.da.org.za/newsroom.htm?action=view-news-item&id=10467> (accessed 9th December 2013); E Swanepoel, 'Over 100 South African Mines Operating Without Water Licences', 29th September 2009, *Mining Weekly*, available at <http://www.miningweekly.com/article/over-100-mines-operating-without-water-licences-in-sa-2009-09-29> (accessed 9th December 2013).

<sup>293</sup>S Gore and H Dagut, 'Streamlining Water Use Licence Applications into Environmental Mining Regulation', 18 April 2013, available at <http://www.bizcommunity.com/Article/196/547/92264.html> (accessed 2nd September 2013).

### 3.4.2 Water pollution

Section 1 of the Act defines ‘pollution’ as

the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it-

(a) less fit for any beneficial purpose for which it may reasonably be expected to be used;

(b) harmful or potentially harmful-

(aa) to the welfare, health or safety of human beings;

(bb) to any aquatic or non-aquatic organisms;

(cc) to the resource quality; or

(dd) to property.

This definition will therefore include pollution of water resources as a result of hydraulic fracturing.

The Act provides for measures to be taken to prevent and remedy the effects of water pollution. Section 19(1) places a duty on landowners and people who are in control of or use land on which any activity or process was undertaken which causes, has caused or is likely to cause pollution of a water resource, to take all reasonable measures to prevent that pollution from occurring, continuing or recurring. This provision mirrors Section 28(1) of NEMA and creates an obligation on companies conducting fracking operations to undertake remedial measures where water pollution caused by fracking activities has occurred.

These measures include the prevention of movement of the pollutants; the elimination of any source of pollution; and remedying the effects of pollution.<sup>294</sup> A directive may be issued by a catchment management agency (CMA) for failing to take such measures which will then require measures to be taken and completed before a specific date.<sup>295</sup> The object of issuing a directive is to prevent the pollution of water resources.<sup>296</sup> Inadequate compliance or non-compliance with the directive may result in the CMA taking necessary measures to remedy the situation.<sup>297</sup> Section 19(5) allows for costs incurred by the CMA in taking such necessary measures to be recovered jointly and severally from:

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<sup>294</sup>Section 19(2).

<sup>295</sup>Section 19(3).

<sup>296</sup>*Minister of Water Affairs and Forestry v Stilfontein Gold Mining Company Limited and Others* (7655/05, 7655/05) [2008] ZAGPHC 47 (15 May 2009) at 16.9

<sup>297</sup>Section 19(4).

- any person responsible for or who directly or indirectly contributed to the pollution;<sup>298</sup>
- the person who has a right to use the land or who is in control of the land when the activity was undertaken or when the situation came about;<sup>299</sup> or
- any person who negligently failed to prevent the activity from being undertaken or the situation from coming about.<sup>300</sup>

In terms of Section 151(1)(d), failing to comply with a directive issued under Section 19 is an offence and a person is

‘liable, on the first conviction, to a fine or imprisonment for a period not exceeding five years, or to both a fine and such imprisonment and, in the case of a second or subsequent conviction, to a fine or imprisonment for a period not exceeding ten years or to both a fine and such imprisonment’.<sup>301</sup>

In *Minister of Water Affairs and Forestry v Stilfontein Gold Mining Company (Ltd)*<sup>302</sup> the respondents were issued with three directives by the applicant and were required to provide necessary information and the payment of funds for pumping operations, which was not complied with.<sup>303</sup> The Court held that

“the object of the directives is to prevent pollution of valuable water resources. To permit mining companies and their directors to flout environmental obligations is contrary to the Constitution, the Mineral and Petroleum Resources Development Act and the National Environmental Management Act”.<sup>304</sup>

The respondents were subsequently sentenced to individual fines of R15 000.<sup>305</sup>

Section 20 of the Act regulates the pollution of water resources that has been caused by emergency incidents. An ‘incident’ includes any incident or accident in which a substance -

- (a) pollutes or has the potential to pollute a water resource; or
- (b) has, or is likely to have, a detrimental effect on a water resource.<sup>306</sup>

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<sup>298</sup> Section 19(5)(a).

<sup>299</sup> Section 19(5)(c).

<sup>300</sup> Section 19(5)(d).

<sup>301</sup> Section 151(2).

<sup>302</sup> (7655/05, 7655/05) [2008] ZAGPHC 47 (15 May 2009).

<sup>303</sup> *Ibid* at 13.

<sup>304</sup> *Ibid* at 16.9.

<sup>305</sup> *Ibid* at 22.

<sup>306</sup> Section 20(1).



It is submitted that this definition would apply to incidents involving fracking fluid and flowback that enter groundwater and/or surface water.

Section 20(2) declares a ‘responsible person’ as being any person who –

- (a) is responsible for the incident;
- (b) owns the substance involved in the incident; or
- (c) was in control of the substance involved in the incident at the time of the incident.

A responsible person will therefore include, by virtue of this definition, the company conducting hydraulic fracturing operations.

The responsible person is required to report the incident to the Department of Water Affairs or the relevant CMA<sup>307</sup> and take reasonable measures to contain and minimise the effects of the incident.<sup>308</sup> Clean-up procedures must be undertaken and the effects of the incident must be remedied.<sup>309</sup> Additionally, the CMA may direct the responsible person to take other measures and if the directive is not complied with, the CMA may take such necessary measures to address the pollution.<sup>310</sup> It is an offence under Section 151(1)(d) to fail to comply with a directive issued under this Section and a person will be liable to the penalties stipulated in Section 151(2).

Section 151(1)(i) and (j) provide that no person may unlawfully and intentionally or negligently commit any act or omission which pollutes or is likely to pollute a water resource, or which detrimentally affects or is likely to affect a water resource. Such action constitutes an offence subject to penalties prescribed in Section 151(2) of the Act. These provisions apply to water pollution or detrimental effects to water resources that are caused by hydraulic fracturing. Although the Act does not specifically provide for mining related activities that cause pollution to water resources, the provision of Section 151(1) may still be applied to such activities, as demonstrated in *State v Nkomati Anthracite (Pty) Ltd*<sup>311</sup> where the accused

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<sup>307</sup>Section 20(3).

<sup>308</sup>Section 20(4)(a).

<sup>309</sup>Section 24(4)(b) and (c).

<sup>310</sup>Section 24(4)(d) read with Section 24(6).

