THE CONTINUED PUMPING OF EXTRANEOUS WATER IN NON-OPERATIVE GOLD MINES: EVALUATING PERPETUAL LIABILITY AGAINST THE NOTION OF SUSTAINABLE DEVELOPMENT

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UNIVERSITY OF PRETORIA

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TABLE OF CONTENTS

ACRONYMS

AMD	Acid Mine Drainage
ARD	Acid Rock Drainage
ARMgold	African Rainbow Minerals Gold Ltd
DEFF	Department of Environmental Affairs, Forestry and Fisheries
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
ECA	Environmental Conservation Act
EIA	Environmental Impact Assessment
IIASA	International Institute for Applied Systems Analysis
IUCN	International Union for the Conservation of Nature & Natural Resources
KOSH	Klersdorp-Orkney-Stilfontein-Hartebeesfontein
MPRDA	Mineral and Petroleum Resources Development Act
NEMA	National Environmental Management Act
NWA	National Water Act
RMCS	Regional Mine Closure Strategies
SDG	Sustainable Development Goal
UNCED	United Nations Conference on Environment & Development
UNEP	United Nations Programme on the Environment
UN	United Nations

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

"A bitter paradox is unfolding in the economic heartland of South Africa: we're short of water to drink; we are also running out of gold. Yet, as the sun sets on the gold industry, the waters beneath her commercial capital are rising".[1]

1. Background to the study

This study is aimed at determining whether the concept of perpetual liability is compatible with the principle of sustainable development in South African law. In particular, when evaluated in terms of the environmental obligations placed on South African mining operations, and the responsibility to manage pumping of extraneous water in non-operative gold mines.

The concept of sustainable development attracts a diverse range of interpretations. Though most commonly associated with the definition ascribed to it by the Brundtland Commission,[2] the concept is both convenient, and precarious, in its ambiguity.[3] The latter position is arguably best summarised by Cordes when he states "… (sustainable development) can be made to mean almost anything or almost nothing and thus can be interpreted to support a vast array of arguments, strategies and decisions".[4] Notwithstanding, the notion of sustainable development essentially encapsulates a functional balance between three fundamental components — the environment, the economy and society — the application of which is often referred to as the triple bottom line approach.[5] The three components are of equal importance, with the application of the concept of sustainable development thus representing achieving, and maintaining, equilibrium between these three components. Intertwined in the matrix of these three components is the intergenerational helix – the ability of present generations to meet their needs without compromising the future generations' ability

[1] M Mujuru, S Mutanga & Z Dyosi 'Formation of acid mine drainage', S Mutanga & M Mujuru (eds) *Management and mitigation of acid mine drainage in South Africa: Input for mineral beneficiation in Africa* (2016) 34.
[2] At its most elementary, sustainable development is described as "… development that meets the needs of the present without compromising the ability of future generations to meet their own needs." See Our Common Future, From One Earth to One World (20 March 1987 World Commission on Environment and Development), 41. Available at https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf (last accessed 17 May 2018).
[3] E Holden, K Linnerud, D Banister 'Sustainable development: Our Common Future revisited' (2014) 26 *Global Environmental Change*, 130–131.
[4] J Cordes 'Normative and Philosophical Perspectives on the Concept of Sustainable Development' in James M. Otto and John Cordes (eds.) *Sustainable development and the future of mineral investment* (2000) 1. Available at https://wedocs.unep.org/rest/bitstreams/13309/retrieve (last accessed 17 May 2018).
[5] JA du Pisani 'Sustainable development – historical roots of the concept' (2006) 3(2) *Environmental Sciences* 92.

to do so. Therefore, the more in balance the three components are, the more the ideal behind the concept of sustainable development is attained.

In terms of a contextual interpretation of sustainable development in the South African legal framework, Section 24(b)(iii) of the Constitution states that everyone has the right to have the environment protected, for the benefit of present and future generations. [6] A feature of the content of the right in the Constitution, referred to in the context of the Supreme Law of the Republic of South Africa, is its negative phrasing. This characteristic is more in line with an orthodox negative right, which implies that there is a certain minimum standard as opposed to the guarantee of a positive right of indeterminate extent.[7] Section 24 of the Constitution achieves the protection of the environment through reasonable legislative and other measures that secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development. Section 24 of the Constitution, therefore, places an environmental governance obligation also on the State as custodian and as public trustee of South Africa's natural resources. This subsequently creates a direct link between section 24 of the Constitution and the public trust doctrine that requires, when exercising its environmental governance obligation, that the State must take into consideration the imperatives of sustainable development.[8] The founding principle of the public trust doctrine is codified in section 2 of the National Environmental Management Act, 1998 (NEMA) which states that "the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage". [9] The public trust doctrine originated in the Roman Common Law and precipitated the concept of public property and the rights thereto, which was eventually codified in the Institutes of Justinian. Thereafter it migrated to the Magna Carta and the English Common Law, where the Crown held the public property for the benefit of its people.[10] The public trust doctrine thus creates an obligation on the state to protect and hold in trust certain natural resources. This obligation at the same time extends toward the protection of natural resources for future generations.[11] Similarly to the triple bottom-line discussed

[6] I Currie & J de Waal, *The bill of rights handbook, 5th Ed*, (2005) 525. For example it provides for an environment which is "not harmful" as opposed to a healthy environment.
[7] *Ibid*.
[8] Feris L 'The public trust doctrine and liability for historic water pollution in South Africa' (2012) 8/1 *Law, Environment and Development Journal* 13.
[9] Section 2(4)(o) of National Environmental Management Act 107 of 1998 (NEMA).
[10] A Blackmore 'The relationship between NEMA and the Public Trust Doctrine: The importance of the NEMA principles in safeguarding South Africa's biodiversity' (2015) *South African Journal of Environmental Law on Policy* 8.
[11] Feris (n 8 *supra*) 5.

above, the doctrine of public trust is intertwined with an intergenerational obligation, bringing it squarely within the realm of sustainable development.

In terms of its inclusion in South African law, the public trust doctrine is further reflected in the preamble of the Mineral and Petroleum Resources Development Act, 2002 ('MPRDA').[12] The preamble affirms the State's obligation to protect the environment for the benefit of present and future generations, to ensure ecologically sustainable development of mineral and petroleum resources and to promote economic and social development.[13] Notwithstanding the aforementioned, the concept of sustainable development is defined in the NEMA, is "the integration of social, economic and environmental factors into planning, implementation and decision-making to ensure that development serves present and future generations".[14] The aim of the balance of these three components is to allow the present generation to meet their needs, without compromising the ability of future generations to meet theirs.

When applied in the context of the South African mining sector, the practical challenges associated with giving effect to sustainable development become readily apparent in the case of water contamination. Water is not only a fundamental part to life, but also to the environment, to power generation, and to food and industrial production. Only if water resources are truly and in fact protected, used, developed, conserved, managed, and controlled in a sustainable manner, can water be available for these purposes and then in turn, provided over the long term. This sentiment with respect to water resources has long been acknowledged. For example, in the case of *Retief v Louw* 1874 4 Buch 165 at 176, Judge Bell quoted from *Groenewegen S Tractatus de Legibus Abrogatis et Iniusitatis in Hollandia Vicinisque Regionibus* (Amsterdam 1669) para 2.1.6:

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[12] Act 28 of 2002.

[13] The preamble of the MPRDA states that: "Recognising that minerals and petroleum are non-renewable resources. Acknowledging that South Africa's mineral and petroleum resources belong to the nation and that the State is the custodian thereof; affirming the State's obligation to protect the environment for the benefit of present and future generations, to ensure ecologically sustainable development of mineral and petroleum resources and to promote economic and social development; recognizing the need to promote local and rural development and the social upliftment of communities affected by mining; being committed to eradicating all forms of discriminatory practices in the mineral and petroleum industries; considering the State's obligation under the Constitution to take legislative and other measures to redress the results of past racial discriminations; reaffirming the State's commitment to guaranteeing security of tenure in respect of prospecting and mining operations; and emphasizing the need to create an internationally competitive and efficient administrative and regulatory regime."

[14] See also the preamble of NEMA which states that "whereas many inhabitants of South Africa live in an environment that is harmful to their health and well-being… … sustainable development requires the integration of social, economic and environmental factors in the planning, implementation and evaluation of decisions to ensure that development service present and future generations".

'Common things…which on account of the common use that all have the right to be nature, cannot, by the laws of nations, be divided: Therefore…water, which, collected either from rain or from the veins of the earth, makes a perpetual current. These things, by nature itself as it were, are attributed to, and may be occupied by, anyone, provided that the common and promiscuous use is not injured, for without use of…water no-one could live… '.[emphasis added].[15]

Water can ingress to underground mining voids either directly, as in cases of open shafts, or direct connections to the surface through shallow undermining. The result of direct water ingress into mines is almost instantaneous resulting from water from precipitation, storm events and collection of storm water. Water may also ingress by way of indirect pathways through natural features such as geological faults, fractures and fissures.[16] This is even more so in cases where the mines are interconnected. As mines close, sometimes at different times, the pumping of ingress and/or extraneous water from the mine workings may cease.[17] Due to the high degree of connectivity of mines, the Witwatersrand area of South Africa serves as an ideal example in this respect. Water from flooded mines may start to discharge into neighbouring mines, including operational mines.[18] When underground water seepage occurs, harmful acidic water leaches out of the underground mine tunnels or drains from waste rock piles or tailings, which subsequently can enter both underground water systems and above-ground streams and rivers. [19] This causes various forms of water pollution, of which the most common is referred to as Acid Mine Drainage ('AMD').[20]

2. Problem statement

The issue of AMD raises the questions of responsibility and liability as it originates not only from present mining but also from past mining activities. In the present environmental dispensation, as a general rule, one would look towards the polluter to bear

[15] *Retief v Louw* 1874 4 Buch 165 at 176.
[16] DM van Tonder, H Coetzee, S Esterhuyse, N Msezane, L Strachan, P Wade, T Mafanya, S Mudau 'South Africa's challenges pertaining to mine closure – The concept of Regional and Mining Closure Strategies' (2008) *Australian Centre for Geomechanics, The University of Western Australia* 94.
[17] TS McCarthy 'The Impact of acid mine drainage in South Africa' (2001) 107(5/6) *South African Journal of Science* 3.
[18] *Idem*, at 4.
[19] Minnaar A 'Water Pollution and Contamination from Gold Mines: Acid Mine Drainage in Gauteng Province, South Africa' in K Eman, G Meško, L Segate, M Migliorini (*eds*) *Water Governance and Crime Issues* (2020) 193.
[20] *Ibid*.

the brunt.[21] This is evident from the duty of care imposed by section 28 of NEMA, which is dealt with in more detail in Chapter 2. However, the issue of AMD poses a novel conundrum to the extent that AMD is not only a historical problem but, given its potential to occur in perpetuity, also poses a future concern.[22] In turn, this raises questions concerning the obligations associated with effectuating sustainable development. Moreover, when considered from a view of the aforementioned public trust doctrine, in terms of which the state — as the custodian of water resources — would appear to ultimately bear the responsibility for the remediation of this water pollution.[23] Conversely, an argument can be advanced that, in order to effectively apply a risk-based approach for the regulatory assessment and management to prevent the pollution risks posed to water resources as provided for in NEMA,[24] will require a committed effort from all tiers of government, as well as the cooperation from the mining industry towards proper environmental management.[25] These challenges were brought sharply to the fore in September 2003, when Harmony Gold Mining Company Limited ('Harmony Gold') commenced gold mining activities in the Klerksdorp-Orkney-Stilfontein-Hartebeestfontein ('KOSH') area in the watershed case of *Harmony Gold Mining Co v Regional Director, Free State Department of Water Affairs & Others*[26], a case which eventually made its turn in the Supreme Court of Appeal.

The aforementioned suggests that the current legislative framework possibly binds mining houses perpetually to, amongst others, the pumping and treatment of extraneous water.

When this responsibility is considered against the requirements associated with sustainable development, it would appear that the notion of perpetual liability devalues all three components of sustainable development. The economy is negatively impacted, in that mining

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[21] United Nations Conference on Environment and Development, *Agenda 21, Rio Declaration, Forest Principles*, Principle 16. See also P Schwartz 'The Polluter Pays Principle' in M Fitzmaurice, D Ong, M Merkouris (eds) *Research Handbook on International Environmental Law* (2015) 243 where she writes that an earlier version of the polluter pays principle is credited to a 1972 recommendation by the Organisation of Economic Co-operation and Development which defines it as the principle to be used in allocating the costs of pollution prevention and control.

[22] Feris (n 8 *supra*) 1.

[23] *Idem*, at 37.

[24] Section 2(4)(a)(vii) states that "*Sustainable development requires a consideration of all relevant actors including 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*".

[25] C Bosman & LJ Kotze 'Responsibilities, liabilities and duties for remediation and mine closure under the MPRDA and NWA'. *Paper presented at the WISA Mine Water Division, Mine Closure Conference, Randfontein, 6 – 7 April* (2012).

[26] *Harmony Gold Mining Co v Regional Director, Free State Department of Water Affairs & Others*, unreported decision, North Gauteng High Court, Case no 68161/2008, 26 June 2012.

entities may be reluctant to be the 'last mine standing' in fear of perpetual environmental liability, which in turn has the potential to stifle development. Furthermore, it possibly undercuts the opportunity for smaller mining companies to be established due to the capital requirements of perpetual rehabilitation. The societal element is negatively affected, in that it may result in missed employment opportunism and broader development. The environment is negatively impacted in situations where mining companies are unable to comply with the perpetual rehabilitation liability and eventually cease to do so, resulting in perpetual pollution.

3. Aims and objectives

3.1. Aim of the study

In light of the above, the overall aim of the proposed research is accordingly to determine whether the concept of perpetual liability is compatible with the principle of sustainable development, particularly as it is codified and applied in the South African environmental law context. And if compatible, to what degree or extent?

3.2. Chapter objectives

To achieve the aim of the proposed research, the aim will be supported by three objectives, which will be consecutively addressed in the study chapters. The first objective will be to investigate the concept of sustainable development — how it developed, how it is codified, as well as how it is applied within the South African environmental law context —to establish a lens through which perpetual liability can be examined.

The second objective will be to explore the concept of perpetual liability within the broader context of South African environmental law, followed by a contextual analysis of the responsibility of mineral rights holders. To understand the dynamic of this specific problem, the perpetual nature of AMD will also be discussed. The intertwined relationship of the perpetuity of the statutory liability *vis à vis* the perpetuity of AMD will then be analysed to achieve a holistic view of perpetuity within this specific context.

The third objective of the research will be to analyse the concept of perpetual liability through the lens of sustainable development, as previously identified, and how it finds application in the South African mining sector to determine whether these two concepts are in actual fact compatible with one another.

4. Research questions

4.1. Primary Question

To what extent is the concept of perpetual liability in South African environmental law compatible with the broader concept of sustainable development?

4.2. Secondary Questions

The primary question of the research will be underwritten by a series of secondary questions that will be addressed in substantive chapters. These secondary questions are required in order to establish a roadmap of sorts, in order to address the primary question.

- What does the South African codification of sustainable development involve in terms of obligations and requirements for the mining sector?
- What does the concept of perpetual liability, as developed in South African environmental law, entail concerning mining activities in the country?
- What is the interplay between the concept of perpetual liability and sustainable development?

5. Methodology

5.1. Research methodology

This research will primarily comprise a desktop analysis of primary and secondary sources of law, which will be evaluated through both analytical and conceptual methodologies. The analytical methodology will be applied in exploring the concept of perpetual liability; where and why it originated, and how it crystallised into the South African environmental law context. An analytical methodology will also be applied in exploring the concept of sustainable development; how it developed and how it became legislated and applied in South African environmental law. The conceptual methodology will be applied to allow for the re-evaluation of the legal challenges associated with flooding in mines, which perpetuated the concept of perpetual liability and how and if it is compatible with sustainable development.

5.2. Research parameters

This research will be limited to the concept of perpetual liability only within the environmental law context. Perpetual liability finds application within the context of interdicts, delictual law

and insolvency law, none of which are relevant within the context of this study. This research will further be limited to sources of law available as at April 2022.

6. Relevance of the study

As more and more gold mines come closer to the end of life of mine, the issue of the continued pumping of extraneous water will become more and more relevant.[27] At the time of the final submission of this research, there was at least one pending matter before the High Court and one before the Supreme Court of Appeal where the issue of the continued pumping of extraneous water is the contentious issue.[28] There is at the time of the submission of this study no legal certainty regarding the two most prominent factors in the aforementioned issue, which are sustainable development *vís-a-vís* perpetual liability.

7. Chapter overview

The study will commence in Chapter 2 by examining the origins of the concept of sustainable development. Chapter 2 will then deal with sustainable development in South African law by dealing with it in terms of legislation, case law and then specifics with regard to the mining sector. The objective of this chapter is to establish a sustainable development-focused lens through which perpetual liability can be examined in subsequent chapters.

Chapter 3 will consider the concept of perpetual liability. Within the context of this study, the notion of perpetual liability has three dimensions, which are all important to understand in order to address the primary aim, which is whether the notion of perpetual liability is compatible with sustainable development. Therefore this Chapter in particular will explore how the concept of perpetual liability originated within the environmental law context in two parts. Firstly it will deal with the perpetual nature of statutes and thereafter the perpetual nature of the obligations in South African environmental law. This chapter will also deal with the perpetual nature of AMD, whereafter all three components will be analyzed together.

Following the findings of the preceding chapters, Chapter 4 will analyse the concept of perpetual liability through the lens of sustainable development. To frame the analysis, this chapter will focus on a series of case discussion — in particular, the case of Harmony Gold as the pioneer of perpetual liability case law, and thereafter a case discussion of present

[27] Sibanye Stilwater's Cooke life of mine is 2022, Driefontein is 2028 and Kloof is 2033. Sibanye Stillwater, *SA Gold Operations*. Available at: https://www.sibanyestillwater/business/southern-africa/gold-operations. (Last accessed 19 November 2020).
[28] *Ezulwini Mining Company (Pty) Ltd v Minister of Mineral Resources & Others*, Case no: 53379/2019 and *AngloGold Ashanti Limited v Sibanye Gold Limited t/a Sibanye Stilwater & Others*, Case no: 12784/2020.

litigation.[29] Through this analysis and subsequent discussion, the research lens developed in Chapter 2 will be applied against the characteristics and obligations of perpetual liability that were identified in Chapter 3. As such, the objective of this chapter is to determine the interplay between these two concepts and to identify legal implications, if any.

The study will conclude in Chapter 5 by summarising the findings of the research and addressing the primary research question.

[29] *Harmony Gold Mining Co Ltd v Regional Director, Free State Department of Water Affairs and Others* 2014 (3) SA 149 (SCA); *Ezulwini Mining Company (Pty) Ltd v Minister of Mineral Resources & Others*, Case no: 53379/2019.