<sup>311</sup>Case no. SH 412/13 (unreported), Nelspruit Regional Court, 28 August 2013, Plea and Sentence Agreement available at <http://cer.org.za/virtual-library/plea-and-sentence-agreements/s-v-nkomati-anthracite-pty-ltd> (accessed 16th September 2013).

was held responsible for disposing of waste generated from mining activities in a manner that detrimentally impacted a water resource.<sup>312</sup>

The Act also provides for damages to be awarded where an offence has been committed and damage to a water resource has occurred due to the commission of that offence. Section 152(b) allows for the Court convicting the offender, at the written request of the Minister, to enquire into the harm or damage that has been caused to the water resource. The Court may then order the accused to pay costs for remediation and order for such remedial measures to be undertaken by the accused.<sup>313</sup>

These provisions will apply where fracking fluid pollutes groundwater resources and where surface water is polluted due to accidents involving flowback and/or fracking fluids. The remedial measures aim to mitigate the effects of pollution on water resources and place a duty on the polluter to take such action.

### **3.4.3 Regulations under the NWA**

During 1999, the Minister of Water Affairs and Forestry published the *Regulations on the Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources*.<sup>314</sup> The Regulations prescribe requirements for the protection, conservation and control of water resources in relation to mining activities.

Regulation 1 defines an ‘activity’ as being

any mining related process on the mine including the operation of washing plants, mineral processing facilities, mineral refineries and extraction plants, as well as the operation and usage of mineral loading and off-loading zones, transport facilities and mineral storage yards.

This may include fracking processes used during shale gas extraction.

Regulation 2(1) requires that the Department of Water Affairs be notified of the intention to operate a new mine or conduct any new activity not less than fourteen days before

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<sup>312</sup>Ibid at page 5.

<sup>313</sup>Section 153(b) and (c).

<sup>314</sup>GNR 704 in GG 20119 of 4 June 1999.

commencing. Failing to provide notification is an offence and a person will be liable on conviction to a fine or to imprisonment for a period not exceeding five years.<sup>315</sup>

The Regulations expand on the requirements under the NWA regarding the application of reasonable measures to protect water resources. Regulation 7(a) places an obligation on persons in control of a mine or activity to take reasonable measures to prevent water containing waste or any substance which causes or is likely to cause pollution of a water resource from entering any water resource, either by natural flow or seepage. This requirement would apply to fracking fluids that may seep out of gas wells into groundwater.

Disposing any residue or substance that is likely to cause pollution of a water resource into any prospecting diggings or pits is prohibited in terms of Regulation 4(a).

Failing to comply with any of the mentioned provisions is an offence in terms of Regulation 14(1).

Regulation 14(2) creates vicarious liability by holding the person in control of the mine liable for an offence committed by a manager or employee.

#### **3.4.4 Summary**

The Proposed Declaration intends to classify hydraulic fracturing as a controlled activity under the NWA, thereby requiring a water use licence to be authorised prior to the commencement of fracking. The issuing of licences will allow for water use to be monitored by the competent authority. The Act imposes penalties for using water without a licence and creates liability when a water resource is polluted or detrimentally affected by an activity. These legislative consequences will apply to fracking and the consequences it produces that impact water resources. The NWA Regulations provide for the management and protection of water resources during mining related activities and would apply to shale gas extraction.

However, the number of mines in South Africa that do not operate with a water use licence presents cause for concern. The coordination and cooperation between the Department of Mineral Resources and the Department of Water and Environmental Affairs needs to be strengthened to ensure that exploration and production rights for shale gas are not granted

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<sup>315</sup>Regulation 14(1).

before a water licence has been authorised. This will prevent the unlawful and unchecked use of large amounts of water during hydraulic fracturing.

### **3.5 The National Environmental Management: Waste Act 59 of 2008 (NEMWA)**

The objects of NEMWA are to protect the environment by providing reasonable measures for

- avoiding and minimising the generation of waste;
- reducing, re-using, recycling and recovering waste; and
- preventing pollution and ecological degradation.<sup>316</sup>

Section 5 provides that the Act must be read in conjunction with NEMA and its application must be guided by the principles in Section 2 (of NEMA).

The Act applies to ‘waste’ which is defined in Section 1 as

any substance, whether or not that substance can be reduced, re-used, recycled or recovered—

- (a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of;
- (b) which the generator has no further use of for the purposes of production;
- (c) that must be treated or disposed of; or
- (d) that is identified as a waste by the Minister by notice in the *Gazette*;

and includes waste generated by the mining, medical or other sector, but—

- (i) a by-product is not considered waste; and
- (ii) any portion of waste, once re-used, recycled or recovered, ceases to be waste.

Following the scope of this definition, waste produced by hydraulic fracturing operations falls into this category. Additionally, flowback produced by fracking may also be classified as hazardous waste under the Act, which is defined as:

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<sup>316</sup>Section 2.

‘any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment’.<sup>317</sup>

Flowback from hydraulic fracturing may be declared as a priority waste under Section 14 of the Act due to its chemical composition. Section 14(1) allows the Minister of Water and Environmental Affairs to declare a waste to be priority waste if the Minister on reasonable grounds believes that the waste poses a threat to health, well-being or the environment because of the quantity or composition of the waste and- (a) that specific waste management measures are required to address the threat; or (b) that the imposition of specific waste management measures may reduce health and environmental impacts of that waste. Section 14(4) requires that notices in terms of Section 14(1) must contain specific waste management measures to be taken.

Companies that conduct fracking operations which produce flowback are holders of waste in terms of the Act. A holder is defined in Section 1 as ‘any person who generates, stores, accumulates, transports, processes, treats or exports waste or disposes of waste’. Holders of waste have a duty to take reasonable measures to minimise the toxicity and amount of waste that is produced,<sup>318</sup> and manage the waste in a manner so that it does not endanger the environment.<sup>319</sup> Reasonable measures under NEMWA reflect those in the NWA and NEMA. The measures include eliminating the source of pollution or environmental degradation and remedying such effects.<sup>320</sup> If a holder fails to take measures to manage waste in a manner so that it does not endanger the environment, then that failure constitutes an offence for which the holder may be liable on conviction to a fine not exceeding R 10 million or imprisonment for a period not exceeding ten years, or to both, in addition to any other penalty in terms of NEMA.<sup>321</sup> As such, companies engaging in fracking operations must employ these measures to prevent and minimise environmental impacts caused by flowback or face the possibility of being fined for non-compliance.

Section 19(1) of the Act allows the Minister to list certain waste management activities that have, or are likely to have a detrimental effect on the environment. Waste management

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<sup>317</sup>Section 1.

<sup>318</sup>Section 16(1)(a).

<sup>319</sup>Section 16(1)(d).

<sup>320</sup>Section 16(3).

<sup>321</sup>Section 67(1)(a) read with Section 68(1).

activities include the generation, storage and transportation of waste.<sup>322</sup>Fracking operations therefore conduct waste management activities by producing, storing and transporting flowback (that is, in instances where flowback is transported by the company conducting fracking to a waste disposal facility).

In order to commence or undertake a listed waste management activity, a waste management licence has to be issued where such licence is required.<sup>323</sup> During 2009, Minister van Schalkwyk published such a list<sup>324</sup> which was amended during 2012<sup>325</sup> by the current Minister, Miss Edna Molewa. The activities are separated into three lists. In order to commence activities in Category A, a basic assessment process must be conducted in terms of the 2010 NEMA Environmental Impact Assessment Regulations.<sup>326</sup> Category B activities require a scoping and environmental impact report in terms of the NEMA EIA Regulations and includes activities that involve hazardous waste.<sup>327</sup> A S&EIR is required for the construction of a facility for a waste management activity listed in Category B.<sup>328</sup> Activities in Category C that are undertaken must comply with standards determined by the Minister in terms of NEMWA.<sup>329</sup> Commencing with a listed activity without the necessary waste management licence is an offence in terms of Section 67(1)(a). The penalties imposed may be a fine not exceeding R 10 million or imprisonment for a period not exceeding ten years, or to both these penalties in addition to any other penalty or award that may be imposed under NEMA.<sup>330</sup>

Section 21 provides various requirements for the storage of waste. Operations that store flowback onsite must take steps to ensure that the containers used are not corroded or unfit for the safe storage of flowback and that adequate measures are taken to prevent accidental spillage or leakage.<sup>331</sup> This prevents the likelihood for contamination caused by flowback. Contravening Section 21 is an offence and a person convicted is liable to a fine not exceeding R5 million or to imprisonment for a period not exceeding five years, or to both.<sup>332</sup>

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<sup>322</sup>Section 1.

<sup>323</sup>Section 20.

<sup>324</sup> GN 718 in *GG* 32368 of 3 July 2009.

<sup>325</sup> GN 1113 in *GG* 33880 of 14 December 2012.

<sup>326</sup>Regulation 3.

<sup>327</sup>Regulation 4.

<sup>328</sup>Regulation 4(9).

<sup>329</sup>Regulation 5.

<sup>330</sup>Section 68(1).

<sup>331</sup>Section 21.

<sup>332</sup> Section 67(1)(b) read with Section 68(2).

Reasonable steps must be taken by a person transporting waste to prevent any spillage of the waste from the vehicle.<sup>333</sup> This duty will rest on fracking operations that transport flowback to a waste treatment facility; similarly, the duty will also be placed on waste facilities that pick up flowback from the site. Additionally, where waste is transported for disposal, the person transporting the waste must, before offloading the waste from the vehicle, ensure that the facility is authorised to accept such waste.<sup>334</sup> Section 67(2) of the Act specifically creates offences in this regard and creates liability for a person in control of a vehicle or who is in a position to control the use of the vehicle. Liability will therefore rest on companies who use vehicles to transport flowback for: failing to take all reasonable steps to prevent spillage from the vehicle; intentionally or negligently causing spillage from the vehicle; or disposing of waste at a facility that is not authorised to accept the waste.<sup>335</sup> Penalties may not exceed R5 million or a five year period of imprisonment, or both can be imposed.<sup>336</sup>

The Act makes provision for compliance and enforcement mechanisms by the submission of waste impact reports. An EMI appointed in terms of NEMA may require a person to submit a waste impact report if the EMI suspects, on reasonable grounds, that the person has contravened or failed to comply with NEMWA or conditions of a waste management licence, which has had or is likely to have a detrimental effect on the environment, or has contributed to the degradation of the environment.<sup>337</sup> The cost of compiling the report rests with the person who is required to submit that report.<sup>338</sup> This measure allows for the assessment of compliance with the Act. Failing to submit the report is an offence, the penalty for which is a fine not exceeding R5 million or five years imprisonment.<sup>339</sup>

### **3.6 Summary**

Due to the chemical composition of flowback, this wastewater has to be managed in a manner that reduces possible environmental risks. Although the NEMWA does not specifically refer to the management of flowback fluid, the provisions would be applicable to waste generated from hydraulic fracturing as the Act pertains to the management of general waste and

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<sup>333</sup>Section 25(2).

<sup>334</sup>Section 25(3).

<sup>335</sup>Section 67(2).

<sup>336</sup>Section 68(2).

<sup>337</sup>Section 66(1).

<sup>338</sup>Section 66(6).

<sup>339</sup>Section 68(2).

hazardous waste. The NEMWA prescribes significant penalties for failing to manage waste in an environmentally sound manner and creates duties on fracking operations regarding the storage and transportation of flowback. These duties are required to be fulfilled with a view to ensure that the environment is protected during waste management.

A major issue relating to the disposal of flowback fluids would be the insufficient capacity of South African wastewater treatment facilities to treat wastewater. Facilities are currently unable to perform their functions and it is uncertain whether they will be able to handle the large volumes and chemical composition of flowback produced by hydraulic fracturing.



# Chapter Four: The Suggested Approach for South Africa

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## 4.1 Suggestions for the development of South African legislation by analysing foreign legislation that has been adopted to regulate hydraulic fracturing

Although the South African legislation discussed provides procedural remedies and penal provisions for environmental harm that may be caused by hydraulic fracturing, the approach may be seen as being fragmented due to the application of different laws. Yes, the legislation does address pollution and environmental degradation; however the statutes do not directly contain provisions applicable to the unique environmental threats presented by fracking, such as the possible contamination of groundwater caused by fracking fluid escaping into underground aquifers. The confusion surrounding the relationship between NEMA, the MPRDA and their Amendment Acts presents a further challenge for environmental authorisations required for shale gas extraction under these Acts. The temptation to begin shale gas extraction in order to exploit the resource and improve economic development should not be given in to at the cost of causing environmental harm, particularly when that harm is preceded by inadequate legislative regulation.