CHAPTER 2: THE LENS OF SUSTAINABLE DEVELOPMENT IN THE SA LEGAL FRAMEWORK

"Nothing is sacred. Every gift we've been given, every resource discovered. Each new and shining thing that catches our eye, we pollute, disrespect. Violate. We tell ourselves that this is progress. Selling each other the fruits of our destruction. Sparing no thought to what we lose or leave behind, churning in our wake".[1]

1. Introduction

Sustainability has evolved to become the buzzword of this era. But understanding what sustainable development means in practice is important because it manifests itself as policies, programs and initiatives each with its implications.[2] Berke believes that sustainability presents the next paradigm shift which could dramatically change the practice of participation from being dominated by narrow special interests towards a more holistic approach and inclusive view.[3] To achieve this holistic view, sustainability is considered as the overarching principle and importantly recognising that the decisions the world takes today can have serious implications for future generations.[4] The following is an example of a model that is often used in the discussion of sustainable development:

According to the Scottish Environment Protection Agency, a simple way of picturing sustainable development is to think of it as a seat with three legs, representing the environment, the economy and society. If any one leg takes precedence over another (i.e. shorter or longer) than the others, the seat will be unstable. If any leg is missing entirely, the seat simply will not work. But if all three legs are the same length in that the environmental, economic and social considerations have been given equal importance, the result will be a well-balanced seat which will serve its purpose indefinitely.'[5]

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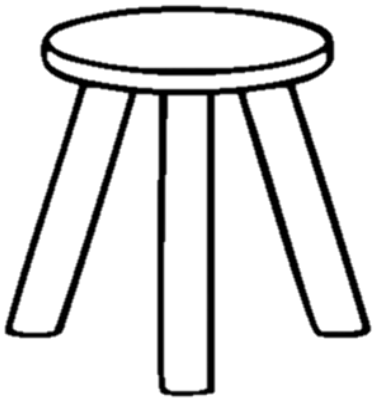
[1] Altered Carbon, Season 2, Episode 2, based on the novel by Richard K Morgan, written by Sarah Nicole Jones, directed by Ciaran Donnelly.
[2] SA Roosa *Sustainable Development Handbook, 2nd Ed* (2010) 1.
[3] PR Berke & M Manta-Conroy 'Are we planning for sustainable development? An evaluation of thirty comprehensive plans' (2007) 66(1) *Journal of the American Planning Association* 30.
[4] Roosa (n 2 supra) 2.
[5] Scottish Environment Protection Agency 2002, as quoted in NK Dawe & KL Ryan 'The faulty three-legged-stool model of sustainable development' (2003) 17(5) *Conservation Biology* 145.



On the surface, sustainable development is a simple concept: current and future generations must strive to achieve a decent standard of living and live within the limits of natural systems.[6] But despite the simplicity, there is no common agreement on how the notion of sustainable development must be interpreted in practice.[7] Ask an official from a developing country, and you will hear that alleviating poverty and meeting the needs of the poor underpins the meaning of sustainable development.[8] Ask someone from a developed nation, and the response will be in the line of considering future generations in policymaking.[9] Ask a representative of an environmental NGO, and the answer will be about redefining development to include environmental and economic objectives.[10] The vagueness with which sustainable development is cloaked in this regard is not peripheral but central to the notion itself.[11]

In light of this apparent ambiguity, the objective of this Chapter is to investigate the concept of sustainable development — how it developed, how it is codified, as well as how it is applied within in the South African environmental law context. Accordingly, Section 2 of this chapter will firstly, explore the various events which led to the creation and expansion of the notion of sustainable development. This will be followed in Section 3 by an analysis of the introduction of the concept in South African law — particularly through the Constitution, other legislation and case law — but with specific reference to its application within the mining sector. Finally, Section 4 will then aim to conceptualise a lens of sustainable development — what it is, and what the other side looks like when viewed through that lens. The chapter will

[6] Berke & Manta-Conroy (n 3 *supra*) 22.
[7] *Ibid.*
[8] FC Moore 'Toppling the tripod: Sustainable development, constructive ambiguity, and the environmental challenge' (2011) *Consilience* 5 *Columbia University* (2011) 143.
[9] *Ibid*.
[10] *Ibid*.
[11] *Ibid.*

conclude in Section 5 by summarising the findings and addressing the question of what the South African codification of sustainable development involves in terms of obligations and requirements for the mining sector?

2. The origins of sustainable development

2.1. Events leading to the notion of sustainable development

Although the terms 'sustainability' and 'sustainable' appeared for the first time in the Oxford Dictionary during the second half of the 20th century, the equivalent terms in French, German and Dutch have been used for centuries.[12] During the twentieth century, the ideas about growth and development were a continuous fluctuation between optimism and pessimism.[13] This was, for the most part, caused by the fact that at times it seemed as though the Western civilization was on the brink of collapse. This shattered the optimistic predictions of unlimited possibilities opening up due to scientific and technological advances at the beginning of the century. It was, however, soon after World War II, during the 1950s which saw an unprecedented economic boom which paved the way for a renewed optimism in the prospect of better living standards for all.[14] This period was categorized by growth in production, consumption, and wealth on a scale unprecedented since the Industrial Revolution which was initially considered the greatest revolution in outlook that has ever taken place.[15] It was, however, also during this period post-WWII consisting of industrial and commercial expansion that the environmental crisis started looming larger on the horizon, forcing people to change their basic understanding of growth and development.[16]

The term 'sustainable development' first became prominent in the 1980s within the inner operations and policies of the United Nations.[17] The exact moment in history which gave rise to the concept of sustainable development is a highly debated topic. For example, according to Worster, the concept had its origin during the 18th or 19th century when Germany — after realizing that the forests were in a state of decline — started to consider how to manage its forests in order to ensure long-term economic and ecological continuity. Worster believes that is where the concept of sustainability originated from '*nachhaltige Ausbeute*' meaning

[12] JA du Pisani 'Sustainable development – historical roots of the concept' (2006) 3:2 *Environmental Sciences* 85.
[13] *Idem* at 87.
[14] *Ibid*.
[15] D Worster *The wealth of nature: Environmental History and the ecological imagination* (1993) 180.
[16] Du Pisani (n 12 *supra*) 87.
[17] F Dodds, M Strauss & M Strong *Only one earth: The long road via Rio to sustainable development* (2012) 24.

'sustained yield'.[18] Conversely, according to Du Pisani, the terms 'sustainable development' was coined at the start of the 1970s, probably by Barbara Ward, founder of the International Institute for Environment and Development.[19] Hundloe suggests that three publications had the most substantial impact on the integration of the triple-bottom-line components,[20] namely, *Our Common Future*, better known as the *Brundtland Report*, *A Blueprint for a Green Economy* and *For the Common Good* both published in 1989.[21] In a somewhat similar approach, Van den Bergh and Van den Straaten further suggest that the UNCED meeting on Environment and Development in Rio de Janeiro in 1992 should be considered a pivotal event in the conceptualization of sustainable development. Notwithstanding the importance of this meeting, the authors posit a series of important events and political actions that paved the way for the emergence of the concept of sustainable development.[22] Considering that these events follow sequentially, it may be considered a chronological timeline of the evolvement of sustainable development. For purposes of understanding this evolvement, each event will be discussed here below to establish each event's contribution to the notion of sustainable development as we understand it today.

Specific events in history leading to the conceptualisation of sustainable development

In 1968 Sweden introduced a resolution during the UN General Assembly to convene a world conference on the environment, which was subsequently held in Stockholm in 1972.[23] During the opening statement of this UN Conference of the Human Environment, Maurice Strong — the Secretary-General of the Conference - stated:

> "*Our purpose here is to reconcile man's legitimate, immediate ambitions with the rights of others, with respect for all life supporting systems, and with the rights of generations yet unborn. Our purpose is the enrichment of mankind in every sense of that phrase. We wish to advance – not recklessly, ignorantly, selfishly and perilously, as we have done in the past – but with greater understanding, wisdom and vision. We are anxious*

[18] Worster (n 15 *supra*) 144.
[19] Du Pisani (n 12 *supra*) 91.
[20] *Ibid*.
[21] T Hundloe, '*Sustainable development: environmental limits and the limits of economics*' (1992) *Australian Development Studies Network, Australian National University* 1, sourced form openresearch-repository.anu.edu.au lasted accessed on 11 December 2020.
[22] JCJM van den Bergh & J van der Straaten 'The significance of sustainable development for ideas, tools and policy' in JCJM van den Bergh & J van der Straaten (*eds*) *Toward sustainable development: Concepts, methods and policy* (1994) 5.
[23] Dodds, Strauss & Strong (n 17 *supra*) 5.

and rightly so, to eliminate poverty, hunger, disease, racial prejudice and the glaring economic inequalities between human beings."[24] [Emphasis added]

The aforementioned indicates from the outset, that the underlying and underpinning ideal behind sustainable development is to protect resources for future generations, the so-called intergenerational concept. But apart therefrom, the Conference produced three major outcomes – a declaration and statement of principles, an action plan and the new United Nations Programme on the Environment (UNEP).[25] UNEP was given the mandate to coordinate the development of environmental policy by keeping the global environment under review and bringing emerging environmental issues to the attention of governments and the international community.[26] What became commonly known as the Stockholm Declaration recognises that humans are both creatures and moulders of the environment as a whole. This unique position creates the perfect platform in which humans can transform the environment in countless ways, bearing in mind that both natural and man-made environments are essential to humans' well-being and enjoyment of life itself. Therefore, it recognises that the power and duty to mould the environment in such a manner which caters for the present and preserves the future is essentially in our hands alone.

Limits to growth: A report for the Club of Rome's Project on the predicament of mankind (Limits to Growth Report) is a report published in 1972 based on the problem statement; exponential economic and population growth within a natural environment of a finite supply of resources.[27] The report was commissioned by the Club of Rome when it decided to undertake a project called the Project on the Predicament of Mankind. In target of the project was to examine and analyse problems which worried all nations i.e. the fact that poverty remains prominent, the degradation of the environment, people's loss of faith in institutions, uncontrolled urban development, employment insecurity, the rejection of tradition and its values and general economic disruptions.[28] These factors were identified as the Club of Rome believed that these factors shared three common characteristics: i) they occur, to some degree, in most societies, ii) they all contain technical, social, economic and political elements and iii) they all interact.[29] The correct identification of these so-called 'global' worries is

[24] *Idem*, at 3.
[25] *Idem*, at 11.
[26] *Idem*, at 12.
[27] DH Meadows, DL Meadows, J Randers & WW Behrens *The limits to growth: A report for the club of Rome's project on the predicament of mankind* (1972) 11.
[28] *Idem*, at 10.
[29] *Idem,* at 11.

corroborated when considering that most of these issues are also issues identified as issues that need to be addressed in order to attain sustainable development in the Sustainable Development Goals, which are discussed in more detail below.[30]

In brief, the Limits to Growth Report uncovered that if the present growth trends (in population, food production and resource depletion) remained unchanged, the planet would reach its limit within 100 years. However, the authors held that these trends could be changed to reach a more stable and sustainable ecology that would still provide every human its basic needs, but that it would require a re-design of the world's equilibrium. If the world people decided on the second outcome rather than on the first, the sooner they started working thereon to achieve it, the greater the chances of success would be.[31] The Limits to Growth report, in essence, did not contribute toward the notion of sustainable development in as much as it was a dire call and a reminder that the notion of sustainable development is critical to the survival of the human race. The Limits to Growth report is rather a spark re-igniting the flame as opposed to being the flame itself.

The Global 2000 Report for hearing before the subcommittee on International Economics of the joint Economic Committee Congress of the United States was published in 1980 by the Council on Environmental Quality and the State Department after it was commissioned by the then president of the United States, Jimmy Carter. [32] According to the report, in a mere 20 years, therefore by the year 2000, the earth would be populated by 6.4 billion people. That meant a 55% increase in the population in 20 years. 77% of that population would live in less developed countries and their lives, as it was then predicted, would be miserable.[33] It would consist mostly of slums and shanty towns where sanitation, water supply and health care would be minimal at best. Concerning food production, the report predicted that the "quantity of food available to the poorest groups of people will simply be insufficient to permit children to reach normal body weight and intelligence".[34] The report also points to a world where half the forests are gone, where up to 2 million species have become extinct and where the resources required for agriculture continue to deteriorate.[35] The report ends,

[30] See section 2.3 *infra*, p. 29.
[31] Meadows, Meadows, Randers & Behrens (n 27 *supra*) 23–24.
[32] The Global 2000 Report, accessed at http://www.jec.senate.gov/reports/96th%20Congress/The%20Global%202000%20Report%20(998).pdf. Accessed on 22 January 2021, at 1.
[33] *Ibid.*
[34] *Idem*, at 2.
[35] *Ibid*.

however, on a positive note in that it recognizes that the disaster as predicted need not be the earth's inevitable fate. Those projections would only materialize if humanity failed to take vigorous, determined new initiatives necessary to change the present trends and policies.[36] The report attracted worldwide attention, and resulted in public outcry, from laymen as well as from scientists whom all urged the president to act as a matter of urgency against environmental destruction, which the report predicted would take place on a dramatic scale by the year 2000. However, the unfortunate fact of Carter's defeat by Ronald Reagan in the 1980 presidential election, lead to the situation where no follow-up action was taken on these issues.[37] The Global 2000 Report was another siren calling for the firm and concrete establishment of the notion of sustainable development.

The Resourceful Earth: A response to Global 2000, edited by Julian Simon and the late Herman Kahn, was written to refute the conclusion of the Global 2000 Report. The main controversy concerns the direction in which the world was heading. The two editors called the Global 2000 study 'dead wrong' on all counts,[38] and held that the aggregate global trends were improving instead of deteriorating, as was predicted in the Global 2000 report.[39] This is indicative of the reality that despite the worldwide attention that the Global 2000 report attracted, the need for the notion of sustainable development was not common cause.

The term 'sustainable development' first became prominent in 1980 when the International Union for the Conservation of Nature and Natural Resources ('IUCN') agreed on its World Conservation Strategy. In other words, "the overall aim of achieving sustainable development through the conservation of living resources".[40] The World Conservation Strategy is the first international document on living resource conservation.[41] The three main objectives identified in this report are: 1) to maintain essential ecological processes and life-support systems on which human survival and development depend; 2) to preserve genetic diversity on which the functioning of many of the above processes and life-support systems depend; and 3) to ensure the sustainable utilization of species and ecosystems which support

[36] *Ibid*.
[37] *Ibid*.
[38] JL Simon & H Kahn *The Resourceful Earth: a response to Global 2000* (1984), at 1.
[39] R Repetto 'Population and Development Review', (1985) 11(4) *JSTOR* www.jstor.org/stable/1973463, accessed on 22 January 2021, 757 – 768.
[40] Dodds, Strauss & Strong (n 17 *supra*) 24.
[41] The Environment and Society Portal, a project of the Rachel Carson Center for Environment and Society, *The World Conservation Strategy*, accessed at http://www.environmentandsociety.org, accessed on 21 January 2021.

millions of rural communities as well as major industries. In its foreword, the World Conservation Strategy states:

> "*Human beings, in their quest for economic development and enjoyment of the riches of nature, must come to terms with the reality of resource limitation and the carrying capacities of ecosystems, and must take account of the needs of future generations. This is the message of conservation… Development and conservation are equally necessary for our survival and for the discharge of our responsibilities as trustees of natural resources for the generations to come."*[42] [Emphasis added].

The importance of the need to protect natural resources for future generations is once again emphasised, and this time in what was considered to be an intellectual framework and practical guidance for the conservation actions required at that point in time. [43] It appears that the World Conservation Strategy was therefore the first document to contain a practical strategy for the implementation of the notion of sustainable development.

In recognising the fact that there were very few historical analogies to guide humanity on the consequences of some of the aforementioned global changes, the International Institute for Applied Systems Analysis (IIASA) formulated a Feasibility Study on Sustainable Development of the Biosphere in 1983.[44] The final framework for the Study was compiled after numerous meetings, and resulted in the following points:

- To amalgamate the policy terms relating to global ecological and geophysical systems as they are inextricably linked with industrial and resources development activities;
- To characterize the various issues of change in the global environmental change according to their ability to inhibit or promote regional development; and
- To explore various institutional and organizational designs which could provide more effective international research, policymaking, and management, with specific reference to interactions between the environment and regional development.[45]

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[42] *World Conservation Strategy: Living resource conservation for sustainable development*, prepared by the International Union for Conservation of Nature and Natural Resources with the advice, cooperation and financial assistance of the United Nations Environment Programme and the World Wildlife Fund, (1980). Available at https://eatrhmind.org/sites/default/files/1980-IUCN-WorldConservationStrategy_0.pdf.
[43] *Ibid.*
[44] WC Clark & RE Munn (Eds) *Sustainable development of the Biosphere*, published on behalf of the International Institute for Applied Analysis by Cambridge University Press New Yok & Melbourne, (1986). Available at https://pure.iiasa.cic.at/id/eprint/2751/1/XB-86-703.pdf.
[45] *Ibid*.

The aforementioned points were deliberated at the hand of overview papers during an IIASA Task Force meeting held in 1985, which led to the finding that long-term research on sustainable development of the biosphere, within the context of resource management, was urgently required. The Report on Sustainable Development of the Biosphere is a compilation of the overview papers which were discussed and deliberated during the Task Force meeting. These papers addressed a number of issues concerning human development, the world environment, social response and usable knowledge.[46] In essence, the Report recognises that the future management of the world's resources depended upon the reconciliation between the socio-economic developmental needs and the conservation of the environment. The report provides a strategic framework for the long-term interactions of these two elements based on the sustainable development of the biosphere. Much like the World Conservation Strategy, the Report on Sustainable Development of the Biosphere is a document containing strategic frameworks for the long-term practical application of the notion of sustainable development, albeit more refined within the context of the biosphere. The Report's emphasis on the management of the long-term effects of the socio-economic need *vis-à-vis* the environment is, once again, indicative of the ideal balancing of needs and resources and preserving it for future generations.