It is submitted that a more concrete approach to regulating and controlling environmental risks presented by fracking would be via the promulgation of a single national statute which would include precise procedural and substantive obligations resting on applicants for rights to conduct shale gas extraction and holders of such rights. One system for environmental authorisation needs to be applied and the distinct ways of how pollution can occur needs to be addressed by the legislation. Preventative measures that are exclusively designed to address the potential threats of hydraulic fracturing should be included within the ambit of the Act. However, the drafting of legislation takes time and a solution will not appear overnight. An attempt to provide a solution has come in the form of the *Proposed Technical Regulations for Petroleum Exploration and Exploitation* (discussed under 3.3.1) which is currently in its draft stage.

Provincial legislation that is adopted to regulate hydraulic fracturing may provide an important avenue for addressing discrepancies in the national legislative scheme. South African provincial legislatures are vested with legislative authority in terms of Section 104 of

the Constitution, 1996 and have the competence to adopt legislation that relates to the environment and pollution control in each particular province.<sup>340</sup> A provincial legislature may initiate or prepare legislation<sup>341</sup> which takes the form of a Bill, which is then assented to by the Premier of that province.<sup>342</sup> The provinces therefore have Constitutional legislative capacity to implement fracking legislation that addresses environmental and pollution issues. An advantage of this is that provincial legislation can address individual environmental conditions in the various provinces by being drafted in a manner that takes those unique factors into account.

Different American states have adopted state laws and regulations for hydraulic fracturing which highlights the differences and shortfalls in the South African legislative scheme. Moreover, some American states have banned or placed moratoriums on fracking due to the potential environmental impacts that are associated with the practice. This highlights the ecological uncertainty surrounding fracking.

#### **4.1.1 Idaho**

During 2012, the state of Idaho passed regulations on fracking entitled *Rules Governing Oil and Gas Conservation in the State of Idaho*.<sup>343</sup> The Rules provide requirements for the disclosure of information in applications for hydraulic fracturing.<sup>344</sup> The owner or operator of fracking operations is required to submit an application for a permit to drill which must contain the following information:

- the geological names and descriptions of the formations that are to be injected with fracking fluids,<sup>345</sup> and
- concentrations and rates of chemical additives that are proposed to be mixed into water and injected.<sup>346</sup>

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<sup>340</sup> In terms of Part A of Schedule 4 of the Constitution, 1996.

<sup>341</sup> Section 114 of the Constitution, 1996.

<sup>342</sup> Section 121 of the Constitution, 1996.

<sup>343</sup> IDAPA 20.07.02, available at <http://adminrules.idaho.gov/rules/2012/20/0702.pdf> (accessed 27th November 2013).

<sup>344</sup> Rule 20.07.02.056 (1).

<sup>345</sup> Rule 20.07.02.056 (1)(a).

<sup>346</sup> Rule 20.07.02.056 (1)(b)

The Rules prohibit the injection of volatile organic compounds, such as benzene and xylene, or any petroleum distillate into groundwater that is in excess of groundwater quality standards.<sup>347</sup> Prior to commencing well stimulation, the operator is required to perform a suitable mechanical integrity test of the casing and submit an affidavit certifying that the test was conducted.<sup>348</sup>

#### 4.1.2 Pennsylvania

In Pennsylvania, oil and gas wells are regulated in terms of the *Pennsylvania Code*.<sup>349</sup> In terms of the Code, a well operator who pollutes or diminishes a public or private water supply is required to restore or replace the supply with an alternate source of water that is adequate in quality and quantity.<sup>350</sup> Requirements for the quality and quantity of the water supply are provided.<sup>351</sup> A landowner or affected person suffering from pollution or diminishment of water supply caused by drilling or operating a gas well may notify the Department of Environmental Protection and request an investigation to be conducted.<sup>352</sup> The Code also addresses soil erosion caused by gas well activities and requires an operator of a well to implement best management practices for erosion and sediment control during and after drilling activities.<sup>353</sup> An operator must prevent gas, brine, and any other fluids or materials from below the casing seat from entering fresh groundwater.<sup>354</sup> Additionally, any excess gas that is encountered during drilling or well stimulation must be captured or diverted away from the drilling rig in a manner that does not create a hazard to public health or safety.<sup>355</sup> The Code provides extensive casing and cementing requirements in Sections 78.82 – 78.87. Casing and cementing of the well is required to accomplish the prevention of the migration of gas or other fluids into sources of fresh groundwater, and prevention of pollution or diminution of fresh groundwater.<sup>356</sup>

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<sup>347</sup>Rule 20.07.02.056 (2).

<sup>348</sup>Rule 20.07.02.056 (3).

<sup>349</sup>PA. Code 78.1, available at <http://www.pacode.com/secure/data/025/chapter78/chap78toc.html> (accessed 27th November 2013).

<sup>350</sup>Section 78.51 (a).

<sup>351</sup>Section 78.51(2) and (3).

<sup>352</sup>Section 78.51 (b).

<sup>353</sup>Section 78.53.

<sup>354</sup>Section 78.73 (b).

<sup>355</sup>Section 78.73 (e).

<sup>356</sup>Section 78.81 (a).

During 2011, *Senate Bill No. 596*<sup>357</sup> was introduced which plans to establish the Emergency Drinking Water Support Fund in terms of Section 2. The funds are to be used to test well water and to purchase clean water for residents and businesses that have reason to believe their well water is contaminated from an accidental spill or seepage of chemicals, or from seepage of gas that has escaped during fracking.<sup>358</sup> A copy of the test that has been conducted is to be provided to homeowners or businesses that requested the test.<sup>359</sup>

Although Pennsylvania conducts hydraulic fracturing, the environmental risks surrounding fracking are not being ignored. During 2013, *Senate Bill 1100*<sup>360</sup> was introduced which provides for a Statewide moratorium on natural gas drilling. The Bill was referred to the Environmental Resources and Energy Committee on the 23<sup>rd</sup> of September 2013.<sup>361</sup> This indicates the shift being made by fracking states towards a more environmentally sound approach to hydraulic fracturing where the practice is better understood and the associated environmental risks are analysed before conducting or resuming fracking operations.