The report produced by UNEP following its 10th Session precipitated the document entitled 'Our Common Future'[47] which became better known as the Brundtland Report.[48] The Brundtland Report is widely accepted as the report which defined the most widely used definition of the concept of sustainable development.[49] It defines sustainable development, in its most basic form, as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.[50] In discussing the concept of sustainable development, the Report identifies that as long as poverty remains endemic, the earth will always be prone to ecological and other crises. This is because the basic needs are not met, and neither are the poverty-stricken people's aspirations for a better quality of life.[51] In this regard, the Report weaves together multiple societal values to confront the challenges

[46] *Idem*, at preface.
[47] World Commission of Environment and Development *Our Common Future* (1987).
[48] Dodds, Strauss & Strong (n 17 *supra*) 24.
[49] Du Pisani (n 12 *supra*) 93.
[50] *Our Common Future – An overview by the World Commission on the Environment and Development*. Available at https://sustainabledevelopment.un.org/content/documents/5957our-common-future.pdf, at Chapter 2, paragraph 1.
[51] *Idem*, at paragraph 27.

of over-consumption and grinding poverty.[52] The meeting of essential needs requires not only a new era of economic growth but more so the assurance that the poor get their fair share of the specific resources which they require in order to sustain such growth. This type of equity would be abetted by political systems that secure effective citizen participation in decision-making. On the other hand, some of those people who live beyond the basic requirements also live beyond the world's ecological means and use the example of the pattern of energy consumption. The Brundtland Report states that the perceived needs of people are determined socially and culturally and, therefore, sustainable development requires the promotion of values that encourage consumption levels that are within the bounds of what is ecologically possible. In essence sustainable global development requires that those citizens who are more affluent to adopt lifestyles within the planet's ecological means.[53] This view was reiterated in the 2015 Paris agreement which recognized that sustainable lifestyles and sustainable patterns of consumption and production play an important role in addressing climate change.[54]

Concerning resources, the report states that renewable resources are part of a complex and interlinked ecosystem. This means that the maximum sustainable yield can only be defined once the system-wide effects of exploitation has been taken into account.[55] The general rate of depletion of non-renewable resources, such as fossil fuels and minerals, should take into account not only the scarcity of that resource but also the significance of that resource. Also the availability of technologies for minimizing depletion, and the likelihood of substitutes being available.[56] The loss of plant and animal species can greatly limit the options of renewable resources for future generations, so sustainable development also requires the conservation of plant and animal species. Sustainable development further requires that the adverse impacts on the quality of air, water, and other natural elements are minimized to sustain the ecosystem's overall integrity. The Brundtland Report further states that in the end, sustainable development is not a fixed state of harmony; it should rather be considered as a process of change which requires that the exploitation of natural resources, the direction of technological development, and overall institutional changes are made consistent with future as well as present needs. The Brundtland Report, in its final analysis, determines that sustainable development must rest on

[52] Berke & Manta-Conroy (n 3 *supra*) 22.
[53] *Our Common Future – An overview by the World Commission on the Environment and Development* (n 50 *supra*) 29.
[54] D Welch & D Southerton, "After Paris: transitions for sustainable consumption" (2019) 15:1 *Sustainability: Science, Practice and Policy* 31.
[55] *Our Common Future – An overview by the World Commission on the Environment and Development* (n 50 supra) 11.
[56] *Idem,* at 12.

political will.[57] This is because beyond the most basic biological needs, what society feels that it needs becomes inextricably linked with what society wants.[58] In a constantly changing world of highly unequal consumption, distinguishing necessities from luxuries becomes highly politically charged.[59]

According to Schmuck & Schultz, the causes for the problems, as identified in the Brundtland Report, is to be found in two key behavioural patterns.[60] Firstly, the use of fossil energy and secondly the rapid growth of the human population. According to these authors, two further beliefs shaped the general goals that humankind made for itself over the last few centuries, which are presently increasingly recognized as misleading but important causes for the problems mentioned above.[61] The first is the worldwide view that economic growth is appropriate for each phase of human development. The second belief is the assumption that the level of material consumption is proportional to human happiness.[62] Schmuck and Schultz ask the question why do humans maintain non-sustainable behaviour patterns despite evidence of its harmful consequences? They pin it down to the limitations of the human perceptive.[63] Fortunately, humans are not helpless victims of this deficiency — they can reflect on the deficiency, and find ways to overcome it. The Authors use Agenda 21 as an example of overcoming the human limitation on perception.[64] However, psychological research has shown that awareness of an issue is not sufficient to motivate people to act. Humans do not only need cognitive insight but also require an emotional connectedness with other beings for engaging in sustainable development.[65]

The case of the Gabčikovo-Nagymaros Project

The international *Case concerning the construction of the Gabčikovo-Nagymaros Project*[66] heard by the International Court of Justice is one of the most well-known cases

[57] *Idem,* at 3.
[58] FC Moore 'Toppling the tripod: Sustainable development, constructive ambiguity, and the environmental challenge' (2011) *Consilience* 5 *Columbia University* 144.
[59] *Idem,* at 145.
[60] P Schmuck & PW Schultz 'Sustainable Development as a challenge for psychology' in Schmuck P & Schultz PW (*eds*) *Psychology of Sustainable Development* (2002) 8.
[61] *Idem,* at 9.
[62] *Ibid.*
[63] *Ibid.* For example, "humans cannot predict the future because its determinants have a higher complexity than humans can manage. Therefore, humans cannot determine the long-term consequences of our present behavior. If the problem raises above our capacity to detect it, to the point where we can no longer ignore the changes, then we are inclined to deny the personal contribution to these changes."
[64] Schmuck & Schultz (n 60 *supra*) 9.
[65] *Idem*, at 10.
[66] (1998) 37 ILM 162.

dealing with 'a rich array of environmentally related legal issues'.[67] It was the first case in which the concept of sustainable development enjoyed the attention of the International Court of Justice.[68] The main environmental argument considered was whether Hungary could invoke the customary law defence of a state of necessity on ecological grounds as a ground to revoke a treaty which was concluded between the Hungarian People's Republic and the (then) Czechoslovak People's Republic in 1977.[69] The treaty concerned the construction and operation of the *Gabčikovo-Nagymaros* system of locks in the Danube River.[70] Concerning the argument of a state of necessity, the Court held that this was not shown.[71] The Court, however, further held that the treaty was not static and was open to adaptation by emerging norms of international environmental law.[72] In this regard, Justice Weeramantry held as follows:

> "*Throughout the ages, mankind has for economic and other reasons, constantly interfered with nature. In the past, this was often done without consideration of the effect upon the environment. Owing to new scientific insights and to growing awareness of the risks for mankind – for present and future generations – of pursuit of such interventions at an unconsidered and unabated pace, new norms and standards have been developed, set forth in a great number of instruments during the last two decades. Such new norms have to be taken into consideration, and such new standards given proper weight, not only when states contemplate new activities, but also when continuing with activities begun in the past. This need to reconcile economic development with protection of the environment is aptly expressed in the concept of sustainable development.*"[73]

Vice-President Judge Weeramantry wrote a separate opinion on three legal issues after the judgment, one of which was the concept of sustainable development.[74] According to Judge Weeramantry, sustainable development is more than a mere concept, but that it is a principle with normative value, and that it is likely to play a major role in determining important environmental disputes in the future.[75] Both parties in the case agreed on the applicability of the principle of sustainable development to the dispute, however, the parties disagreed on how

[67] (1998) 37 ILM 204.
[68] *Ibid*.
[69] (1998) 37 ILM 182 at par 40.
[70] (1998) 37 ILM 174 at par 15.
[71] (1998) 37 ILM 184 at par 48.
[72] J Glazewski *Environmental Law in South Africa 2nd Ed* (2005) 38 – 39.
[73] (1998) 37 ILM 162 at 201 par 140.
[74] 1998) 37 ILM at 204.
[75] (1998) 37 ILM at 204.

the principle should be applied to the facts of the case.[76] Judge Weeramantry held that this case offered a unique opportunity for the application of the principle of sustainable development, for the dispute arose from a treaty that had development as its objective, and which been brought to a standstill over arguments concerning environmental considerations.[77] The other cases in which environmental questions were raised have mostly been considered within the context of environmental pollution arising from various sources, but which are all rather far removed from environmental issues related to development. Thus, this case is unique in that it focuses attention on the question of harmonization of developmental and environmental concepts.[78] As a principle of International Law, Judge Weeramantry states that even the earliest formulations of the concept of sustainable development, recognized that development cannot be pursued to such a point that it would result in substantial, or even irreparable damage to the environment. This principle thus requires that development should only be pursued in harmony with the reasonable demands of environmental protection. Whether the development is sustainable by reason of its impact on the environment will and can only be determined on a case by case basis, depending on the merits. The correct interpretation and application of the right to sustainable development is that it does not exist in the absolute sense. It will always be relative to its tolerance by the environment. The right to development as thus refined is clearly part of modern international law.

Judge Weeramantry further summarises that the principle of sustainable development thus forms part of modern international law not only because logic dictates that such a principle is necessary within the context of International environmental law, but also because it is so widely accepted by the global community. It was found that the concept of sustainable development has a significant role to play in the resolution of environmental disputes. This is so because it offers an important principle for the resolution of tensions between two established rights in that there must be both development and environmental protection and that neither of these rights can be neglected.[79]

[76] (1998) 37 ILM at 205. 'Hungary and Slovakia agree that the principle of sustainable development, as formulated in the Brundtland Report, the Rio Declaration and Agenda 21 is applicable to this dispute…International law in the field of sustainable development is now sufficiently well established, and both Parties appear to accept this. Slovakia states that 'inherent in the concept of sustainable development is the principle that developmental needs are to be taken into account in interpreting and applying environmental obligations'.
[77] 1998) 37 ILM at 205.
[78] (1998) 37 ILM at 205.
[79] (1998) 37 ILM at 206 – 207.

Final remarks on the events leading to sustainable development

The general support in the international community does not mean that each member state has given its express and specific support for the principle of sustainable development, nor has it become a requirement for the establishment of a principle of customary international law. However, the evidence of the principle appearing in international instruments and State practice supports a contemporary general acceptance of the concept.[80]

Throughout the aforementioned chronology, the notion of sustainable development received criticism at various levels.[81] Less-developed countries were suspicious that sustainable development might be an ideology imposed by more wealthy countries to enforce stricter rules on aid to less-developed countries. Another major critique was that the notion of sustainable development did not address the question of the ideology of economic growth and consumer culture and was thus only serving neo-liberal interests.[82] The concept of sustainable development was a compromise between growth and conservation. It was not ideologically neutral as it inclined away from the no-growth option. Like any compromise, the concept was not wholly and entirely embraced by each side, especially those with extremist views. What remains true, is that throughout these reports, books and events, a golden thread of the development of the notion of sustainable development is evident; the recognition that past and present activities have caused irreparable harm to the environment, the recognition that present and future activities must change to ensure that it is sustainable in the long run to ensure that there is an environment left for future present and future generations.

2.2. Beyond the Brundtland Report

Following the Brundtland Report, in 1989 the General Assembly agreed to convene another global conference. The conference was formally called the United Nations Conference on Environment and Development, more commonly known as the Earth Summit, which was eventually held in Rio de Janeiro in 1992. The Earth Summit produced, amongst others, Agenda 21, also known as the Rio Declaration, which was a blueprint for sustainable development for the first part of the 21st century.[83] The preamble of Agenda 21 states that it recognizes that sustainable development will have to be delivered not only by governments but

[80] (1998) 37 ILM at 207.
[81] Du Pisani (n 12 *supra*) 93.
[82] *Ibid*.
[83] Dodds, Strauss & Strong (n 17 *supra*) 32.

by all relevant stakeholders.[84] It states that governments will have the responsibility for national strategies, plans and policies to attain sustainable development. This reiterates what the authors of Our Common Future believed that sustainable development must rest on political will. The preamble states further that the only way to assure a safer, more prosperous future is to deal with the environment and developmental issues together in a balanced manner.[85] The aforementioned reiterates the principle of balancing the elements of sustainable development.[86] The United Nations Commission on Sustainable Development was also established at the Earth Summit, with the primary mandate to monitor and implement the agreement reached during the summit and to negotiate future policy commitments.[87]

The World Summit on Sustainable Development was hosted by South Africa in 2002 and convened by the UN Commission on Sustainable Development at the instance of the UN General Assembly under Resolution 55/199.[88] The Summit in Johannesburg produced several declarations.[89] However, the focus of the summit was mostly on implementation rather than substantive principles.[90] The most important two declarations concerning the evolution of sustainable development were the Johannesburg Declaration on Sustainable Development[91] and the Plan of Implementation of the World Summit on Sustainable Development.[92] The former is a four-page political declaration which re-iterates the global communities' commitment to sustainable development in its opening article and further recognizes that sustainable development requires a long-term perspective and broad-based participation in policy formulation and decision-making on all levels.[93] A third declaration, which was probably more significant for implementation in the Southern Africa context, was the action-orientated Johannesburg Principles on the Role of Law and Sustainable Development ("the Johannesburg Principles").[94] The Johannesburg Principles were adopted to serve as a guide to the judiciary to promote the goals of sustainable development, through the rule of law and the democratic process. There were four main principles identified — these included, a full

[84] United Nations Conference on Environment and Development 'Agenda 21, Rio Declaration, Forest Principles (1992) at preamble paragraph 1.3.
[85] *Idem*, at preamble paragraphs 1.1 and 1.2.
[86] n 5 *supra*, Chapter 1.
[87] Dodds, Strauss & Strong (n 17 *supra*) 32.
[88] Glazewski (n 72 *supra*) 35.
[89] *Ibid*.
[90] *Ibid*.
[91] Accessed at www.dhs.gov.za/sites/default/files/legislation/The_Johannesburg_Declaration/pdf.
[92] Accessed at www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf.
[93] Johannesburg Declaration on Sustainable Development, Article 26. Accessed at www.dhs.gov.za/sites/default/files/legislation/The_Johannesburg_Declaration/pdf.
[94] Glazewski (n 72 *supra*) 35.

commitment to achieve the goals of sustainable development; to implement international and national regimes to achieve those goals; education and training in the fields of environmental law, and collaboration between the judiciary and other stakeholders for the improvement, development and enforcement of environmental law.[95] Since participating in the Earth Summit in 1992, South Africa has become a signatory to the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change and has made significant progress in incorporating environmental considerations, such as sustainable development, into its policies and plans. South Africa also committed to the 2015 Millennium Goals, a National Strategy and Action Plan for Sustainable Development as well as commitment to the 2030 Sustainable Development Goals.[96]

2.3. Sustainable Development Goals

Haughton argues that what makes sustainable development discernible from other existing concerns of environmental planning, is five underlying and interconnected equity principles that distinguish the concept of sustainable development and represent the essential environmental justice dimension.[97] These include intergenerational equity, intra-generational equity, geographical equity, procedural equity and inter-species equity. Haughton however, notes that these principles are not quantifiable end-goals, but rather the process of changing the human spirit and moving towards them which is important.[98]

Firstly, is the principle of intergenerational equity, or the principle of futurity. Haughton argues that this is perhaps the most widely known principle as it is drawn directly from the definition of sustainable development from the Brundtland Report as being "development which meets the needs of the present without compromising the ability of future generations".[99] The second principle, and also drawn from the Brundtland Report is the principle of intra-generational equity, or the principle of social justice.[100] This principle, however, encompasses

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[95] Johannesburg Principles on the Role of Law and Sustainable Development adopted at the Global Judges Symposium held in Johannesburg, South Africa on 18 – 20 August 2002. Available at https://www.soas.ac.uk/cedep-demos/000_P514_IEL_K3736-Demo/treaties/media/2002%20WSSD%20Joburg%20Principles%20on%20the%20Role%20of%20Law%20Development.pdf, accessed on 31 January 2021.
[96] HA Strydom, ND King & FP Retief, *Fugle & Rabie Environmental management in South Africa,* (2018) 805.
[97] G Haughton, 'Environmental justice and the sustainable city' (1999) 18 *Journal of Planning Education & Research* 235.
[98] *Ibid*.
[99] *Ibid*.
[100] *Our Common Future – An overview by the World Commission on the Environment and Development* (n 50 *supra*) paragraph 26.

a wider meaning of social justice; in other words, not only the redistribution of wealth but more so identifying and addressing the underlying causes of social injustice.[101] The third key principle is that of geographical equity, or transfrontier responsibility.[102] This requires local policies to address and resolve global as well as local issues; this implies that in addressing and solving local environmental problems policies should consider and include the effect on the external impacts, and vice versa. This in turn relates and ties in with the fourth principle being that of procedural equity.[103] In essence, this principle envisages that all people should be treated openly and fairly. Usually, this principle is applied with a particular legal jurisdiction, which creates problems given the global economy and the fact that many environmental concerns are large-scale and do not adhere to political boundaries.[104] Those affected by ecological disasters in other jurisdictions, for instance, should have the same rights to legal standing to defend themselves against environmental transgressors as those in the host country would.[105] Critical to making this principle effective in practice is the right of equal access to information for all interested parties on activities that could have detrimental environmental impacts, both locally and globally.[106] To this extent, the principle of procedural equity also covers what is referred to as the principle of participation, which is also covered in the Brundtland Report.[107] The fifth principle is that of inter-species equity which places the survival of other species on an equal basis to the survival of humans.[108] Without suggesting the moral equivalence of humans with other life forms, this principle serves to highlight the importance of preserving ecosystem integrity and maintaining biodiversity.[109]

Berke and Manto-Conroy advance six principles and define and operationalize the notion of sustainable development to evaluate how well policies which support sustainable development have been doing.[110] According to Berke, an examination of various definitions of sustainable development in planning literature reveals certain key characteristics.[111] One

[101] Haughton (n 97 *supra*) 235.
[102] *Idem*, at 236.
[103] *Ibid*.
[104] *Ibid*. For example degradation of the Amazon. When consumers have the information about the products of the Amazon rainforest, whether it was sustainably sourced or whether it was a short-term economic pillaging, everyone can take part in the process.
[105] *Ibid*.
[106] *Ibid*.
[107] *Our Common Future – An overview by the World Commission on the Environment and Development* (n 50 *supra*) paragraph 20.
[108] Haughton (n 97 *supra*) 237.
[109] *Ibid*.
[110] Berke & Manta-Conroy (3 *supra*).
[111] *Idem*, at 22.

characteristic is 'reproduction' in the context of a system must be able to reproduce.[112] Not only limited to the reproduction of the status quo — rather, in the sense of revitalisation. By applying this characteristic in planning, planners must foresee and shape the scope of future development, and identify existing and future needs to enable communities to continuously reproduce and revitalise themselves.[113] A second characteristic is "balance" among environmental, economic and social values.[114] According to Berke, achieving balance usually entails coordination, negotiation and compromise. When all the values are not represented, sustainability cannot be promoted by a plan.[115] A third characteristic is that plans must link local to global concerns.[116] Plans must therefore recognise that local communities function within the context of global environmental, economic and social systems.[117] The fourth characteristic is that the notion of sustainable development is a "dynamic process".[118] Plans must be orientated towards searching for ways to continuously move towards sustainability.[119] To evaluate plans, Berke used the abovementioned characteristics to develop the following working definition for sustainable development:

> *"Sustainable development is a dynamic process in which communities anticipate and accommodate the needs of current and future generations in ways that reproduce and balance local social, economic, and ecological systems and link local actions to global concerns."*[120]

In 2000 the Millennium Development Goals were set, consisting of 8 goals for sustainable development to be achieved by the year 2015.[121] The 8 goals were to eradicate extreme poverty and hunger, achieve universal primary education, promote gender equality and empower women, reduce child mortality, improve maternal health, combat HIV/AIDS, malaria and other diseases, ensure environmental sustainability and form a global partnership for development.[122]

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[112] *Ibid*.
[113] *Ibid*.
[114] *Ibid*.
[115] *Ibid*.
[116] *Ibid*.
[117] *Idem*, at 23.
[118] *Ibid*.
[119] *Ibid*.
[120] *Ibid*.
[121] Millennium Development Goals accessed at https://research.un.org/en/docs/dev/2000-2015 accessed on 27 January 2022.
[122] *Ibid.*

The Millennium Development Goals were superseded by the Sustainable Development Goals, which represents a universal call to action to work towards these goals. The 17 goals were adopted by all UN member states as part of the 2030 Agenda for Sustainable Development which set out a 15-year plan to achieve these goals.[123] These 17 goals are no poverty, zero hunger, good health and well-being, quality education, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace justice and strong institutions and partnerships for these goals.[124]

3. Sustainable Development in South African law

3.1. The Constitution and legislation

In South Africa, section 24 of the Constitution codifies the concept of sustainable development by requiring the passing of legislation and other measures in order to secure 'ecologically sustainable development'.[125] In 1998, the White Paper on Environmental Management Policy for South Africa[126] was published, which stipulated that sustainable development is to be an overarching goal in stating that:

> *"…the intention is to move from a previous situation of unrestrained and environmentally insensitive development to sustainable development with the aim of achieving an environmentally sustainable economy in balance with ecological processes.*"[127]

Two important general features underpin the White Paper. Firstly, the notion of sustainable development and specifically the endorsement of the definition and analysis offered by the Brundtland Report,[128] and secondly, the notion of the transition into a democracy.[129] The White Paper describes its vision as "an integrated and holistic management system for the environment aimed at achieving sustainable development now and in the future".[130] It further

[123] United Nations Department of Economic and Social Affairs – Sustainable Development accessed at https://sdgs.un.org/2030agenda accessed on 27 January 2022.
[124] *Ibid.*
[125] The Constitution of the Republic of South Africa, 1996.
[126] *White Paper on Environmental Management Policy*, Department of Environment and Tourism (1997). Available at https://www.environment.gov.za/sites/default/files/legislations/environmental_management_0.pdf, accessed on 3 February 2021.
[127] *Idem,* at 13.
[128] *Idem,* at 14.
[129] Glazewski (n 72 *supra*) 134.
[130] *White Paper on Environmental Management Policy* (n 126 *supra*).

emphasises that integrated and sustainable management of the environment, both in the present and in the future, is the essential basis of sustainable development in all areas of human activity.[131] The policy, therefore, requires that all national development policies, plans, programmes and activities in all sectors, address environmental concerns in such a manner as to be considered sustainable.[132]

The White Paper was the predecessor to NEMA, and the very same principles thus underpin NEMA.[133] NEMA was assented to on 1 November 1998 and commenced on 29 January 1999. NEMA bases all of the important environmental management principles which underpin the Act on the general provision that "development must be socially, environmentally and economically sustainable*"*[134] thus essentially encapsulating the triple-bottom-line. NEMA defines sustainable development as "the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations*"*. It goes on to stipulate that the notion of sustainable development requires consideration of a number of factors such as the disturbance to ecosystems, pollution or degradation to the environment and the production of waste should be avoided, but where it cannot be avoided that it be minimised and remedied insofar as possible. Its further states that the use and exploitation of natural resources must be done in a responsible manner taking into consideration the possible depletion of the natural resource. Another factor that should be considered within the context of sustainable development is that a risk-averse and cautious approach should be applied in the absence of scientific evidence and in the limits to knowledge.[135]

[131] *Idem,* at 14.
[132] *Ibid.*
[133] Glazewski (n 72 *supra*) 134.
[134] Section 2(3) of NEMA.
[135] Section 2(4)(a) of NEMA. Also see *WWF South Africa v Minister of Agriculture, Forestry and Fisheries and Others* 2019 (2) SA 403 (WCC).