### 4.1.3 Ohio

In Ohio, the *Amended Substitute Senate Bill No. 315*<sup>362</sup> introduced strict provisions applicable to well stimulation by hydraulic fracturing. An owner of a horizontal well is required to obtain liability insurance coverage for an amount not less than \$5 million to pay damages for injury to persons or damage to property that is caused by production operations of all the owner's wells in the state of Ohio.<sup>363</sup> A well completion record is required within sixty days after drilling to the proposed depth has been concluded, which must include information on the type and volume of fluid used to stimulate the well reservoir.<sup>364</sup> The Bill prohibits the placing of natural gas or fluids associated with the exploration or development of gas resources in surface or ground water or in or on land in a manner that will cause damage to

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<sup>357</sup> Pennsylvania Senate Bill No. 596, available at <http://www.legis.state.pa.us/cfdocs/billinfo/billinfo.cfm?year=2011&sind=0&body=S&type=B&BN=0596> (accessed 9th December 2013).

<sup>358</sup>Section 4 (1).

<sup>359</sup>Section 4(2).

<sup>360</sup> Pennsylvania Senate Bill No. 1100, available at <http://legiscan.com/PA/bill/SB1100/2013> (accessed 16th March 2014).

<sup>361</sup>Ibid.

<sup>362</sup>Amended Substitute Senate Bill No. 315, available at [http://www.legislature.state.oh.us/bills.cfm?ID=129\\_SB\\_315](http://www.legislature.state.oh.us/bills.cfm?ID=129_SB_315) (accessed 27<sup>th</sup> November 2013).

<sup>363</sup>Section 1509.07 (A)(2).

<sup>364</sup>Section 1509.10 (A) (10)(a).

the environment.<sup>365</sup> Violating any of the provisions relating to the requirements for gas production is subject the imposition of civil and criminal penalties, and each day that a violation occurs constitutes a separate offence for purposes of such penalties.<sup>366</sup>

#### 4.1.4 Michigan

During January 2013, *House Bill No. 4061*<sup>367</sup> was introduced and proposes to amend the *Natural Resources and Environmental Protection Act*<sup>368</sup> to include requirements for hydraulic fracturing. The Bill adds in Section 61532 (1) which disallows the issuing of a permit to drill a well for gas production that will use hydraulic fracturing unless the applicant provides various information for review and approval, which includes an evaluation of whether there are alternative hydraulic fracturing treatments that could be used which presents fewer potential risks to human health and the environment than the proposed treatment.<sup>369</sup> The information submitted by the applicant is to be posted on the website of the Department of Environmental Quality for at least sixty days prior to a decision being taken (that is, to grant or reject application for a permit) to allow for public notice and comment.<sup>370</sup> Such information is to remain on the website for three years after the hydraulic fracturing treatment is completed.<sup>371</sup>

Section 61536 (1) requires a person to supply certain information to a healthcare professional for diagnostic purposes, which includes information that is to be provided directly to the professional regarding additives that have been used if such information is requested in a medical emergency.<sup>372</sup> A request that is made by the healthcare professional has to state that: he or she has a reasonable basis to believe that the information is required in order to diagnose or treat the individual; the individual may have been exposed to a chemical ingredient and; knowledge about that chemical is likely to assist in diagnosis or treatment.<sup>373</sup>

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<sup>365</sup>Section 1509.22 (A).

<sup>366</sup>Section 1509.33.

<sup>367</sup> Michigan House Bill No. 4061, available at <http://www.legislature.mi.gov/documents/2013-2014/billintroduced/House/pdf/2013-HIB-4061.pdf> (accessed 9th December 2013).

<sup>368</sup>Act 451 of 1994.

<sup>369</sup>Section 61532 (1)(H).

<sup>370</sup>Section 61532 (4).

<sup>371</sup>Ibid.

<sup>372</sup>Section 61536 (1)(A)(i).

<sup>373</sup>Section 61536 (2).

#### 4.1.5 New York

The State of New York has proposed a number of Bills to regulate natural gas extraction and hydraulic fracturing. *Senate Bill No. 4251*<sup>374</sup> intends to allow for the promulgation of regulations which will require treatment works that treat waste from hydraulic fracturing operations to test that waste water to identify radioactive contaminants, such as radium.<sup>375</sup> Additionally, the Bill stipulates that no waste from outside the State of New York is to be accepted, treated or discharged by treatment works in New York that treat hydraulic fracturing waste.<sup>376</sup>

*Assembly Bill No. 6488*<sup>377</sup> plans to prohibit treatment works from accepting industrial wastewater from fracking operations if that wastewater contains radium at levels that are twelve times higher than the maximum contaminant levels in the Safe Drinking Water Act.<sup>378</sup>

In the *Senate Bill No. 6772*,<sup>379</sup> which was introduced during 2012, the legislature recognised that the public should be informed about any potential health impacts posed by hydraulic fracturing<sup>380</sup>. The Bill proposes that health impact assessments are to be conducted to identify and examine the potential health impacts that could be caused by horizontal gas drilling and fracking.<sup>381</sup> Assessments are required to include recommendations for the mitigation of such impacts and a long-term plan for monitoring impacts throughout the time that horizontal drilling takes place.<sup>382</sup> Section 7 of the Bill prohibits horizontal gas drilling and hydraulic fracturing from commencing prior to the adoption of a final health impact assessment and the implementation by the State of the recommendations in that assessment.

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<sup>374</sup> New York Senate Bill No. 4251, available at [http://assembly.state.ny.us/leg/?default\\_fld=&bn=S04251&term=2011&Summary=Y&Actions=Y&Text=Y&Votes=Y](http://assembly.state.ny.us/leg/?default_fld=&bn=S04251&term=2011&Summary=Y&Actions=Y&Text=Y&Votes=Y) (accessed 9th December 2013).

<sup>375</sup> Section 17-0833.1. and 2.

<sup>376</sup> Section 17-0833.4.

<sup>377</sup> New York Assembly Bill No. 6488, available at [http://assembly.state.ny.us/leg/?default\\_fld=&bn=A06488&term=2011&Summary=Y&Actions=Y&Text=Y&Votes=Y](http://assembly.state.ny.us/leg/?default_fld=&bn=A06488&term=2011&Summary=Y&Actions=Y&Text=Y&Votes=Y) (accessed 9th December 2013).

<sup>378</sup> Section 17-0833.1.

<sup>379</sup> New York Senate Bill No. 6772, available at [http://assembly.state.ny.us/leg/?default\\_fld=&bn=S06772&term=2011&Summary=Y&Actions=Y&Text=Y&Votes=Y](http://assembly.state.ny.us/leg/?default_fld=&bn=S06772&term=2011&Summary=Y&Actions=Y&Text=Y&Votes=Y) (accessed 9th December 2013).

<sup>380</sup> Section 1.

<sup>381</sup> Section 2.

<sup>382</sup> Section 4 (e) and (f).

During 2011, *Senate Bill No. 425*<sup>383</sup> was introduced and aims to establish rules and regulations which will prohibit the use of hydraulic fracturing fluids that contain a chemical substance that poses a risk to human health.<sup>384</sup>

The New York legislature recognised, in *Senate Bill No. 1234*,<sup>385</sup> that hydraulic fracturing uses components that are toxic and pose a high level of environmental risks, which requires the policy of the State to ensure that those toxic components are excluded from an area that is important for public drinking water resources.<sup>386</sup> Section 23-2901.1 and 2 of the Bill prohibits natural gas drilling within the New York City watershed and in any area where groundwater contributes to surface water sources of drinking water. A presumption exists where natural gas drilling occurs and contamination of water wells takes place that that drilling has caused that contamination unless it can be proven otherwise.<sup>387</sup> The Bill also regulates incidents where fracking compounds are spilt or discharged. Section 23-2901.4 allows for fines to be imposed where spills or discharge incidents are not reported. A natural gas driller who knowingly attempts to cover up a spill or discharge is guilty of a misdemeanour, and knowingly discharging fracking compounds into surface water is a felony.<sup>388</sup>

In terms of Section 23-2905.1, a natural gas driller is responsible for mitigating damage to air, wetlands, streams and endangered and threatened species' habitats. Well permits to drill natural gas are not to be granted in an area where the drilling will destroy or degrade unique natural or scenic resources.<sup>389</sup> Applications for a well permit are to include an assessment of the impacts on biodiversity proposed by the drilling of natural gas.<sup>390</sup>

The Bill also makes provision for the consideration of landowners and residents during gas drilling. Section 23-2907.5 requires gas drilling operations to be conducted in a manner that does not burden neighbouring landowners and residents. Creating a noise that is audible indoors in neighbouring residences is not permitted between 8pm and 8am on weekdays, and

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<sup>383</sup> New York Senate Bill No. 425, available at <http://open.nysenate.gov/legislation/bill/s425-2011> (accessed 9th December 2013).

<sup>384</sup> Section 1(I).

<sup>385</sup> New York Senate Bill No. 1234, available at [http://assembly.state.ny.us/leg/?default\\_fld=&bn=S01234&term=2011&Summary=Y&Actions=Y&Text=Y&Votes=Y](http://assembly.state.ny.us/leg/?default_fld=&bn=S01234&term=2011&Summary=Y&Actions=Y&Text=Y&Votes=Y) (accessed 9th December 2013).

<sup>386</sup> Section 1.

<sup>387</sup> Section 23-2901.3.

<sup>388</sup> Section 23-2901.5.

<sup>389</sup> Section 23-2905.2.

<sup>390</sup> Section 23-2905.3.

between 6pm and 10am on weekends.<sup>391</sup> Furthermore, night lighting used during drilling operations must not be obtrusive or disruptive to landowners and residents.<sup>392</sup> Section 23-2907.5 allows for its provisions to be enforced by a system of fines in order to protect the quiet enjoyment of local residents.

In determining whether a permit to drill natural gas should be accepted, the prior record of the applicant must be considered in terms of previous permits.<sup>393</sup> A permit will not be granted to an applicant who shows a pattern of violating permit conditions or who lacks a standard of care in drilling operations.<sup>394</sup>

It is significant to note that bans and moratoria on hydraulic fracturing are in place in the New York state. Numerous towns, such as Albany; Hudson; Buffalo and Highland have banned fracking.<sup>395</sup> Stafford; Lima; Brookfield and Lincoln, amongst many other towns, have placed moratoria on fracking.<sup>396</sup> These developments highlight the environmental concerns connected to hydraulic fracturing and the steps being taken by government officials to prevent such harm from occurring in the future.

#### **4.1.6 Maryland**

In the state of Maryland, *House Bill 296*<sup>397</sup> was introduced in 2012 which regulates hydraulic fracturing wastewater. Section 9-293 (B) prohibits a person to transport, store, treat or dispose flowback or wastewater from fracking activities occurring in another State in the State of Maryland.

*House Bill 1123*<sup>398</sup> also applies to natural gas exploration. Section 14-110.1.(B) stipulates that when permits are issued to drill a well for gas exploration and production, there is a presumptive impact area around the gas well where it is presumed that contamination of water supply was caused by that activity. The Bill places an obligation on the holder of a

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<sup>391</sup> Section 23-2907.5.

<sup>392</sup> Ibid.

<sup>393</sup> Section 23-2911.2.

<sup>394</sup> Ibid.

<sup>395</sup> 'Current High Volume Horizontal Hydraulic Fracturing Bans and Moratoria in NY State' – updated on 22 November 2013, available at <http://www.fractracker.org/map/ny-moratoria/> (accessed 16<sup>th</sup> March 2014).

<sup>396</sup> Ibid.

<sup>397</sup> Maryland House Bill 296, available at <http://mlis.state.md.us/2012rs/bills/hb/hb0296f.pdf> (accessed 9th December 2013).

<sup>398</sup> Maryland House Bill 1123, available at <http://mlis.state.md.us/2012rs/bills/hb/hb1123e.pdf> (accessed 9th December 2013).



permit to replace water supply that has been contaminated as a result of the drilling and operation of the well.<sup>399</sup>

#### **4.1.7 Colorado**

The protection of water resources from the potential effects of hydraulic fracturing is provided for in *Colorado's Senate Bill 107*.<sup>400</sup> Section 34-60-130.(6)(a) creates the rebuttable presumption that an operator of a fracking operation is responsible for pollution of a water supply that is within half a mile of a well if the pollution occurs within six months after the completion of the hydraulic fracturing.

Section 34-60-130.(7)(a) prohibits an operator from conducting hydraulic fracturing within half a mile of any surface water or other artificial waterway unless a closed loop system is used. This system keeps fluids in tanks and pipes without making contact with the ground.<sup>401</sup>

#### **4.1.8 Countries which have banned or placed a moratorium on hydraulic fracturing**

Due to the environmental concerns and potential ecological implications associated with hydraulic fracturing, various countries have banned the technique.