The concept of sustainable development is also alluded to in other pieces of legislation such as the Marine Living Resources Act,[136] The Water Act,[137] and The MPRDA.[138] The National Environmental Management: Biodiversity Act, defines 'sustainable' within the context of the use of a biological resource as "the use of such resource in such a way and at a rate that a) would not lead to its long terms decline; b) would not disrupt the ecological integrity of the ecosystem in which it occurs; and c) would ensure its continued use to meet the needs and aspirations of present and future generations of people".[139]

3.2. Sustainable Development in case law

Glazewski submits that the essence of sustainable development in practice[140] was captured in *BP Southern Africa (Pty) Ltd v MEC for Agriculture, Conservation and Land Affairs*[141] and that this case is considered as the case which encapsulated the concept of sustainable development in South African case law.[142]

In this case, *BP Southern Africa (Pty) Ltd,* BP ("the Applicant") sought an order for the review and setting aside a decision by the Gauteng Provincial Department of Agriculture, Conservation, Environment and Land Affairs. The decision sought to be reviewed and set aside was the refusal of the Applicant's application in terms of s22(1) of the Environmental Conservation Act 73 of 1989 for authorisation to develop a filling station on a property in a commercial area in Midrand, which was owned by the Applicant.[143] There were various issues that had to be analysed by the Court, however the Court proceeded firstly with an examination and analysis of the Department's mandate. This necessitated starting with the Constitution and in doing so it held that both the Applicant and the Department are subject to the express

[136] Section 2 of the Marine Living Resources Act, 18 of 1998 provides for sustainable development "The Minister and any organ of state shall in exercising any power under this act, have regard to the following objectives and principles (a) the need to achieve optimum utilization and ecologically sustainable development of marine living resources; (b) the need to conserve marine living resources for both present and future generations; (c) the need to apply precautionary approaches in respect of the management and development of marine living resources; (d) the need to utilize marine living resources to achieve economic growth, human resource development, capacity building within fisheries and agriculture branches, employment creation and a sound ecological balance consistent with the development objectives of the national government."
[137] Section 2 of the National Water Act 36 of 1998 provides for sustainable development in that "the purpose of this Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors (a) meeting the basic human needs of present and future generations; (d) promoting the efficient, sustainable and beneficial use of water in the public interest; (e) facilitating social and economic development."
[138] Act 28 of 2002.
[139] Section 1, Definitions.
[140] Glazewski (n 72 *supra*) 14 – 15.
[141] 2004 (5) SA 124 (W).
[142] Glazewski (n 72 *supra*) 15.
[143] *BP SA (Pty) Ltd v MEC, ACE and Land Affairs* 2004 (5) SA 124 at 125A.

provisions of section 24 of the Constitution. In essence this meant that environmental considerations that were often ignored in the past have now been given rightful prominence by their inclusion in the Constitution.[144] In this regard the Court referred to the judgment in *Director: Mineral Development, Gauteng Region, and Another v Save the Vaal Environment and Others*[145] where it was held that because environmental rights enjoyed the status of fundamental, justiciable human rights in the Constitution, it required by necessary implication that environmental considerations also be accorded the appropriate recognition and respect in all administrative processes. The Court thus concluded that the Department is at the centre of these 'administrative processes' as far as the promotion and protection of the constitutional right to the environment in Gauteng is concerned.[146] In practice the Department is thus required to carry out this duty by means of the implementation of adequate legislation and other programmes which would ensure rational consideration of environmental concerns.[147]

Judge Claassen held that he was in respectful agreement that the constitutional right to the environment is on par with the rights of freedom of trade, occupation, profession, and property entrenched in ss 22 to 25 of the Constitution.[148] He further held that this meant that environmental rights consideration should receive equal and unequivocal consideration when it comes to any dealings with property, land and freedom to trade.[149] He goes on to state that it will require a balancing of rights where competing interests and norms are concerned. This is in line with the injunction in s 24(b)(iii) that ecologically sustainable development and the use of natural resources are to be promoted jointly with justifiable social and economic development. The balancing of environmental interests with other interests needs to be done by conceptually taking into consideration those needs of future generations as well. This sentiment must be found to be correct since s 24(b) requires the environment to be protected for the benefit of present and future generations. Judge Claassen restates that the above principles of intergenerational equity which qualifies the rights to ownership of land, have been recognised as far back as 1971. He, in that regard, then further refers to Sands Principles of International Environmental Law 1995 which describes the recurring legal elements of ecological sustainable development as follows: i) the need to preserve natural systems for the benefit of future generations; ii) the aim of exploiting natural resources in a manner which is

[144] *Idem,* at 142C.
[145] 1999 (2) SA 709 (SCA) at 719C – D.
[146] *BP SA (Pty) Ltd v MEC, ACE and Land Affairs* (n 143 *supra*) 143E.
[147] *Idem,* at 142E – F.
[148] *Idem,* at 143B – C.
[149] *Idem,* at 143C.

sustainable or prudent or rational or wise or appropriate (the principle of sustainable use); iii) the equitable use of natural resources (the principle of equitable use); and iv) the need to ensure that environmental considerations are incorporated into economic and other development plans, programmes, and projects (the principle of integration).'[150]

Claassen J then refers to Justice Weeranmantry where he states that the concept of sustainable development is likely to play a major role in the resolution of environmental disputes.[151] He goes on to state that the concept of sustainable development is the fundamental building block around which environmental legal norms have been fashioned, both internationally and in South Africa, and is reflected in s 24(b)(ii) of the Constitution. Pure economic principles will no longer be the unbridled determining factor in considering whether development is acceptable is to proceed or not. Claassen J concludes to state that development, which may be regarded as economically and financially sound, will, in future, be balanced by its environmental impact. This balance will require coherent cognisance of the principle of intergenerational equity and sustainable use of resources to arrive at an integrated management of the environment. By elevating the environment to a fundamental justiciable human right, South Africa has irreversibly embarked on a road, which will lead to the goal of attaining a protected environment by an integrated approach, which takes into consideration, *inter alia*, socio-economic concerns and principles.

3.3. Sustainable development within the South African mining sector

One of the objectives of the MPRDA is to give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development.[152] In the case of *Fuel Retailers Association of Southern Africa*[153] the Constitutional Court laid a solid foundation for an integrated understanding of the right to development in an environment protected by section 24 of the Constitution. Ngcobo J, under the heading of 'sustainable development' states that:

> "*What is immediately apparent from s 24 is the explicit recognition of the obligation to promote justifiable 'economic and social development'. Economic and social development*

[150] *Idem,* 124 at 143D – 144A.
[151] *Idem* at 144A – B. See also *supra* at n.75.
[152] Section 2(h) of the MPRDA.
[153] *Fuel Retailers Association of Southern Africa v Director-General: Environmental Management, Department of Agriculture, Conservation and Environment, Mpumalanga Province and Others* 2007 (6) SA 4 (CC).

is essential to the well-being of human beings. This Court has recognised that socio-economic rights that are set out in the Constitution are indeed vital to the enjoyment of other human rights guaranteed in the Constitution. But development cannot subsist upon a deteriorating environmental base. Unlimited development is detrimental to the environment and the destruction of the environment is detrimental to development. Promotion of development requires the protection of the environment. Yet the environment cannot be protected if development does not pay attention to the costs of environmental destruction. The environment and development are thus inexorably linked."[154]

The notion of sustainable development ties directly into the mining sector when cognisance is taken of sections 16(1) and 22(1) of the MPRDA which states that any person who wishes to apply to the Minister for a prospecting or mining right must simultaneously apply for an environmental authorisation.[155] This obligation, in conjunction with sections 17(1) and 23(1) of the MPRDA, states that a prospecting or mining right may only be granted if an environmental authorisation has been granted.[156] The legal implication is thus that an application for either a prospecting or a mining right is subject to the rigorous Environmental Impact Assessment Regulations, and thus subject to the notion of sustainable development. The aforementioned is evident from that fact that, in terms of Regulation 18 of the Environmental Impact Assessment Regulations, when the competent authority considers the application for an environmental authorisation, it must have regard to section 24O and 24(4) of NEMA.[157]

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[154] *Idem,* at par 44.

[155] Section 16(1) of the MPRDA states that "Any person who wishes to apply to the Minister for a prospecting right must simultaneously apply for an environmental authorization…". Section 22(1) of the MPRDA states that "Any person who wishes to apply to the Minister for a mining right must simultaneously apply for an environmental authorization…".

[156] Section 17(1)(c) of the MPRDA states that "The Minister must within 30 days of receipt of the application from the Regional Manager, grant a prospecting right if the prospecting will not result in unacceptable pollution, environmental degradation or damage to the environment and an environmental authorization is issued [emphasis added]." Section 23(1)(d) states that "Subject to subsection (4), the Minister must grant a mining right if the mining will not result in unacceptable pollution, environmental degradation or damage to the environment and an environmental authorization has been granted [emphasis added]."

[157] Section 24O(1)(b) of NEMA states that "if the Minister, the Minister responsible for mineral resources or an MEC considers an application for an environmental authorisation…it must take into account all relevant factors, which may include, any pollution, environmental impacts or environmental degradation likely to be caused if the application is approved or refused; and measures that may be taken to protect the environment from harm as a result of the activity which is the subject of the application; and to prevent, control, abate or mitigate any pollution, substantially detrimental environmental impacts or environmental degradation." Section 24(4)(a)(ii) of NEMA states that "procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment must ensure, with respect to every application for an environmental authorization that the findings and recommendations flowing from an investigation, the general objectives of integrated environmental management laid down in this Act and the principles of environmental management set

Following the World Summit on Sustainable Development in 2002, the Department of Mineral Resources instituted a broad program to develop a strategic framework for sustainable development in the minerals sector in South Africa. Since 2002, much consideration has been given to incorporating sustainable development perspectives into many aspects of policy, process and planning from a national level to an industry level.[158] Essentially, mine closure planning should: a) be conceived at the beginning of the life of mine, b) not lead to a culture of community dependency, c) involve partnerships between mining companies, trade unions, the government, and civil society.[159] Mine closure in areas of cumulative and integrated environmental impacts, without regional closure strategy planning, not only results in negative social and national economic impacts, but may also be severely detrimental to the immediate and surrounding physical environment. A shift in the legal requirements for mine closure was realized with the promulgation of the Minerals Act 50 of 1991. This act addressed the negative environmental consequences of mining and required environmental management through the introduction of stricter requirements and environmental principles for the mining industry.

For example, section 12 of the Minerals Act held that if a mining authorisation is cancelled, the person who was the holder of the authorisation remains liable to comply with the provisions of the Act until such time as the Director of Mineral Development provides the holder with a certificate that all the provisions have been complied with.[160] Before such a certificate is issued, the Director of Mineral Development was required to consult with the Chief Inspector of Mines to ensure compliance with the Mine Health and Safety Act 1996.[161] A further example of the shift towards stricter requirement *vís a vís* the environment is section 38 of the Minerals Act. This section required that the rehabilitation of the surface of land concerned in any mining activity shall be carried out by the holder of the authorisation and in compliance with the environmental management plan approved in terms of section 39. This provision was carried over to the MPRDA, before the amendment by Act 49 of 2008.[162] The

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out in section 2 are taken into account in any decision made by an organ of state in relation to any proposed policy, programme, process, plan or project."

[158] DM van Tonder, H Coetzee, S Esterhuyse, N Msezane, L Strachan, P Wade, T Mafanya, S Mudau 'South Africa's challenges pertaining to mine closure – The concept of Regional and Mining Closure Strategies' (2008) AB Fourie, M Tibbett, IM Weiersbye, PJ Dye (eds.) *Australian Centre for Geomechanics, The University of Western Australia* 87.

[159] *Idem*, at 88.

[160] Section 12(1) of the Minerals Act 50 of 1991.

[161] Section 12(2) of the Minerals Act 50 of 1991.

[162] Section 39(1) of the MPRDA, before the amendment by The Mineral and Petroleum Resources Development Amendment Act 49 of 2008 held that: "*Every person who has applied for a mining right in terms of section 22 must conduct an environmental impact assessment and submit an environmental management programme within 180 days of the date on which he or she is notified by the Regional Manager to do so."*

requirements for mine closure as set out in the MPRDA is discussed in Chapter 3,[163] however notwithstanding the aforementioned, as stated above, the MPRDA makes provision for regulations to be published regarding aspects of the Act, specifically closure, and places the legal obligation for mine closure on the holder of the mining or prospecting right. The 'closure' regulations in terms of the MPRDA promote a new thinking with the concept of a risk-based approach to mine closure, which is a legal requirement in terms of the MPRDA.

The need for Regional Closure Strategies

In a number of areas, notably the Witwatersrand Goldfields, interconnection of underground mine voids has led to the situation where the closure of one mine within a region can have a profound influence on the ability of other mines to close in a sustainable manner.[164] In some cases, the closure of one mine can directly precipitate the premature closure of other mines. These mines have become dependent on the infrastructure of other mines to continue to operate their underground workings, such as the Stilfontein Mine.[165]

Over and above these inter-mine impacts, large complexes of mines within a single catchment area may have a cumulative impact on their shared environment. This could result in difficulty to apportion liability to a particular mine after years of operations and the resultant downstream environmental degradation.[166] In such cases it has been proposed that closure regions be promulgated and that the mines operating within these closure regions need to amend their individual closure plans to comply with the regional closure strategy of that particular area, which is based on consensus among all interested and affected parties.[167]

Regional closure strategies are not intended to replace individual mine closure plans, but rather to provide a high-level framework to which the individual mine closure plans need to conform, with the aim of addressing regional environmental issues in a strategic manner. It was therefore recommended that the framework be limited to aspects of closure related to inter-mine impact and cumulative environmental impact and that the site-specific aspects of mine closure, which have no direct bearing on these regional impacts, be dealt with in individual mine closure plans. The aim of regional mine closure is to prevent or minimize adverse long-

[163] *Infra* pp 55 – 59.
[164] Van Tonder, Coetzee, Esterhuyse, Msezane, Strachan, Wade, Mafanya, Mudau (n 157 *supra*) 89.
[165] *Idem*, at 88 & 90.
[166] *Idem*, at 90.
[167] *Ibid*.

term environmental impacts, and to create a self-sustaining natural ecosystem or ultimate land use.[168]

Some of the key issues identified in the compilation of Regional Closure Strategies with regard to water management are the management of impacts related to inter-connected underground mine voids, groundwater and surface water management and water quality management.[169]

The need for the development of Regional Closure Strategies is echoed in the problem statement in this research. The need for sustainable and systematic closure of inter-connected mines, especially with regard to ingress water and the continued need for pumping of extraneous water. Despite the recognized need, there have been no final Regional Closure Strategies promulgated and/or published. On 21 May 2021, the Minister for Mineral Resources and Energy published a draft Mine Closure Strategy[170] in terms of the MPRDA. According to the executive summary, mining can have profound adverse impact on the biophysical and socio-economic environments. The closure of mines typically results in irreversible environmental degradation and economic hardship in the mining-dependent communities, most visibly in the areas local to the mining activity. The closure of mines further results in the externalization of environmental degradation to the social and economic detriment of those communities local to the mining site.

To mitigate these impacts, South African mining legislation requires of mining companies to submit Environmental Management Plans to define their responsibility to manage impacts during the process of mining.[171] Further according to the executive summary, the key problem area is where mines are interconnected, all their safety, health, social or environmental impacts are integrated which results in cumulative impact and the socio-economic impact post mine closure. The closure of any mine has an impact on the remaining mines in that region i.e., environmentally, economically, and socially. Because different mines in a specific area will cease their operations are different times, and overarching integrated framework needs to be developed for each mining region/cluster within which individual mines will be able to plan for mine closure. This has led the Department to take a proactive approach to the sustainable closure of mines.[172]

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[168] *Ibid*.
[169] *Idem*, at 92–93.
[170] Published in GG No. 44607, Vol. 671 dated 21 May 2021.
[171] *Idem*, at 5.
[172] *Ibid*.

The draft Mine Closure Strategy further takes note that mine closure is redefined in the current global mining industry to embrace the concept of handing over predetermined and post mining land use with concurrent economic diversification rather than just closure when the operational stage of a mine ceases and decommissioning is complete.[173] It further states that the concurrent economic diversification on the scale of a mine site or mining cluster can utilize the relative prosperity generated by mining to create sustainable environments and economies, which will endure beyond the life of mining projects. The concept of concurrent economic diversification embraces the principle that every mine has the potential for some form of economic diversification during the currency of mining operations as well as beyond the closure of the mines.[174] The executive summary concludes that while the exploitation of non-renewable resources is in itself not sustainable, the vertical and lateral economies that are catalyzed can be.

According to the draft document, the objectives of the mine closure strategy are to manage the closure of mines in a demarcated area in an integrated and sustainable manner. This will ensure that these mines work together to achieve self-sustaining ecosystem after closure and also ensure that mines do not impact negatively on the livelihood of adjacent and/or interconnected mines in a demarcated area. The mine closure strategy also aims to promote a strategic approach to managing water at mining and mineral processing sites so that water is more efficiently managed and valued and to develop a post-closure mine water strategy for an area, which in turn will expectantly drastically decrease the problem related to extraneous water issues post-closure.[175]

4. The lens of sustainable development

In light of the above discussion, sustainable development can be considered the balancing of economic, social and environmental issues to achieve intra- and intergenerational equity. Sustainability, therefore, clothes itself in a systems analysis approach that considers how processes are redesigned and managed, with the hope of yielding better long-term outcomes.[176]

With specific reference to the three-legged seat example used in the introduction of this Chapter, Dawe and Ryan[177] criticize this model on the basis that humanity is, once again, placed

[173] *Ibid.*
[174] *Ibid*.
[175] *Idem*, at 14.
[176] Roosa (n 2 *supra*) 3.
[177] Dawe & Ryan (n 5 *supra*) 145.

outside the environment. Dawe and Ryan state that this model fails to encourage people to recognize their place within the biosphere. Worse, this model suggests that if people can only find an equal balance between our economic needs, our social well-being, and the environment, people can simply continue to walk their current path merely maintaining the status quo. Dawe and Ryan further state that the environment can never be considered as 'one leg of the stool'; rather it is the ground upon which the stool stands.[178] It is the foundation of any economy and social well-being that humanity is fortunate enough to achieve. Therefore, it follows that the environment must be considered at a different, more significant level than either the economy or humanity's social well-being because it is the source of both these necessities.