France banned fracking during 2011 and during October 2012, former President Nicolas Sarkozy reaffirmed that the country will maintain the ban until there is proof that shale gas exploration will not harm the environment.<sup>402</sup>

During 2012, Bulgaria banned hydraulic fracturing and revoked a shale gas permit granted to the American energy company Chevron. Any form of extraction which includes the pumping of water or gel underground was banned.<sup>403</sup>

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<sup>399</sup>Section 14-110.1.(D).

<sup>400</sup>Colorado Senate Bill 12-107, available at [http://www.leg.state.co.us/clics/clics2012a/csl.nsf/billcontainers/0A93185AA46CAEC587257981007F573B/\\$FILE/107\\_01.pdf](http://www.leg.state.co.us/clics/clics2012a/csl.nsf/billcontainers/0A93185AA46CAEC587257981007F573B/$FILE/107_01.pdf) (accessed 9th December 2013).

<sup>401</sup>FracFocus: 'Fracturing Fluid Management', available at <http://fracfocus.org/hydraulic-fracturing-how-it-works/drilling-risks-safeguards> (accessed 9th December 2013).

<sup>402</sup>'List of Bans Worldwide – Countries with a Ban or Moratorium', available at <http://keeptapwatersafe.org/global-bans-on-fracking/> (accessed 2nd December 2013).

<sup>403</sup>Ibid.

Argentina and Switzerland have also banned fracking, while Ireland's Minister for Energy has stated that hydraulic fracturing will not take place pending further detailed scientific analysis and advice.<sup>404</sup>

## 4.2 Summary

The various legislative and regulatory mechanisms that have been adopted and proposed by American states provide a system of law that comprehensively addresses the environmental threats presented by hydraulic fracturing. The law does not only promote the safety and protection of the environment from the effects of fracking – it also makes provision for the protection of human health that may be impacted due to fracking activity. This detailed approach allows for the prevention and minimisation of environmental risks associated with hydraulic fracturing. However, American state law differs – many States have banned or placed moratoria on fracking which emphasises the magnitude of the environmental consequences presented by this practice.

When comparing the American law to South African law, the following is deduced:

- American state law prohibits the injection of certain volatile organic compounds, like benzene and xylene, into groundwater that exceeds groundwater quality standards. South African legislation fails to establish such a prohibition. Regulation 31 of the Proposed Technical Regulations only stipulates that a holder of an exploration or production right under the MPRDA must minimise environmental and health risks associated with frackingfluid, assess potential risks and develop a risk management plan for wells that are to be fractured. Additionally, Section 151 of the NWA makes it an offence to intentionally or negligently commit an act or omission which pollutes or is likely to pollute a water resource, or which detrimentally affects a water resource. This may apply to the injection of compounds which exceeds groundwater quality standards and which causes water pollution. However, the legislation does not specifically prohibit the injection of certain compounds associated with hydraulic fracturing.

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<sup>404</sup>Ibid.

- State law in America addresses the issue of water contamination by requiring clean water to be supplied to people where hydraulic fracturing has caused pollution of water resources that are used by the public. South African law does not address this issue. The NWA does prescribe measures to be taken to prevent and remedy the effects of water pollution; however the replacement of water supply is not provided as a remedial measure. South African legislative provisions may be expanded in this regard by requiring the fracking operatives responsible for polluting a water resource to supply people affected by that pollution with an adequate supply of clean water until measures have been taken to remedy that pollution and to ensure the water resource is suitable for human consumption. However, the situation should not reach this point where water becomes contaminated as this is indicative of the failure to properly manage the environmental risks posed by fracking. Regulatory mechanisms need to be stringent in their application in order to avoid such a situation from arising.
- State law prohibits treatment facilities in certain States (such as New York and Maryland) to accept, treat or discharge waste that is produced from hydraulic fracturing operations in other States. South African legislation does not create this prohibition. Although this seems unlikely as being a major concern between different Provinces, it does raise the point about whether treatment facilities are capable of handling and treating waste from hydraulic fracturing operations. Norms and standards for the management of waste produced from fracking should be adopted to ensure that treatment facilities handle that waste in an environmentally sound manner.
- American state law considers potential health impacts that are posed by fracking and allows for health impact assessments to be conducted to identify possible risks that could ensue due to shale gas extraction and hydraulic fracturing. In terms of the South African legislation, the MPRDA requires environmental authorisations to be granted prior to conducting exploration or production activities (in respect of shale gas). An EIA is required to be submitted before a production right may be granted, which consists of a scoping report and an environmental impact report. However, the EIA requirements are not interpreted as specifically requiring an assessment of potential health impacts in addition to the assessment of potential environmental impacts. Section 24 of the Constitution, 1996 includes the right to an environment that is not

harmful to human health or well-being which demonstrates the interrelationship between these two aspects. Human health concerns are not necessarily excluded by EIAs, however it should be explicitly included and emphasised in the legislative requirements. A suggestion would be to include this obligation in the EIA that is to be conducted in terms of Regulation 3 of the Proposed Technical Regulations for exploration and production activities that could impact natural resources. The scope of the Regulations should be extended to incorporate the assessment of health risks.

- A rebuttable presumption is created by American state law that the contamination of water that occurs near an area where drilling for natural gas takes place has been caused by that activity. South African law does not create such a presumption. Duties are placed on polluters to take measures to address pollution and environmental degradation. In terms of Section 28 of NEMA, a duty rests on persons who have caused significant pollution or environmental degradation to take measures to prevent that pollution or environmental degradation from continuing or recurring. The NWA takes a similar approach in Section 19 which requires measures to be taken to prevent pollution of a water resource from occurring, continuing or recurring. Section 20 of the NWA also requires measures to be taken to contain and minimise the effects of an incident in which a substance pollutes or has the potential to pollute or have a detrimental effect on a water resource. However, these provisions do not create a presumption that pollution or environmental degradation has occurred due to a specific activity in a certain area. It must be noted that such a presumption would be acceptable in terms of non-criminal liability,<sup>405</sup> as the South African Constitution creates a presumption of innocence in respect of criminal liability.<sup>406</sup>
- American state law takes into account the needs of residents and landowners who are situated within the vicinity of natural gas operations. State law prescribes time limits for gas drilling operations so that landowners and residents are not burdened by noise that is created. The South African statutes do not provide for this – however, the

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<sup>405</sup> *Prinsloo v Van der Linde and Another* (CCT4/96) [1997] ZACC 5; 1997 (6) BCLR 759; 1997 (3) SA 1012 (18 April 1997) at para 14.

<sup>406</sup> Section 35(3)(h) of the Constitution, 1996; *Ibid* at para 38.

common law of nuisance may be applied where noise from gas operations unreasonably interferes with the comfort of human existence.<sup>407</sup>

The foreign legislation that has been discussed provides a platform for South African laws to be implemented. The highlighted laws applicable to fracking indicate areas that are lacking in South African law. A consolidated approach is needed in order to adequately regulate the hydraulic fracturing process which will reduce potential ecological ramifications. It is suggested that a better way to ensure adequate regulation is through the formulation and adoption of a national statute which incorporates the standards laid down in American legislation. The United States has been conducting natural gas extraction and hydraulic fracturing for decades, thus, the legal system encompasses a wider array of laws that have been designed over the years to specifically govern fracking and the related environmental concerns. A national legal instrument will allow for environmental standards to be applied in a centralised manner and will create liability for contravening obligatory provisions and causing environmental harm through hydraulic fracturing.

Another option would be to adopt provincial legislation, like American state law, that applies to the environmental concerns of fracking. This approach, although it might seem fragmented since each province will have individual requirements, will allow for hydraulic fracturing to be properly monitored and managed by legislation which can take the unique environmental conditions of each province into account in its' application. Additionally, a more environmentally friendly option may be to adopt the approach of other American states and countries, by completely banning or placing a moratorium on fracking in South African provinces due to the concerns raised about environmental impacts.

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<sup>407</sup> M Kidd, *Environmental Law*, 2<sup>nd</sup> ed, 2011, at 145.

## Conclusion

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The shale gas industry presents the possibility of environmental and economic benefits, such as a cheaper and cleaner approach to energy production;<sup>408</sup> the creation of employment opportunities;<sup>409</sup> and the exporting of shale gas to other countries.<sup>410</sup> These lucrative opportunities create an interest in and incentive to exploit shale gas resources, which has been recognised by the South African government. However, the environmental risks associated with the process of hydraulic fracturing, which is undertaken during shale gas extraction, establishes a cautious approach to the development of natural gas supplies. The possible environmental impacts of hydraulic fracturing include threats of pollution and degradation of water resources and land by fracking fluid; issues relating to the management and disposal of flowback fluid; the large amounts of water used during the fracking process; and the potential threat to human health caused by water contamination. Several countries have banned the practice of hydraulic fracturing due to the environmental impacts that may develop from it.<sup>411</sup> Nevertheless, these impacts may be prevented, reduced and controlled if they are managed in an environmentally sound manner.

Legislation applicable to fracking may provide fundamental criteria to regulate the environmental consequences of shale gas production. The NEMA, MPRDA (including the Amendment Act), NWA and NEMWA all provide environmental standards that are required to be met in respect of gas extraction and hydraulic fracturing. The legislation contains substantive and procedural obligations, as well as provisions for the imposition of penalties where offences have been committed which violates statutory commands.

However, the South African legislation that has been analysed fails to create a suitable statutory regime that applies to the unique potential impacts of hydraulic fracturing in an integrated manner. Although the legislation is not deficient as it does allow for the protection of the environment from the effects of fracking, it does so in a fragmented manner and needs to be strengthened in some areas. The integration between the different legislation needs to be

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<sup>408</sup>Bocora, note 15 above.

<sup>409</sup> Western Cape Intra-Governmental Shale Gas Task Team: Interim Report, note 49 above.

<sup>410</sup>Bocora, note 4 above, at page 439.

<sup>411</sup> Countries that have banned fracking include France, Bulgaria and Switzerland – ‘Keep Tap Water Safe: List of Bans Worldwide – Countries with a Ban or Moratorium’, available at <http://keeptapwatersafe.org/global-bans-on-fracking/> (accessed 2nd December 2013).

enhanced in order for the law to be applied in a coherent manner. The current confusion surrounding the amendments to the NEMA and the MPRDA creates a disjointed approach to the environmental authorisation process required for the exploration and production of shale gas.

There is a need for a single overarching statute to be formulated and promulgated which will suitably regulate the practice of hydraulic fracturing in South Africa. The comparison between South African law and American law that applies to natural gas extraction and hydraulic fracturing identifies certain loopholes in the South African legislation which needs to be addressed. American law has been developed over the years to address individual environmental concerns presented by fracking and should be used as a comparative yardstick for South African law in order to align our law with the standards that have been developed by a country who has been playing a pivotal role in the natural gas industry for decades.

Although the South African legislation is not particularly insufficient in its application, issues do arise regarding compliance and enforcement. Even though concrete law exists on paper, such as the MPRDA, many mines in South Africa operate without a water licence and abandoned mines that are not rehabilitated have caused acid mine drainage which has resulted in pollution of water resources. Thus, there are legitimate concerns that shale gas extraction and hydraulic fracturing will not be adequately regulated by observing these failures that are currently occurring in the mining sector. Even though substantive provisions exist for environmental protection, problems with the practical implementation of those provisions creates some doubt as to whether hydraulic fracturing will be properly managed.

Given the fact that the commencement of shale gas exploitation is supported by the South African government, the possible consequences of fracking need to be comprehensively addressed by legislation to guarantee the preservation of the nations' natural resources for the benefit of present and future generations. The Constitutional right to have the environment protected through legislative measures that prevent pollution and ecological degradation needs to be upheld to ensure that South Africa's pristine natural resources are not threatened by hydraulic fracturing and that suitable legislation exists for this purpose.

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**UNIVERSITY OF  
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17 October 2013

Ms Ayesha Motala 208508677  
School of Law  
Pietermaritzburg Campus

Dear Ms Motala

Protocol reference number: HSS/1087/013M

Project title: An Analysis of South Africa's Statutory Regime Pertinent to the Risks of Hydraulic Fracturing

**NO-RISK APPROVAL**

In response to your application dated 28 August 2013, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number. Please note: Research data should be securely stored in the discipline/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....  
**Dr Shenuka Singh (Chair)**  
Humanities & Social Science Research Ethics Committee

/pm

cc Supervisor: Dr MA Kidd  
cc Academic Leader: Professor M Carnelly  
cc School Admin: Mr Pradeep Ramsewak

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