When the ideal behind sustainable development is considered, i.e. to achieve a balance to obtain inter-generational equity, Dawe and Ryan's view is supported to the extent that reaching a purported balance does not equate to the liberty to continue as one pleases. Further to the aforementioned, that suggests that the three-legged seat module requires re-evaluation as in itself it is too stoic and unyielding. If one considers balance scales, the balance achieved depends solely on what is placed on the scales; balance, therefore, depends on the circumstances. Similarly, balance in sustainable development can only be determined on a case-to-case basis. The three-legged seat is therefore not a suitable model, because it cannot change. That, together with the fact that as Dawe and Ryan suggest the environment should receive greater attention, a new model and/or lens is required.

As an alternative to the 'three-legged chair model', the following model could be considered to determine a practical lens of sustainable development: Three legs are the minimum that you need for stability,[179] and it is inherently best for stability on uneven surfaces; think of a photographer's tripod. Although, in politics, the tripod is the most unstable of structures, especially if the politics are rooted in a capitalism economy.[180] This proposition was already recognised in the Brundtland Report where it was reiterated that the implementation of

[178] *Ibid*.
[179] This is because three noncollinear points determine a plane (a plane is an infinitely thin flat surface that goes on forever in all directions). This statement means that if you have three points not on one line, then only one specific plane can go through those points. The plane is determined by the three points because the points show you exactly where the plane is. To see how this works, hold your thumb, forefinger, and middle finger so that your three fingertips make a triangle. Then take something flat like a hardcover book and place it so that it touches your three fingertips. There is only one way that you can tilt the book so that it touches all three fingers. Your three noncollinear fingertips determine the plane of the book. Ryan M *Geometry for dummies, 2nd Ed* (Wiley Publishing Inc, 2007), at p 269.
[180] F Herbert *Dune* (1965) at 25. See also BE Allatt 'Lies and individuation: External and internal authority in the politics and anima of Dune' unpublished thesis Texas State University (2015) 18.

sustainable development must rest on political will.[181] One must accept that each circumstance which calls for the implementation of sustainable development is going to be different, i.e. that is the surface where the tripod must stand. One further accepts that intergenerational equity is a separate and loose disc that must rest evenly and level on three legs, the legs of the tripod will have to adapt to the surface. In order to accommodate Dawe and Ryan's sentiment that the environment should be considered more significant, the 'environmental leg' should be fixed. There is no reason why the environment should adapt to the circumstances; it receives top priority. Therefore, the other two legs of the tripod, i.e. the economy and the society should adapt to the surface in order to hold the 'intergenerational equity disc' level and thereby achieving, as a whole, sustainable development.

5. Chapter conclusion

The analysis in this Chapter was primarily focused in investigating the concept of sustainable development; how it developed, how it is codified and how it is applied in the South African environmental law context. The aforementioned analysis was drawn together in order to conceptualize a lens through which the following Chapter dealing with perpetual liability, would be analyzed.

The findings in this Chapter thus found that firstly, the concept of sustainable development enjoys 'supreme law' status, as it is entrenched in section 24 of the Constitution. The various examples of the subsequent codification of sustainable development shows that it is a founding principle in any decision-making process which deals with the environment or the impacts thereon. It is evident through the findings in this Chapter that the concept of sustainable development has a complex and intertwined history, and that the true meaning of the concept swings as a pendulum, depending on which moment in history is the selected, or from which nation the point of view is taken. But what has remained a founding principle of the concept of sustainable development is that it is there to protect resources for present and future generations. This ideal has osmosed successfully into the South African interpretation and application of sustainable development. This Chapter concludes with defining the lens of sustainable development as a three-legged tripod, where the leg representing the environment is so to say fixed, and that the other two legs, being that of society and the economy, would be the two legs that have to adjust to the specific circumstance, in order to ensure that the tripod remains level.

[181] n 57 *supra*.

The codification of sustainable development resulted in various obligations and requirements for the mining sector, as is evident after the amendment of the MPRDA by the Mineral and Petroleum Resources Development Amendment Act 49 of 2008. Firstly, one of the objectives of the MPRDA is to give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an ecologically sustainable manner. The amendment also meant that most of the environmental issues relating to mining were repealed and replaced with provisions in NEMA. For the mining sector, this meant that all mining-related and incidental activities were so to speak married to the provisions of NEMA. An unequivocal example of this marriage are the sections dealing with applications for prospecting or mining right in the MPRDA specifically state that any applicant for a mining right must simultaneously make an application for an environmental authorisation. The sections dealing with the granting of prospecting or mining rights then go further to state that such a right may only be granted if there is an approved environmental authorisation. Therefore, a mining right cannot be given any effect without an approved environmental authorisation.

The next Chapter will deal with the notion of perpetual liability. Now that the lens of sustainable development within the South African context has been established, the next step is to analyse and define the notion of perpetual liability. Once that has been done, the two concepts will be analysed against one another. The next Chapter will then consider the different aspects of perpetual liability within the context of legislation, statutory duties and the perpetual nature of acid mine drainage itself.

CHAPTER 3: THE CONCEPT OF PERPETUAL LIABILITY

Perpetual: That serves or remains applicable, valid, or in force for ever, or for an indefinite or unlimited period; given or paid in perpetuity; irrevocable.

A1616 W. Shakespeare All's Well that ends Well (1623) IV. Iii 283 Sir, for a Cardecue he will sell the fee-simple of his saluation, the inheritance of it, and cut th'intaile from all remainders, and a perpetuall succession for it perpetually.[1]

1. Introduction

According to the Merriam-Webster dictionary[2], the meaning of perpetual is 'continuing forever' or 'everlasting'. In terms of a right or an obligation, it is thus valid for all time or for an indefinite period if it is said to be perpetual.[3]

This Chapter will deal with the concept of perpetuity firstly how it occurs within the law, specifically the South African law. Secondly it will deal with the notion of perpetuity of statutes in South African law. The potential perpetuity of statutes therefore lies in the fact that a formal amendment or repeal procedure is required to abrogate its effect. Thirdly, the Chapter will analyse the perpetual nature of obligations imposed by South African law. This second part ties in closely with the third section of the Chapter which deals with the perpetual nature of Acid Mine Drainage. This part of the Chapter is of technical and scientific nature, but is necessary in order to properly analyse the notion of perpetual liability. As Hahlo and Kahn describes that laws in the broadest connotation fall within two groups: scientific laws and practical laws.[4] Examples of scientific laws are, for instance, the laws of physics and economic laws and the laws of psychology. Whereas practical laws prescribe a course of action for rational human beings.[5] This group of laws includes the laws of the lawyer, of ethics, of honour etiquette, of bridge and football. The distinction between these two groups of laws lies in the fact that the principle of order and regularity which scientific laws describe, exist independent of human wishes. Meaning that humans can make use of scientific laws, but cannot break them. On the other hand, practical laws do not state 'what is', but what we ought or ought not do i.e.

[1] Oxford English Dictionary 3rd Ed 2005, Oxford University Press.
[2] Accessed at https://www.merriam-webster.com/dictoinary/perpetual. Accessed on 8 February 2022.
[3] Accessed at https://www.merriam-webster.com/dictoinary/perpetual. Accessed on 8 February 2022.
[4] HR Hahlo & E Kahn *The South African legal system and its background* (1968) 3.
[5] *Ibid*.

norms (from the Latin '*norma*', meaning yardstick or rule). Therefore, the scientific laws i.e. the chemistry behind acid mine drainage is important because it is what it is, in that it cannot be broken or changed. In understanding the scientific laws, practical laws can be implemented to address the issue of acid mine drainage. This has been done in the South African environmental law matrix, and will be discussed in this Chapter. An example of the interplay of science and the law is illustrated in the appeal case of *Trojan Exploration Co (Pty) Ltd.*[6] In this case the problem arose out of the existence of a bounteous mixture of minerals, both precious and non-precious, in two associated reefs. The rights to the precious metals vested in one party and the right to the base metals and minerals in another party.[7] The reefs where these parties held respective rights, contained a mixture of precious metals and base metals and minerals. It was impossible to remove the one group without the other.[8] The Appellate Judges in that matter was taken through the entire chemical process of how these precious and base metals can be separated.[9] This was necessary in order for the Judges to firstly understand the problem, and secondly to address the legal issues in dispute.

The three sections of this Chapter, i.e. the perpetual nature of statutes, the perpetual nature of certain statutory obligations and the perpetual nature of acid mine drainage ("AMD"), will together will explore and analyse the perpetual nature of the problem of flooding of non-operative gold mines in that the current legislative framework dealing with the pumping of extraneous water and the nature of the AMD, combined, contribute to the problem of perpetual liability. This Chapter will deal with perpetuity in three different spheres, which in combination, define the problem of perpetual liability which will be analysed through the lens of sustainable development, which was defined in the previous Chapter.

2. The concept of perpetuity in law

The concept of perpetuity in South African law dates as far back as 1897 when in the case of *Corporation of Durban v The Trustees of the Mahomedan Mosque and Madressa*[10] the Durban Corporation brought an application to restrain certain persons from using land as a market for the sale of vegetables and other articles. Finnemore J, one of three Judges hearing the matter, held that the Corporation made out a *prima facie* case for an interdict, but that it should not be

[6] *Trojan Exploration Co (Pty) Ltd and Another v Rustenburg Platinum Mines Ltd and Others* 1996 (4) SA 499 (A).
[7] *Idem,* at 508E.
[8] *Idem,* at 512A – B.
[9] *Idem,* at 512C – F.
[10] (1897) 18 NLR 83.

a perpetual one, so the Corporation was ordered to bring its action within two months.[11] The issue of a perpetual interdict was again considered in the appeal of *Union Government (Minister of Railways and Harbours) v Rumsey's Executors*[12] where the court *a quo* granted a perpetual interdict against the Government restraining it from trespassing on the Plaintiff's property. The nature of the obligations created by the contract between the parties in that case, and whether such obligations were perpetual in nature, were also considered by the Appellate Court. The appeal in this matter was upheld, but more relevant in respect of perpetuity is that in this case, Innes J held that perpetual *rights* are recognised in the South African Law in the case of *fidei commissa*, leases and emphyteusis.[13]

However, the nature of an interdict is not that of a right, but of an obligation, being either mandatory or prohibitory.[14] Prest believes that the beginnings of interdict proceedings in Roman Law date as far back as the *legis actiones*.[15] In its developed form, the interdict was a prohibition (*interdictum*) or command (*decretum*) issued by the magistrate upon the application of a person who considered himself aggrieved.[16] Within the context of perpetuity, a perpetual interdict would create a perpetual obligation for the party against whom the interdict was granted. The requirements to obtain a perpetual interdict was considered in the case of *Crossfield & Son, Ltd v Crystallizers, Ltd*[17] where the court held that where a *prima facie* case is made, but it is open to some doubt, a perpetual interdict will not be granted. The requirement therefore would be that of a clear right. A clear right is one of the requirements for a final interdict, which follows logically as a perpetual interim interdict would be nonsensical.

Another example of a perpetual obligation is that found in one of the peculiar consequences to *mora debitoris*, namely *mora perpetuat obligationem*. This means that the status of *mora,* perpetuates the obligation.[18] This principle is applicable in the case of supervening impossibility, in that a debtor who is in *mora* bears the risk of supervening impossibility. Practically speaking, this means that is that the debtor remains liable to perform despite supervening impossibility, as opposed to the ordinary effect of supervening impossibility which is that the obligations of both parties are extinguished. Therefore, where a

[11] (1897) 18 NLR 83 at 85.
[12] 1913 AD 192.
[13] 1913 AD 192 at 196.
[14] Herbstein and Van Winsen *Civil Practice of the High Court and the Supreme Court of Appeal of South Africa 5th Ed* (2009) 1454.
[15] CB Prest *Interlocutory interdicts* (1993) 10.
[16] *Ibid*.
[17] 1925 WLD 216.
[18] Joubert *The Law of South Africa 3rd Ed* Volume 9 395.

debtor is liable to deliver a thing, the effect of *mora* is that the risk of accidental destruction of the thing falls on the debtor. The only exception to this rule is if the debtor can unequivocally prove that the thing would inevitably have been destroyed even if the debtor delivered the thing on time.[19]

The aforementioned are a few practical examples of how the concept of perpetuity is found in South African law. Whether the perpetuity attaches to a right or an obligation, the point of departure when one considers the concept of perpetuity is that it is not limited to a specific time; it is indefinite and ever-lasting.

3. The perpetual nature of statutes

There is an assumption that South African statutes are of potentially perpetual existence.[20] This assumption is illustrated by saving provisions in five consecutive South African Constitutions since 1910, which all provide for the survival of all legislation in force at the time of commencement of each of these Constitutions. For example, Section 87 of the 1983 Constitution Act provided that all statute law in force immediately prior to the Act "*shall continue in force until repealed or amended by the competent authority*".[21] Similarly, the present Constitution provides that "*All law that was in force when the new Constitution took effect, continues in force, subject to any amendment or repeal, and consistency with the new Constitution*".[22] The practice of parliamentary sovereignty prior to 1994 assisted to keep the potential perpetuity of national legislation intact. Post-1994, legislation, in general, was open to a new Constitutional challenge, but even these challenges would not come to threaten the potential perpetuity of statutes. Statutory laws have, for instance, remained immune to abrogation by disuse.

With respect to the aforementioned, it is important to look at and consider the history of legislation and its development in South Africa.[23]

3.1. The history of the development of legislation in South Africa

According to Du Plessis,[24] South African statute law can be classified according to the following criteria: history, level of government, and hierarchy and status. For purposes of this

[19] *Ibid*.
[20] Hahlo & Kahn (n 4 *supra*) 172.
[21] Section 87 of the Constitution, 1983.
[22] Item 2(1) of Schedule 6 of the Constitution, 1996.
[23] L du Plessis *Re-Interpretation of Statutes* (2002) 70 – 71.
[24] *Idem*, at 23.

study, and with specific regard to the concept of perpetuity, only the first criterion is relevant due to the peculiar historical circumstances underlying legislative development in South Africa. More particularly, how the historical development of South African legislation shaped the present-day principle that statutes are perpetual unless formally amended or repealed.[25] Du Plessis further argues that South African statute law can be divided into four historical categories. [26] The first is pre-1806 legislation of which a few statutes of the Staten-Generaal of the Netherlands and certain *placaaten* of the state of Holland, received at the Cape, are still in force.[27] These enactments are to be found in the *Groot Placcaet-boeck*.[28] However, the placaaten still in force are not 'statute law'. They have been received as common law susceptible to abrogation by disuse, which means that no formal procedures are required for their abolition.[29] The second category is pre-Union legislation (1806 – 1910) of two colonies, the Cape and Natal and two republics, Transvaal and the Orange Free State, which together constitute statute law.[30] In principle statutes in this category cannot be abrogated by disuse, and, therefore, a formal legislative process is required for their express or implied amendment or revocation.[31] Up to 1 June 1979 parliament enacted several statutes expressly repealing certain specified pre-Union statutes. [32] However, the Pre-Union Statute Laws Revisions Act 24 of 1979 adopted a different procedure in that is stated that all laws enacted prior to 31 May 1910 was repealed, save for those statutes specified in the Schedule published together with that Act.[33] The third category is legislation enacted between Union 1910 and 27 April 1994. This category still constitutes the bulk of present-day statute law.[34] The fourth category constitutes legislation enacted on 27 April 1994 under the supremacy of the Constitution (whether it be the interim or final Constitution).[35]

As illustrated above, some pre-1806 legislation had become part of the common law and thereby subject to abrogation by disuse. With respect to pre-Union legislation, there are two possibilities. First, in accordance with Roman-Dutch law, statute law can be abrogated by

[25] *Idem*, at 70.
[26] *Idem*, at 23.
[27] *Ibid*.
[28] *Ibid*.
[29] *Ibid*. at 23. See also *R v Detody* 1926 AD 198 & *Muller v Grobbelaar* 1946 OPD 272 276.
[30] Du Plessis (n 23 *supra*) 23.
[31] *Ibid*.
[32] See Cape Statute Law Revision Act 25 of 1934; Orange Free State Law Revision Act 33 of 1936; Cape Statute Law Revision Amendment Act 32 of 1939, Pre-Union Statute Law Revision Acts 78 of 1967, 44 of 1968, 42 of 1970, 36 of 1976, 43 of 1977.
[33] Pre-Union Statue Laws Revisions Act 24 of 1979.
[34] Du Plessis (n 23 *supra*) 24.
[35] *Idem*, at 70 – 71.

disuse. The reasoning behind this is because as Du Plessis believes, in the final analysis, the authority to legislate derives from the people and not, as in English Law, from a sovereign legislature.[36] When the people, therefore, adopt an abrogative attitude towards a statute, this 'change of mind' eventually causes that statute to fall into disuse and to lose its binding force.[37] Roman-Dutch law held sway in the Transvaal and the Orange Free State prior to British annexation in 1900.[38] All pre-1900 Transvaal and Orange Free State statutes that had been abrogated by disuse when the South Africa Act, specifically s 135 of that act, commenced on May 1910 are, therefore of no force and effect.[39] Second, statutes enacted in the Cape and Natal between 1806 and 1910 (as well as in the Transvaal and Orange Free State under British authority between 1900 and 1910) are subject to the rule of English Law that precludes abrogation by disuse. Under English law, the will of the people cannot trump the will of the supreme legislature. Transvaal and the Orange Free State statutes enacted before 1900, therefore, constitute the only category of post-1806 legislation susceptible to abrogation by disuse. In principle, all legislation in force on 31 May 1910 (including non-abrogated pre-1900 Transvaal and Orange Free State statutes) was kept alive by the previously mentioned saving provisions in five consecutive Constitutions.[40]

3.2. Conclusion on the perpetual nature of statutes

The potential perpetuity of statutes, therefore, lies in the fact that a formal amendment or repeal procedure is required to abrogate its effect. The effect hereof is then that when a statute imposes an obligation on a party for an indefinite period, that obligation will remain effective until such time as the statute is formally amended or repealed. The following section will consider some of these types of specific statutory obligations which have been entrenched in South African environmental laws. As set out in the introduction to this Chapter, perpetuity will be considered in three different spheres. The first has now been established in that a statute in South Africa will remain effective in perpetuity until it has been amended or repealed. The first sphere of the perpetuity analysis has therefore been established. The following section will deal with the following specific obligations codified in South African environmental laws, bearing in mind that these obligations will remain in effect until such time as a formal amendment or repeal

[36] *Idem*, at 70.
[37] *Idem*, at 71.
[38] *Ibid*.
[39] *Ibid*.
[40] *Ibid*.

procedure has been followed: environmental authorisations,[41] financial rehabilitation obligations,[42] closure certificates[43] and the general duty of care.[44]

4. The perpetual nature of the rehabilitation requirements concerning polluted and/or extraneous water in NEMA and the MPRDA

There has never been one all-embracing environmental statute in South Africa. From the various environmental management provisions contained in a wide variety of national and provincial acts, old-order provincial legislation, local by-laws and ministerial regulations, the most important of these, from the perspective of environmental conservation and management in general, is NEMA.[45] The purpose of the NEMA is to provide for cooperative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state.[46] NEMA, as the long title suggests, is primarily concerned with regulating the way that organs of state interact regarding the management of the environment, but several provisions regulate private citizens directly. The most important provisions concerning day-to-day environmental management are those that relate to environmental authorisations and environmental assessment.[47] In pursuance of the so-called "One Environmental System", most, but importantly not all, of the provisions dealing with the environmental impact and management of mining, and related operations have been taken out of the MPRDA and migrated to NEMA.[48] In this regard, the most prominent deletion from the MPRDA was section 39, as it read prior to the amendment by Act 49 of 2008, which states that every person who applied for a mining right must conduct an environmental impact assessment and submit an environmental management plan.[49] This has been replaced by the provisions of section 24F of NEMA, read with sections 23 of the MPRDA, which will be dealt with in more detail below. These provisions now entail that the applicant for a mining right must simultaneously apply a mining right and an application for an environmental

[41] Section 24 of the National Environmental Management Act (NEMA) 107 of 1998.
[42] Section 24P of NEMA.
[43] Section 43 of the Mineral and Petroleum Resources Development Act (MPRDA) 28 of 2008.
[44] Section 28 of NEMA.
[45] Joubert (n 18 *supra*) Vol 17 259.
[46] NEMA long title.
[47] Joubert (n 18 *supra*) Vol 17 259.
[48] *Idem*, at 258 – 259.
[49] Section 39 of the MPRDA prelex prior to the amendment by the Mineral and Petroleum Resources Development Amendment Act 49 of 2008.

authorisation. During the reign of the MPRDA before the amendment, an approved environmental management plan was considered an approved environmental authorisation.[50]

For purposes of this discussion, the statutory obligations are dealt with thematically in order of appearance in NEMA and the MPRDA where after it will deal with the general duty of care as contained in NEMA. The statutory obligations include an authorisation to commence with certain activities known to have an impact on the environment and the obligation to provide sufficient financial security for the rehabilitation of those impacts. It also includes an obligation to obtain a closure certificate in terms of the MPRDA. The last obligation dealt with is the general duty of care as set out in NEMA which requires every person to take all necessary steps to prevent pollution and environmental degradation.

4.1. Environmental authorisations

Firstly, in terms of section 24F of NEMA, no person may commence with an activity specified in the Listing Notices unless the competent authority, or the Minister responsible for mineral resources has issued an environmental authorisation.[51] The activities relating to prospecting and mining permits are covered in Listing Notice 1.[52] The activities related to and/or incidental mining is covered in Listing Notice 2.[53] Should a person thus wish to commence with any mining, or activity incidental or related thereto, that person would require an environmental authorisation.[54]

Once an environmental authorisation has been obtained, there are the obligations of the holder of an environmental authorisation in terms of section 24N(7). This section states that

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[50] Section 12(4) of the National Environmental Management Amendment Act 62 of 2008 states that "an environmental management plan or programme approved in terms of the Mineral and Petroleum Resources Development Act 2002 immediately before the date on which this Act came into operation must be regarded as having been approved in terms of the principal Act as amended by the Act." However the corresponding provision in the MPRDA is missing in that section 38B never came into operation. However, with reference to the case of *Global Environmental Trust and Others v Tendele Coal Mining (Pty) Ltd & Others* [2009] 1 All SA 176 KZP, the provisions of section 12(4) of the National Environmental Management Amendment Act 62 of 2008 stands.

[51] Section 24F of NEMA. See also section 24(2)(a) and (b) which states that the Minister responsible for the environment may identify certain activities which may not commence without an environmental authorization. These activities are contained in the Listing Notices which are published in terms of the Environmental Impact Regulations GN R982 in GG 38282 of 4 December 2014, as amended.

[52] Activity 20 and 21, Listing Notice 1, GN R983 in GG 38282 of 4 December 2014, as amended.

[53] Activity 17, Listing Notice 2, GN R984 in GG 38282 of 4 December 2014, as amended.

[54] Activity 17 state that any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act 28 of 2002 including – "associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource; or the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this notice applies."

the holder must at all times give effect to the general objectives of integrated environmental management laid down in section 23 of NEMA.[55] The general objective of section 23 of NEMA is to provide a person with the necessary tools to facilitate integrated environmental management. The first 'tool' provided in section 23 of NEMA is that the principles set out in section 2 of NEMA, which includes the notion of sustainable development, must be integrated into all decisions made which may affect the environment.[56] The aforementioned thus underpins the ideal that the notion of sustainable development is the backdrop against which all decisions with regard to the environment must be made. Section 24N(7) further requires the consideration, investigation, assessment and communication of the impact of mining activities on the environment.[57] This encourages continuous accountability and prevents a situation where once the activities are authorised the impacts on the environment are ignored. This is especially important when one considers that a mining right may be granted for 30 years.[58] The holder of an environmental authorisation must also manage all environmental impacts per his or her approved environmental management programme.[59] This obligation once again reaffirms continuous accountability as the environmental management plan is approved by the Department of Environmental Affairs. The holder of an environmental authorisation must, as far as possible, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development. [60] Once again, the notion of sustainable development is intertwined with the obligations of the particular environmental authorisation. The requirement that sustainable development must be considered at the outset when the decisions which may impact the environment are made, and that it must be considered once the activities have ceased co-insides with the principles laid out by Berke in that plans must continuously strive to attain sustainability.[61] Lastly, section 24N(7) of NEMA states that the holder of an environmental authorisation is responsible for any environmental damage, pollution, pumping and treatment of polluted or extraneous water or ecological degradation as a result of his or her operations to which such right, permit or environmental authorisation relates.[62]

[55] Section 24N(7)(a) of NEMA.
[56] Section 23(2)(a) of NEMA. See also section 2(3) and (4) of NEMA.
[57] Section 24N(7)(b) of NEMA.
[58] Section 23(6) of the MPRDA.
[59] Section 24N(7)(c) of NEMA.
[60] Section 24N(7)(e) of NEMA.
[61] PR Berke & M Manta-Conroy 'Are we planning for sustainable development? An evaluation of thirty comprehensive plans' (2017) 66(1) *Journal of the American Planning Association* 23.
[62] Section 24N(7)(f) of NEMA.

4.2. Financial provisioning for rehabilitation

Secondly, there is the obligation to provide financial provision to cover any rehabilitation as provided for in section 24P of NEMA. An applicant for an environmental authorisation relating to either prospecting, exploration, mining or production must, before the minister responsible for mineral resources issues the environmental authorisation, comply with the prescribed financial provision for rehabilitation, closure and ongoing post decommissioning management of the negative environmental impacts.[63] If any holder[64] or any holder of an old order right fails to rehabilitate or to manage any impact on the environment, the minister responsible for mineral resources must use all or part of the financial provision to rehabilitate or to manage the environmental impact in question.[65] Every holder must annually assess his or her environmental liability in the prescribed manner and must increase his or her financial provision to the satisfaction of the minister responsible for mineral resources and submit an audit report to the minister responsible for mineral resources on the adequacy of the financial provision.[66] If the minister responsible for mineral resources is not satisfied with the assessment and financial provision, the minister responsible for mineral resources may appoint an independent assessor to conduct the assessment and determine the financial provision.[67] The requirement to retain the financial provision remains in force notwithstanding the issuing of the closure certificate by the minister responsible for mineral resources in terms of the MPRDA. This is because the minister responsible for mineral resources may retain such portion of the financial provision as may be required to rehabilitate the closed mining or prospecting operation in respect of any latent, residual or any other environmental impacts, including the pumping of polluted or extraneous water, for a prescribed period.[68]

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[63] Section 24P(1) of NEMA. The Minister, or an MEC in concurrence with the Minister, may in writing make section 24P(1) – (6) with the changes required by the context applicable to any other application in terms of the Act.

[64] *Holder* has the meaning assigned to it in terms of the Mineral and Petroleum Resources Development Act 28 of 2002 in section 1. "In relation to a prospective right, mining right, mining permit, retention permit, exploration right, production right, reconnaissance permit or technical co-operation permit, it means the person to whom such right or permit has been granted or such person's successor in title." *Holder of an old order right* has the meaning assigned to *holder* in the MPRDA Sch II Item 1: "Holder in relation to an old order right, means the person to whom such right was or is deemed to have been granted or by whom it is held or is deemed to be held, or such person's successor in title before the MPRDA came into effect."

[65] Section 24P(2) of NEMA.

[66] Section 24P(3) of NEMA.

[67] Section 24P(4)(a) at any cost in respect of such assessment must be borne by the holder in question, see section 24P(4)(b) of NEMA.

[68] Section 24P(5) of NEMA.

It is worth mentioning at this point that the National Environmental Management Amendment Act 2 of 2022 was assented to on 24 June 2022, although its date of commencement is yet to be proclaimed.[69] According to this act, NEMA stands to be amended by the insertion of section 24PA which will cater for the financial provisioning for mining. The proposed amendment of section 24PA includes in subsection 3 thereof that, the financial provisioning provided in respect of latent environmental impacts, including the pumping and treatment of extraneous and polluted water must be transferred to the minister of mineral resources upon the issuing of a closure certificate.[70]

4.3. Closure certificates

Thirdly, there is the continuing liability post the issuing of a closure certificate, as provided for in section 24R of NEMA. Every holder, holder of an old order right and owner of works, remains responsible for any environmental liability, pollution or ecological degradation even after a closure certificate has been issued. A holder furthermore also remains responsible for the pumping and treatment of polluted or extraneous water and the management and sustainable closure thereof notwithstanding the issue of the closure certificate.[71] This is in essence the foundation of the notion of perpetual liability. When the minister responsible for mineral resources issues a closure certificate, the minister must return such portion of the financial provision contemplated in section 24P as the minister may deem appropriate to the holder concerned but may retain a portion of such financial provision for any latent, residual or any other environmental impact. These impacts include the pumping of polluted extraneous water, for a prescribed period after issuing a closure certificate.[72] Every holder, holder of an old order right or owner of works must plan, manage and implement such procedures and requirements in respect of the closure of the mine as may be prescribed.[73] The minister may identify areas where mines are interconnected and are integrated to such an extent that the interconnection results in a cumulative impact. The minister may then publish strategies to facilitate mine closure where mines are interconnected, have an integrated impact or pose a cumulative impact.[74] The obligations as set out in section 24R of NEMA should be read together with the general obligation as set out in section 24(N)(7)(f) of NEMA which states that the holder and

[69] GG No 46602, Vol 684, 24 June 2022.
[70] NEMA Amendment Act 2 of 2022, section 24PA(3).
[71] Section 24R(1) of NEMA.
[72] Section 24R(2) of NEMA.
[73] Section 24R(3) of NEMA.
[74] Section 24R(5) of NEMA.

any person with an environmental authorisation is responsible for any environmental damage to, pollution, pumping and treatment of polluted or extraneous water or ecological degradation as a result of his or her operations to which such right, permit or environmental authorisation relates.[75]

Similarly, to section 24PA, section 24R also stands to be amended by the National Environmental Management Amendment Act 2 of 2022 to not only cater for a holder, but also then specifically cater for the 'holder of an environmental authorisation for a mining activity'.

The MPRDA was enacted to provide for equitable access to and sustainable development of the mineral and petroleum resources in South Africa.[76] To achieve this, the old order of mineral rights, prospecting rights and mining rights being held and transferred to holders in a private capacity was changed to a new regulatory framework in which all rights to minerals and petroleum are granted by the state to applicants upon meeting the objectives and requirements of the Act.[77] The flagstone case dealing with this aspect is *Agri SA v Minister for Minerals and Energy* where the issue was whether the MPRDA expropriated a company's coal rights when it came into force.[78] The facts were that Sebenza (Pty) Ltd. acquired coal rights in 2001 which in 2004 became 'unused old order rights' when the MPRDA came into effect.[79] Sebenza, and later Agri SA claimed that there had been expropriation and the North Gauteng High Court (as it then was) agreed, however, the finding was overturned by the Supreme Court of Appeal.[80] On appeal the Constitutional Court it was held that before the commencement of the MPRDA a holder of mineral rights (as it then was known) could prospect, mine, sterilise or freely sell or lease such rights. On coming into force, the MPRDA terminated the ability to sterilise or freely sell or lease the rights but otherwise left them intact.[81] In issue was whether this deprivation was also an expropriation.[82] The Constitutional Court held that the constituents of expropriation included acquisition by the state of the substance of what was deprived, for a public purpose or in the public interest, and that it would be subject to compensation.[83] The Court further held, however, that the state had not acquired Sebenza's entitlement to freely sell or lease or sterilise the rights on the coming into force of the MPRDA, and accordingly, there

[75] Section 24N(7)(f) of NEMA.
[76] Long title of the MPRDA.
[77] Joubert (n 18 *supra*) Vol 18 132 – 133.
[78] *Agri SA v Minister of Minerals and Energy* 2013 (4) SA 1 (CC) at 1D.
[79] *Idem,* at 1D – E.
[80] *Ibid.*
[81] *Idem,* at 1E – F.
[82] *Idem,* at 1F.
[83] *Idem,* at 1F – G.

had been no expropriation.[84] What is relevant is the Constitutional Court's discussion on the objects and purposes of the MPRDA. The Constitutional Court held that in terms of the MPRDA, the state is the custodian of all mineral and petroleum resources on behalf of all people of South Africa because it is their common heritage.[85] It held that one of the objects of the MPRDA is to give effect to this principle by the granting of various kinds of rights to successful applicants. Prospecting, mining, exploration or production rights granted in this manner are regarded as limited real rights. Detailed provision is made for the grant, content and duration of the rights. If these rights are not properly exercised, they may be suspended or cancelled. Whenever the common law is inconsistent with the MPRDA, the latter prevails.[86]

Section 43(1) of the MPRDA states that the holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of old order rights or previous owner of works that ceased to exist, remains responsible for any environmental liability, pollution, ecological degradation, the pumping and treatment of extraneous water, compliance to the conditions of the environmental authorisation and the management and sustainable closure thereof until the minister has issued a closure certificate in terms of this act to the holder or owner consent.[87] This obligation mirrors the obligation as set out in section 24 NEMA to the extent that the holder remains responsible for the pumping and treatment of polluted and extraneous water until such time as a closure certificate has been issued. However, this obligation extends even further when regard is had to section 24R insofar as environmental liability is concerned. In particular, concerning the treatment of polluted and extraneous water beyond the issuance of a closure certificate. The aforementioned appears indicative of a statutory perpetual liability on the rights holders, as there is no time limit attached to the obligation to continue with the treatment of the polluted extraneous water. For as long as polluted or extraneous water is present the obligation to treat such polluted and extraneous water will exist. However, Dale[88] disagrees with this attestation and states that the object of subsection 43(1) is not to impose liability, but rather to emphasise that the responsibility for environmental liability, pollution or ecological degradation remains with such holder until the Minister has issued a closure certificate. According to Dale, the implication of section 43(1) is that upon the issue of the closure certificate, the holder ceases to be responsible for

[84] *Idem,* at 1F – G.
[85] *Idem,* at 9I.
[86] *Idem,* at 10A – B.
[87] Section 43(1) of the MPRDA.
[88] MO Dale *South African Mineral and Petroleum Law* (Service Issue 30) 378.

environmental liability, pollution or ecological degradation or the management thereof. The wording of section 43(1) does not restrict itself to responsibility in terms of the MPRDA and is therefore ambiguous as to whether or not that is the intention. Dale further argues that the effect of the issue of a closure certificate is to exonerate the holder from such responsibility irrespective of the source thereof, not only thus in terms of the MPRDA, but also in terms of other legislation, and even the common law. This interpretation is supported by the fact that in terms of section 43(5), no closure certificate may be issued unless the Chief Inspector of Mines and each government department charged with the administration of any law relating to the environment, has confirmed that the provisions relating to health and safety, the management of pollution of water resources, the pumping and treatment of extraneous water and compliance to the conditions of the environmental authorisation have been addressed.[89] However, this argument is in contrast with the content of section 24R of NEMA which states that the '*holder remains responsible…for the pumping and treatment of extraneous water despite the issue of a closure certificate*'. Therefore, there is no exoneration of the environmental liability. Dale addresses this issue by stating that the content of section 24R of NEMA cannot be interpreted to mean an open-ended responsibility and must be interpreted within the context of section 43, and be understood in the context of those obligations imposed by law on the holder and contained in the particular environmental authorisation and environmental management plan and closure plan.[90] This view cannot, however, be supported when consideration is given to the rules of statutory interpretation applied by the South African judiciary. The 'golden rule' of statutory interpretation requires the application of the plain or ordinary words of the statute unless this would lead to an absurdity or a result contrary to the intention of the legislature.[91] However, the golden rule was designed to salvage a literal interpretation.[92] This means that the language of the statute must present a glaring absurdity or be of such nature that it can clearly be disregarded as the legislature's true intention.[93] The notion of a perpetual liability to continue with the pumping of extraneous water may be considered a subjective absurdity, which will be dealt with more in Chapter 4. But the language of section 24R of NEMA is clear and does not present a glaring absurdity, or that it was not the legislature's true intention.

[89] *Idem*, at 378 – 379.
[90] *Idem*, at 380.
[91] L du Plessis, *Re-Interpretation of Statutes* (2002) 103.
[92] *Ibid*.
[93] *Idem*, at 104.

The perpetual nature of the obligation to continue pumping extraneous water is codified in the aforementioned provisions of NEMA. That is so because the liability is imposed for an indefinite period. Apart from the aforementioned, the perpetuity of these obligations is further reinforced when regard is had to the previous section of this Chapter that dealt with the perpetual nature of statutes.[94] This means that the instrument containing these perpetual obligations is in itself also of a perpetual nature. It will remain in force as statutory law in South Africa until it has formally been amended or repealed. The various statutory obligations as set out in NEMA and the MPRDA will remain in existence firstly; until such section or sections of the legislation have been amended or repealed and secondly; for as long as the polluted or extraneous water is present.

4.4. General duty of care

Fourthly, there is a general duty of care on every person to prevent pollution provided for in section 28 of NEMA. Every person who causes, has caused, or may cause significant pollution or degradation to the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring.[95] This duty also applies to significant pollution or degradation that occurred before the commencement of the NEMA, arises or is likely to arise at a different time from the actual activity that cause the contamination.[96] Within the context of the pumping of extraneous water, section 28 underpins section 24R of NEMA in the sense that a person will remain liable for pollution even if it only happens in future i.e. post the issuance of a closure certificate for example. Section 28 further imposes these measures on persons, including an owner of land or premises, a person in control of land or premises or a person who has a right to use the land or premises on the or in which activity or process is or was performed or undertaken or any other situation exists, which causes, has caused or is likely to cause significant pollution or degradation of the environment.[97] This is important because it undercuts an argument where, for example, a holder of a mining right has been issued with a closure certificate and assumes the position that it no longer has any ties

[94] See *supra* at section 3, pp 48 – 51.
[95] Section 28(1) of NEMA.
[96] Section 28(1A) of NEMA.
[97] Section 28(2) of NEMA.

with the land, and as such, cannot be held responsible for the pollution thereon.[98] The reasonable measures required may include measures to:

- To investigate, assess and evaluate the various impacts on the environment;
- To inform and educate employees about the environmental risks of the work that they are required to do, as well as the manner in which they tasks must be performed in order to avoid causing pollution or degradation to the environment;
- To either stop, change, mitigate or control any acts, activity or process is causing the pollution or degradation;
- Contain or prevent the movement of pollutants or the causing of degradation;
- Eliminate any source of pollution or degradation; and/or
- Remedy the effects of pollution or degradation as quickly and as much as possible.[99]

An authorised delegate for the department of mineral resources may direct any person who is causing, has caused or may cause significant pollution or degradation of the environment to seize any activity, operation or undertaking.[100] The relevant authority, when considering any measure or period envisaged in section 28(4), must have regard for the principles set out in section 2 of NEMA, which includes sustainable development.[101] A further consideration in the application of section 28(4) is the desirability of the state fulfilling its role as custodian holding the environment in public trust for the people.[102] This is a clear example of where the public trust doctrine is entrenched in NEMA.[103] Dale, however, argues that the public trust doctrine only finds application when the resource vests in sovereign ownership in the state, whereas in the instance of South Africa, mineral and petroleum resources belong to the nation [emphasis added].[104] The state has custodianship only. Dale is further of the view that the American public trust doctrine is unnecessary in the present constitutional dispensation as the Constitution itself provides the fundamental right to the environment.[105] If a person required under the act to undertake rehabilitation or other remedial work on the land of another,

[98] See the case of *Harmony Gold Mining Co v Regional Director, Free State Department of Water Affairs & Others*, unreported decision, North Gauteng High Court, Case No 68161/2008, 26 June 2012, which will be discussed in Chapter 4.
[99] Section 28(3) of NEMA.
[100] Section 28(4) of NEMA.
[101] Section 23(2)(a) of NEMA. See also section 2(3) and (4) of NEMA.
[102] Section 28(5)(e) of NEMA.
[103] See the discussion on the public trust doctrine in Chapter 1 (n 8; 11 and 22 *supra*).
[104] Dale (n 88 *supra*) 115.
[105] *Idem*, at 124.

reasonably requires access for rehabilitation or remedial work, but is unable to acquire it in on reasonable terms, the minister may expropriate the necessary rights in respect of that land for the benefit of the person undertaking the rehabilitation or remedial work, who will then be vested with the expropriated rights and recover from the person for whose benefit the expropriation was effected all costs incurred.[106] As also reiterated in the *Agri SA* case, section 25 of the Constitution provides that no one may be deprived of property except in terms of a law of general application, and that no law may provide for the arbitrary deprivation of property.[107] Apart from section 25 of the Constitution, the Expropriation Act 63 of 1975 also deals with and regulates expropriation. The Expropriation Act provides that the Minister of Public Works has the power to expropriate both movable and immovable property for public purposes, and the right to use the property for public purposes.[108] The provision contained in section 28(6) of NEMA is similar to the provision in section 65(1) of the National Water Act.[109] This section states that if a person who is required under the National Water Act to undertake rehabilitation or other remedial work on the land of another and reasonably requires access to that land to effect such rehabilitation, and is unable to access that land, the Minister may expropriate the necessary rights in respect of that land.[110] The rights in respect of that land are expropriated to the benefit of the person undertaking the rehabilitation work who will then be vested with the rights.[111] The Minister may then recover all costs incurred in connection with the expropriation, including the compensation payable, from the person for whose benefit the expropriation was effected.[112] According to Couzens, this is a strange provision because it is not clear whether the expropriation was intended to the temporary or permanent.[113] He goes further to state that although the intention, whether permanent or temporary, is not clear within the National Water Act itself, the expropriation must have been intended to be temporary.[114] This is so because the expropriation is to be effected for a specific purpose, no compensation is payable to the owner, the Expropriation Act is not referred to and it would be illogical for a person who is to effect rehabilitation on land to become the owner thereof.[115] Couzens argues

[106] Section 28(6) of NEMA.
[107] Section 25(1) of the Constitution, 1996.
[108] Section 2 of the Expropriation Act 63 of 1975.
[109] 36 of 1998.
[110] Section 65(1) of the National Water Act 36 of 1998.
[111] Section 65(1)(a) of the National Water Act 36 of 1998.
[112] Section 65(1)(b) of the National Water Act 36 of 1998.
[113] Couzens 'Expropriation as a weapon for environmental protection in South Africa' (2010) 127 *South African Law Journal* at 23.
[114] *Ibid*.
[115] *Ibid*.

for the same reasons as aforementioned, that the expropriation referred to in section 28(6) of NEMA is also intended to be temporary.[116] Notwithstanding the aforementioned, Couzens points to an anomaly which occurs in both NEMA and the National Water Act in that section 36(1) of NEMA provides that the Minister may purchase or expropriate, subject to compensation, any property for an environmental purpose if it is for a public purpose or in the public interest.[117] Similarly to section 64(2) of the National Water Act, section 36(1) of NEMA expressly states that the Expropriation Act applies to all expropriations under NEMA.[118] The anomaly of those lies in the fact that both NEMA and the National Water Act provide for expropriation which is of a temporary nature, following which ownership apparently vests in a person contracted to perform rehabilitative work for a specific purpose alone, but to which the provisions of the Expropriation Act, including compensation, applies.[119]

According to Glazewski one of the most momentous aspects of section 28(1) of NEMA is it generality.[120] A second significant aspect of this section is that it has retrospective effect. This is indicated by the phrase '…causes, has caused, or may cause…' (emphasis added).[121] Thus any person who has caused pollution in the past with respect to extraneous water will remain liable to take reasonable measures, as set out above, to prevent such pollution from continuing. A third and final momentous aspect of section 28(1) of NEMA is that it refers to 'significant' pollution.[122] What is considered to be significant within the context of pollution was discussed in the matter of *Hichange Investments (Pty) Ltd v Cape Produce Company (Pty) Ltd t/a Pelts Products*.[123] This matter dealt with the emission of chemical waste products by the Respondent's tannery.[124] Leach J considered the meaning of 'significant' within the context of section 28(1) and held that the assessment of what is significant involves a considerable measure of subjective import.[125] He further held that in light of the Constitutional right that a person has to an environment conducive to health and well-being, the threshold of what is 'significant' is not very high.[126] Glazewski supports this view wherein he agrees with Leach J

[116] *Idem*, at 24.
[117] *Ibid*.
[118] *Ibid*. See also section 64(2) of the National Water Act 36 of 1998 which states that subject to the National Water Act, the Expropriation Act 63 of 1975, applies to all expropriation is in terms of this Act.
[119] Couzens (n 113 *supra*) 25.
[120] J Glazewski, *Environmental Law in South Africa 2nd Ed* (2005) 149.
[121] *Idem*, at 150.
[122] *Ibid*.
[123] 2004 (2) SA 393 ECD.
[124] *Hichange Investments (Pty) Ltd v Cape Produce Company (Pty) Ltd t/a Pelts Products and Others* 2004 (2) SA 393 ECD at 397.
[125] *Idem,* at 414I – J.
[126] *Ibid.*

that no person should be subjected to an environment which is adverse to one's well-being.[127] Glazewski further states that the term well-being encompasses the essence of environmental concern, namely the sense of environmental integrity.[128] Considering the views held by Leach J and by Glazewski it appears as though any shift in the integrity of the environment can potentially be considered as being 'significant' within the context of pollution. If one accepts the aforementioned proposition, the pollution caused by extraneous water will most certainly be regarded as significant, especially if one considers that the extraneous water from non-operative gold mines is also what is known as acid mine drainage. The nature of acid mine drainage and the perpetual nature thereof will be dealt with in the next section.

5. The perpetual nature of Acid Mine Drainage

The world's largest gold mining basin, which has been mined for more than a century, lies in the Witwatersrand Mining Basin.[129] This mining basin consists of the Eastern Basin, the Central Rand Basin, the Western Basin, the far Western Basin, the Klerksdorp, Orkney, Stilfontein and Hartbeesfontein ('*KOSH*') Basins and the Free State gold mines.[130] The gold in the Witwatersrand Basin occurs in layers of conglomerate rock which form part of the 7000m thick sequence of sedimentary rocks of the Witwatersrand Supergroup.[131] The process of mining gold, in general, but also in the Witwatersrand Basin, includes the sinking of shafts, construction of underground tunnels and the excavation of rock to access and remove gold-bearing ore.[132] The rock which contains the gold ore also contains other minerals, such as pyrite,[133] which is also known as iron sulphide.[134] This rock containing the gold ore and the other minerals is then removed and transported to the surface where it is crushed and the gold extracted. These mining activities relating to the extraction of the gold ore therefore lead to increased exposure of the pyrite-bearing rock to water and oxygen on the surface.[135] The

[127] Glazewski (n 120 *supra*) 77.
[128] *Ibid*.
[129] M Liefferink 'Selected extracts from South Africa's environmental legislation: challenges with the management of gold tailings within the Witwatersrand gold fields and case studies' (2019) *Australian Centre for Geomechanics* 55.
[130] *Ibid*.
[131] TS McCarthy 'The impact of acid mine drainage in South Arica' (2011) 107(5/6) *South African Journal of Science* 2.
[132] *Harmony Gold Mining Co Ltd v Regional Director, Free State Department of Water Affairs and Others* 2014 (3) SA 149 (SCA) 2.
[133] McCarthy (n 131 *supra*) 2.
[134] *Harmony Gold Mining Co Ltd v Regional Director* (n 132 *supra*) 2.
[135] M Mujuru, S Mutanga & Z Dyosi 'Formation of acid mine drainage' in S Mutanga & M Mujuru (eds) *Management and mitigation of acid mine drainage in South Africa: Input for mineral beneficiation in Africa* (2016) 32.

aforementioned exposure, in turn, causes the oxidation and dissolution of this iron sulphide or pyrite in water and thereby creates sulphuric acid, also known as acid mine drainage ('AMD') or acid rock drainage ('ARD'). The term AMD is more commonly used because the aforementioned chemical process occurs mainly in current mining sites or abandoned mines[136] for example in mining tunnels, mine workings, mineral processing sites, open pits, waste rock piles and tailings. The pyrite rock on the surface located in waste rock piles and tailings is mainly exposed to water from rainfall.[137] Unlike the pyrite rock which is dumped on the surface in waste rock piles and tailings, the pyrite rock in mining tunnels and open pits is exposed to groundwater which continually seeps in from surrounding water tables and has to be pumped out to prevent flooding and the formation of AMD.[138] The formation of AMD is therefore not usually as severe in active mines as it is in abandoned mines where the pumping has ceased.[139]

The oxidation of sulphidic minerals in the formation of AMD also promotes the release of a whole range of metals.[140] AMD is therefore strongly acidic wastewater, with high levels of heavy metals, and if left untreated it contaminates ground and surface water resources and soils as it accumulates.[141] AMD therefore primarily affects the environment, specifically where gold (and also coal) is mined in South Africa.

Numerous gold mines in the Witwatersrand area closed over several years.[142] As each mine closed, the pumping of water from the mine workings ceased. This caused these mines to flood, as described hereinabove, due to groundwater seeping into the mine from the surrounding water tables. Due to the high degree of connectivity of mines in the Witwatersrand area, the water from the flooded mines started to discharge into neighbouring mines, not all of which had stopped mining.[143]

The presence of acid mine drainage has the potential, and under certain circumstances has already, devastated rivers, streams and aquatic life for a long time. Mineral resources such as coal and metal ores such as silver, gold and copper and often rich in sulphide minerals, reflecting rock or sediment environments generally high in sulphur content. Once exposed to water and air during mining, pyrite and other iron sulphide rocks release sulphuric acid in the

[136] GS Simate & S Ndlovu 'Acid mine drainage: challenges and opportunities' (2014) 3 *Journal of Environmental Chemical Engineering* 1786.
[137] Mujuru & Mutanga (n 135 *supra*) 27, 32.
[138] McCarthy (n 131 *supra*) 3.
[139] Simate & Ndlovu (n 136 *supra*) 1786.
[140] *Idem*, at 1789.
[141] Mujuru & Mutanga (n 135 *supra*) 28.
[142] McCarthy (n 135 *supra*) 28.
[143] *Idem*, at 4.

presence of extremely acidophilic microorganisms. Once sulphuric acid is created, the pyrite dissolves in drainage water, releasing associated metals and metalloids such as aluminium or arsenic into the surrounding environment. Wherever iron sulphides are exposed — for example, open pits, underground excavations, leach pads and tailings, and waste rock piles — such conditions can occur. Contaminated water flowing from abandoned mines is one of the most significant contributors to water pollution. Acid mine drainage can have severe impacts on aquatic resources, can stunt terrestrial plant growth and harm wetlands.[144] The effect on the environment can be severe. Streams and surface water bodies with a pH of 4.0 or lower can be devastating to fish, animals and plant life. Once started, the process becomes very difficult to stop and can occur indefinitely requiring mitigation and water treatment long after mining ends – in perpetuity. An example is the Golden Sunlight mine where the long-term effects of acid mine drainage are estimated to continue for thousands of years.[145]

Common iron sulphide minerals, primarily pyrite (FeS_2) is exposed to the oxygen in the atmosphere during mining, excavation or through the natural erosion process, and the compounds react with water and oxygen to form sulphate, resulting in acid mine drainage. This acidity results from the reaction of extremely acidophilic bacteria, which generate their energy by oxidizing ferrous iron (Fe^{2+}) to ferric iron (Fe^{3+}) using oxygen for cellular respiration. The ferric iron, in turn, dissolves the pyrite to produce soluble ferrous iron and sulphate. The ferrous iron is then available for oxidation by the aerobic acidophilic microbes, which scavenge dissolved oxygen in the pore space or water column. This biochemical cycle continues until the iron sulphide mineral (pyrite) is dissolved.[146] The often quoted equation (Eq.1) summarising the complete process of pyrite oxidation is somewhat misleading in that i) the primary oxidant involved in pyrite oxidation in most situations is ferric iron rather than molecular oxygen and ii) pyrite oxidation is a multi-step process involving an oxygen-independent reaction (ferric iron attack on the mineral) and oxygen-dependent reactions (reoxidation of ferrous iron to ferric and oxidation of reduced sulphur compounds produced as intermediates in the process, ultimately sulphate).[147]

$$4FeS_2 + 15O_2 + 14H_2O \rightarrow 4Fe(OH)_3 + 8SO_4^{2-} + 16H^+ \qquad \{Eq.1\}$$

[144] JA Jacobs & SM Testa 'Acid drainage and sulphide oxidation: Introduction' in Jacobs, Lehr & Testa (eds) *Acid mine drainage, rock drainage and acid sulfate soils: Causes, assessments, prediction, prevention and remediation* (2014) 3.
[145] *Idem*, at.4.
[146] *Idem*, at 5.
[147] DB Johnson & KB Hallberg 'Acid mine drainage remediation options: review' (2005) 338 *Science of the total Environment* 4.

The longevity of acid mine drainage proves that once pyrite oxidation begins, it is virtually impossible to control acid mine drainage without significant engineering effort. Consequently, many pre-Roman mining sites are still producing acid mine drainage.[148] For example, the Rosia Montana gold mine — a mine site located in present-day Romania that has been exploited since pre-Roman times, and which ceased operations in 1985.[149]

The presence of pyrite, iron sulphides and other oxygen-sensitive minerals in rock indicates a great potential for oxidation when exposed to oxygen and water at the time of disposition. Putting the geochemistry of the acid generation process in perspective is important, of 2.2 to 2.3 billion years. Before 2.2 to 2.3 billion years ago, pyrite crystals were found in surficial sedimentary rock deposits, indicating that pyrite and other iron sulphide minerals were deposited at a time when the atmosphere was virtually devoid of oxygen. Since that time, sulfuric acid generation from pyrite oxidation has been occurring naturally on earth. Anthropogenic disturbance of surface rock, sediments and soils containing iron sulphide by early metal mining activities, has started the same acid drainage geochemical process. Acidic drainage has been identified as the largest environmental liability facing the mining industry worldwide. In 1989 it was estimated that approximately 19 300 km of streams and rivers and approximately 72 000 ha of lakes and reservoirs worldwide has been seriously damaged by mine effluents, although the true scale of the environmental pollution caused by mine water discharges is difficult to calculate exactly.[150] One of the largest problems is historic and abandoned mining operations in which the acid drainage process has started and no responsible funding source is available for acid mine drainage mitigation and site clean-up and restoration. Once started, the acid generation process is virtually impossible to stop without a significant effort to remove the sources of oxygen and water, due to the iron-oxidizing bacteria, which act as catalysts. Acid generation does not stop due to the length of time since the iron sulphides were first exposed to oxygen. Since both oxygen and water are required to generate soluble metals and sulfuric acid, excluding either water or oxygens should be a way to stop or minimize acid drainage by limiting cellular respiration of the aerobic microbial communities that oxidize iron and sulphide minerals. Excluding eater and oxygen in underground mines requires a detailed location of all faults, joints, fractures, surface conduits, shafts and adits. It is important

[148] Jacobs & Testa (n 144 *supra*) 5.
[149] RM Truta, ID Bråhaita, CI Pop, C Baciu & G Popita 'Batch experiment to rest the limestone treatment on two types of acid mine water' (2017) *Faculty of Environmental Science and Engineering, Babes-Bolyai University, Cluj-Napoca, Romania, AES Bioflux* 93.
[150] Johnson & Hallberg (n 147 *supra*) 3.

that this includes the location where the influx of rainwater or groundwater containing dissolved oxygen does not occur because the dissolved oxygen (DO_2) present in flooding waters equals about 8-9 mg/l, which will be consumed by mineral-oxidizing micro-organisms and the replenishment of DO_2 by mass transfer and diffusion will be impeded by sealing of the mine. Other methods of precluding the formation of acid mine drainage include underwater storage, shallow water covers, sealing layers or combining acid-generating and acid-consuming materials to produce environmentally benign composites. This is what is more commonly known as 'source-control'.[151]

Many mines extend below the shallow groundwater, and when mine pumps are finally turned off during mine abandonment, the natural groundwater elevation is likely to rebound, changing geochemical conditions such as pH and redox in the mine and surrounding subsurface.[152] This can lead to contaminated groundwater being discharged, sometimes in a catastrophic event such as the one that happened at the Wheal Jane mine in Cornwall, UK. The presence of heavy metal mineralisation in West Cornwall has led to a long history of mining activity in the area. The tin mining at Wheal Jane mine in the Carnon Valley was still active as recently as 1991. The closure of the Wheal Jane mine resulted in a well-publicised release of approximately 50 000m^3 of acidic metal-rich mine water into the Carnon River and the Fal Estuary in the winter of 1991/1992.[153] In this case, a pilot passive treatment plant was subject to a 2-year period of evaluation of the plant for the Wheal Jane acid mine drainage remediation, which focussed on the fundamental principles of acid mine drainage remediation using a composite wetland approach.[154] This example of a passive approach is one of two processes, the other being the 'active approach' in what is known as the 'mitigation control measures'. These approaches are more often than not utilised due to the practical difficulties entailed in the source-control approaches.[155] According to Johnson and Hallberg, the choice of which option to use to remediate acid mine drainage is dictated by several economic and environmental factors.[156]

[151] *Idem*, at 5.
[152] Jacobs & Testa (n 144 *supra*) 45.
[153] PG Whitehead & H Prior 'Bioremediation of acid mine drainage: an introduction to the Wheal Jane wetlands project' (2005) 338(1) *Science of the total Environment* 15.
[154] Kevin B Hallberg & D Barrie Johnson 'Microbiology of a wetland ecosystem constructed to remediate mine drainage from a heavy metal mine' (2005) *Science of the total environment* 53.
[155] Johnson & Hallberg (n 147 *supra*) 6.
[156] *Idem*, at 5.

Sometimes the true environmental cost of a remediation system is not immediately apparent. For example, one of the costs which is not always considered is the amount of fossil fuel energy needed to transport liming minerals, often for very long distances, such as in the Wheal Jane mine pilot project. The sustainability of any remediation system is a factor that is becoming increasingly critical in decision-making. One of the present problems is that by-products of acid mine drainage have not been perceived or even identified as resources. Ultimately, it will be policy-considerations, legislation and political will which are likely to become the dominant factors in determining which remediation system can be used in any situation.[157]

6. Chapter conclusion

The beginning of this chapter looked at the liability to treat polluted and extraneous water in flooded mines. What has become evident, and what has been illustrated above, is that the liability to treat his polluted and extraneous water is perpetual in nature as a result of three intertwined aspects. Firstly, the statutory obligations to do so as contained in NEMA and the MPRDA. Secondly, the fact that South African statute law is no longer subject to disuse by abrogation and as such both the NEMA and the MPRDA, and the statutory liabilities which they create, will remain in existence until they are amended or repealed and as long as the polluted or extraneous water is present. Thirdly, as stated above, the nature of acid mine drainage and in itself is perpetual in nature. This causes a unique problem to the extent that both the nature of the problem and the statutory liabilities which govern it, is perpetual.

Notwithstanding in the sphere of law it appears, and whether perpetuity attaches to a right or an obligation, the point of departure when one considers the concept of perpetuity is that it is not limited to a specific time; it is indefinite and ever-lasting. There is also the assumption in South African law that South African statutes are potentially perpetual in existence. The potential perpetuity of statutes lies in the fact that a formal amendment or a repeal procedure is required to abrogate its effect. The effect hereof is then that when a statute imposes an obligation on a party for an indefinite period, that obligation will remain in effect until such a time as the statute is either amended or repealed. The question that this Chapter seeks to address is what does the concept of perpetual liability as developed in South African environmental law, entail concerning mining activities?

[157] *Idem*, at 12 – 13.

The analysis in this Chapter found that the specific obligations imposed on the mining sector are contained in NEMA and the MPRDA. In terms of NEMA, no person may commence with listed activities unless that person is the holder of an approved environmental authorisation. Such an environmental authorisation imposes further obligations on the holder, such as those contained in section 24N(7) of NEMA. Specific to this study is the obligation that the holder of an environmental authorisation remains responsible for the pumping and treatment of polluted or extraneous water. There is also the obligation that the holder of an environmental authorisation must provide financial provisioning for rehabilitation, even past closure of the mine. One of the most prominent obligations is that which is contained in section 24R of NEMA where the holder of an environmental authorisation remains responsible for any pollution or environmental degradation even after a closure certificate in terms of section 43 has been issued. The perpetual nature of these obligations to continue with the treatment and pumping of extraneous water is not only codified in NEMA but further reinforced when regard is had to the perpetual nature of the statute itself. It is therefore not only the obligation but also the instrument containing the obligation which is perpetual nature. This perpetuity is further exacerbated by the fact that the presence of acid mine drainage has the potential to devastate the environment for a long time. Mineral resources such as coal and metal ores are generally high in sulphur content. Once exposed to water and air during mining, pyrite and other iron sulphide rocks release sulphuric acid. Once sulphuric acid is created, the pyrite dissolves in the drainage water, releasing associated metals into the environment. Once started, the process becomes very difficult to stop and can occur indefinitely requiring mitigation and water treatment long after mining ends.

Chapter 4 of this research will analyse the two concepts, i.e. sustainable development as conceptualized in Chapter 2 and the notion of perpetual liability on Chapter 3, against one another in order to eventually determine whether these two concepts are compatible in law. Chapter will, in this context deal with analysis of past of pending case law which revolves around the issue of the continued pumping of extraneous water in mines. The discussion of the case law will in turn not only present a clear example of the problem statement as alluded to in Chapter 1, but also provide a platform upon which to test the theory of whether the two concepts, mentioned earlier, can effectively co-exist.

CHAPTER 4: ANALYSIS OF THE CONCEPT OF PERPETUAL LIABILITY THROUGH THE LENS OF SUSTAINABLE DEVELOPMENT

"The first rule of sustainability is to align with natural forces, or at least not try to defy them." – Paul Hawken

1. Introduction

In Chapter 2 it was found that the notion of sustainable development is essentially the balancing of three components – the economy, society and the environment – in such a manner that development meets the needs of the present without compromising the ability of future generations to meet its needs.[1] The lens of sustainable development was found to be a tripod which needs to remain level. Each leg of the tripod represents one of the so-called elements of sustainable development i.e. the environment, the economy and society. The ideal behind the tripod is that the environmental leg remains fixed, which results in a situation where the economy and society will have to adapt in order to ensure that the tripod remains level. In this Chapter, that lens of sustainable development will be used to analyse the notion of perpetual liability. In Chapter 3, the perpetual liability of the continued pumping of extraneous water was found to be statutorily entrenched in the provisions of National Environmental Management Act (NEMA) 107 of 1998 and the Mineral and Petroleum Resources Development Act (MPRDA) 28 of 2002.[2] As was set out in Chapter 2[3] because mines may be hydrologically connected to neighbouring or adjacent mines, the regional context is important when the closure of one mine in a region is likely to affect remaining mines. This concern was the background and what led to the litigation in the Harmony cases.[4]

The Harmony case was the first case where the idea of perpetual liability was raised in argument and considered by the High Court. It precedes the inclusion of section 24R in NEMA and section 43 in the MPRDA, therefore it will be analysed in this Chapter as the 'origin' of perpetual liability within the context of the obligation of continued pumping of extraneous water in non-operative mines. This Chapter will also discuss and analyse the

[1] See *supra* Chapter 2, at pp. 14 – 43.
[2] See *supra* Chapter 3, Section 4 at pp. 51 – 63.
[3] See *supra* Chapter 2, pp. 39 – 41.
[4] MO Dale *South African Mineral and Petroleum Law* (Service Issue 30) 379.

subsequent litigation of Ezulwini (Pty) Ltd where the issue of perpetual liability with the continuous pumping of extraneous water is raised as a key issue. The case discussions will provide a platform to give context to the study, but also to provide an example against which the two concepts of sustainable development and perpetual liability can be tested. After the case discussion, a thorough analysis of the two concepts against one another will follow in order to determine whether these two concepts, are in law and in fact, compatible.

2. The case of Harmony Gold

In September 2003, Harmony Gold Mining Company Limited ('*Harmony Gold*') commenced gold mining activities in the KOSH area after it acquired all the shares in African Rainbow Minerals Gold Ltd ('*ARMgold*'). Notwithstanding that Harmony Gold was in control of the land on which the gold mine was based, the ownership of the land remained vested with ARMgold.[5] On 1 November 2005, the Regional Director of the Free State Department of Water Affairs issued a directive in terms of section 19(3) of the National Water Act 36 of 1998 ('*NWA*') to amongst others[6], Harmony Gold.[7] The directive was aimed at requiring Harmony Gold to take reasonable measures to prevent pollution, caused *inter alia* by AMD, of underground- and surface water resources in the vicinity of the mining activities.[8] This directive was to operate until Harmony Gold and the other mining houses had reached an agreement on the long-term management of the water resources. Such an agreement was never reached.[9]

On 29 August 2007 ARMgold sold the mine, including the land, to Pamodzi Gold Orkney (Pamodzi). The sale became unconditional and was implemented on 27 February 2008. From that time, Harmony ceased to manage the mine and no longer exercised control over the land where the mine was based. Pamodzi assumed all of Harmony Gold's obligations in respect of the mining operations, including the obligations imposed by the section 19(3) directive.[10] Pamodzi, however, only paid a third of Harmony Gold's contribution to the monthly costs of pumping and treating the water found underground for the period March until May 2008. Thereafter, this specific obligation arising from the section 19(3) directive was resumed by

[5] *Harmony Gold Mining Co v Regional Director, Free State Department of Water Affairs & Others*, unreported decision, North Gauteng High Court, Case No 68161/2008, 26 June 2012, at 5.
[6] The directive was also issued to AngloGold Ashanti Ltd, Simmer and Jack Mines, Simmer and Jack Investments (Pty) Ltd and Stilfontein Gold Mining Company Ltd.
[7] *Harmony Gold Mining Co v Regional Director* (n 5 *supra*) 5.
[8] *Ibid*.
[9] *Ibid*.
[10] *Idem*, at 11.

Harmony Gold.[11] On 20 March 2009 Pamodzi was placed into provisional liquidation. On 25 May 2009, Harmony Gold wrote to the Department of Water Affairs with the view that as of February 2008, the directive was no longer valid against it. It further gave notice that it would cease its contribution towards the pumping and treatment of the underground water as of 30 June 2009. On 28 August 2009 Harmony Gold requested the Department of Water Affairs to withdraw the directive against it based on the fact that Harmony Gold no longer fell within the ambit of section 19(1) of NWA as it was no longer the landholder of the affected land. On 21 September 2009, the Department of Water Affairs refused Harmony Gold's request. This refusal precipitated an application for the review and setting aside of that decision in the High Court, Pretoria. That application was dismissed on 29 June 2012 by Makgoka J.

Harmony Gold appealed against the judgment of Makgoka J and in 2014 the Supreme Court of Appeal delivered judgment in the matter of *Harmony Gold Co Ltd v Regional Director, Free State Department of Water Affairs and Others*[12] where the appeal was dismissed.

3. Considerations in the Harmony Gold case

In essence, the merits of the review application stood to be determined by the interpretation of section 19(3) of the NWA. It was common cause that the Minister's directive-issuing power in terms of section 19(3) of the NWA is limited to a landholder. Makgoka J held therefore that the primary question to be determined was whether the continuance of the particular relationship between the landholder and the affected land is also a requirement for its ongoing validity.[13]

Makgoka J held that as long as the obligations imposed by the directive were not fulfilled, the directive remained valid. This was so as the directive was not issued after the sale of shares that caused Harmony Gold to sever its ties with the land, and the disposal of interest could never bring an end to unfulfilled obligations imposed in terms of the directive. The directive, as such, did not breach the legality principle.[14] Makgoka J also rejected a restrictive interpretation of section 19(3) of the NWA.

[11] *Ibid*.
[12] 2014 (3) SA 149 (SCA).
[13] *Idem*, at 11 - 12.
[14] *Idem*, at 48.

The Supreme Court of Appeal held that the '… *task of construing s 19 must commence with reference to s 24 of the Constitution*.[15] It further held that the limitation contended for by Harmony Gold, that a landholder may only be directed to take anti-pollution measures for as long as it remains the person who owns, controls, occupies or uses the land, is not expressly provided for in section 19(3) and as such will thus have to be read in. Meyer AJA held that the wording of section 19(3) made it clear that the legislature intended to vest the Minister of Water Affairs with wide discretionary powers and to leave it to him or her to determine what measures a defaulting landholder must take and for how long it must continue to do so.[16] The appeal was subsequently dismissed.

4. Considerations of subsequent litigation – the case of Ezulwini Mining Company (Pty) Ltd

On 25 July 2019, Ezulwini Mining Company (Pty) (Ezulwini) Ltd brought an application against the Minister of Mineral Resources and others[17] in the High Court in Pretoria, seeking, *inter alia*, a declaration on Ezulwini's rights that its can, without any permit or authorisation, cease the pumping of water from the defunct underground workings of the Ezulwini mine.

4.1. The facts of the case and argument a quo

Ezulwini states that it is entitled to cease pumping of water from the underground workings at the Ezulwini mine due to the prejudicial financial consequences, physical constraints, potential health and safety consequences as well as key findings of the impact and risk assessment[18] studies that it commissioned. According to Ezulwini, the cost of maintenance of the shaft and pumping infrastructure as well as the costs of pumping and treating the water is on average R 21 127 822.20 per month. The effect of this expenditure is that Ezulwini has an overall loss and is not a going concern. The 5th and 6th Respondents, being GFI Joint Venture Holdings (Pty) Ltd ('*GFI*') and Goldfields Operations Ltd (Goldfields), specifically oppose Ezulwini's relief based on the content of section 43 of the MPRDA and section 24R of NEMA. Apart from its opposition, GFI and Goldfields also instituted a counterclaim in which they seek a declaratory order stating that Ezulwini remains responsible for the pumping and treatment of

[15] *Idem*, at 19.
[16] Idem, at 22 - 23.
[17] *Ezulwini Mining Company (Pty) Ltd v Minister of Mineral Resources and Energy & Others*, Case No: 53379/2019.
[18] The physical constraints, potential health and safety consequences and findings of the impact and risk assessment is not relevant for purposes of this research.

extraneous water from the underground workings until the Minister of Mineral Resources and Energy has issued a closure certificate or such longer period as contemplated in section 24R of NEMA. According to Goldfields, the underground referred to in this particular matter comprises of various gold mines in the West Rand and Far West Rand. These areas are situated below dolomitic compartments holding a massive volume of water. Through various cracks and faults, and because of the volume of water above these compartments, the flow of water is at an enormous rate and will rapidly fill the mining area if not pumped out. It was further argued that these gold mines have been de-watering for decades and that the de-watering disturbs the natural balance. It was further argued that the MPRDA and NEMA both cater for these scenarios, specifically with reference to section 43 of the MPRDA and section 24R of NEMA. Goldfields argues that the aim of these sections is to regulate the cessation of pumping.[19] The consequences and the resultant re-watering must be considered carefully and set out in expert reports that must be submitted to the regulator and pumping may only cease once the reports are approved and a closure certificate has been issued.[20] Fabricius J in his judgment held that the legislature without a doubt mentions pumping and treatment of extraneous water expressly and separately from environmental liabilities and conditions of the EMP. He holds further that what is contemplated is that in a situation where the mine has been pumping water, the mine as the holder of the mining right remains responsible for pumping and treatment of water until a closure certificate is issued, to maintain the *status quo* until the cessation of pumping can be properly regulated.[21]

Ezulwini, in its heads of argument, deals with the legislative history of sections 43 of the MPRDA and section 24R of NEMA. Ezulwini states that section 43(3) deals with the circumstances when a closure certificate must be applied for. This includes the cessation of the prospecting or mining operation. At the relevant time during 2004, the environmental impacts of mining were regulated exclusively through the MPRDA, specifically through the requirement to obtain an Environmental Management Programme prior to commencing mining and to ensure that all mining activities takes place in line with that approved EMP. An EMP

[19] *Ezulwini Mining Company (Pty) Ltd v Minister of Mineral Resources and Energy* 2021 JDR 0052 (GP) (unreported judgment) at par 22.
[20] Section 43 pf the MPRDA, read with MPRDA Regulations 56 – 62. Also section 24R of NEMA read with the EIA Regulations including Regulation 19(6) and appendix 5. Regulation 19 deals with the submission of a basic assessment report and environmental management program, and where applicable a closure plan, to the competence of thorough tea. Appendix 5 deals with the content of the closure plan. "Pumping and treatment of extraneous water or ecological degradation as a result of closure" is mentioned specifically in clause 1(h) of Appendix 5.
[21] *Ezulwini Mining Company (Pty) Ltd v Minister of Mineral Resources and Energy* (n 19 *supra*) 23.

would also cater for activities post-closure, by identifying and describing measures for the management of such impacts. An EMP was also required to include a closure plan as contemplated in section 43(3)(d) of the MPRDA, which would include methods for the decommissioning of the mine and various mitigation and management strategies. According to the MPRDA Regulations, the quantum of financial provisioning of an application for a mining right was required to cater for the rehabilitation or management of negative impacts. This included provision for the actual costs required, *inter alia*, the decommissioning and final closure of the mining operations. The general principles for mine closure were prescribed in the MPRDA Regulations 56 in terms of which environmental concerns and impacts played a major role. It was conceded by Ezulwini that terms and obligations of the EMP created legal and enforceable obligations on the holder of the mining right. It was therefore contended by Ezulwini where mining operations involved the pumping of underground water and the cessation of such operations involved, either the continuation of such pumping or the cessation thereof, provision for any environmental impacts had to be contained in the relevant EMP and closure plan and financial provision would have to be made thereunder.[22] This is also the view shared by Dale.[23]

Ezulwini further contended that during December 2014, the legislative framework changed with the introduction of the "One Environmental System". This entailed the removal of all provisions in the MPRDA that dealt specifically with environmental authorisation and management and moving such provisions over to NEMA. This system was accordingly implemented through several legislative amendments including the MPRDA Amendment Act 49 of 2008, the National Environmental Management Laws Second Amendment Act 30 of 2013 and the National Environmental Management Laws Amendment Act 25 of 2014.

Ezulwini argued that the implementation of the "One Environmental System" did not change the objections and the legislative measures for the mitigation and the management of the environmental impacts of mining operations during and post-closure. The fact that there was no express reference to the pumping and treatment of polluted or extraneous water in the MPRDA, but it was in NEMA, has not changed the scope of the obligations on the holder of the right. Fabricius J held that to determine Ezulwini's objections concerning the pumping and treatment of water from underground workings, regard must be had to its existing EMP, which was approved in March 2015. Fabricius J further held that the EMP contemplates two options

[22] *Idem*, at 27.
[23] Dale (n 4 *supra*) 380.

for the closure of the underground workings.[24] The first is the cessation of pumping, which the EMP states will result in a rise in the water table in the particular dolomitic aquifer, and the second is that the pumping infrastructure could be maintained by South Deep Mine and pumping would continue. In either scenario, the EMP does not contemplate Ezulwini responsible for the pumping and treatment of water from the particular underground workings in perpetuity.

Ezulwini further argued that the respective purposes of section 43 of the MPRDA and section 24R of NEMA is to cater for the remaining or continuing obligation to pump and/or treat polluted or extraneous water until the minister has issued a closure certificate. Both sections are accordingly concerned with the perpetuation of an existing obligation to pump and treat extraneous water and polluted water, and not for the creation of a new obligation. It was further argued that as the literal interpretation of the meaning of the word "remain" and "remains responsible" is concerned, both parties have understood the word responsible to refer to a legal obligation. This, therefore, requires that the relevant obligation to pump and treat extraneous water must exist independently from the sections in question, in other words, a prior legal obligation must have existed. Both sections are concerned with the perpetuation of an existing obligation and not the creation of a new one. Ezulwini further contended that interpretation of a legislative provision is an objective process, meaning that such interpretation should not be adapted to the facts of each case specifically.[25]

Goldfields in reply contended that section 43 of the MPRDA does not refer to the cessation of pumping of extraneous water within the context of an existing EMP, but mentions it by name in addition to the existing EMP conditions. Section 43 creates a liability and imposes a duty to continue pumping until a closure certificate has been issued.[26]

4.2. Findings by Fabricius J in the Court a Quo

Fabricius J held that neither of the sections (43 of the MPRDA or 24R of NEMA) contemplates an existing obligation emanating from a source other than the said specific statutory provisions to pump and treat extraneous water. He further held that the words "remains responsible" should be read together with the word "until". In other words, a period is contemplated, and not a pre-existing obligation emanating from some other source.[27] He further held that

[24] *Ezulwini Mining Company (Pty) Ltd v Minister of Mineral Resources and Energy* (n 19 *supra*) 30 – 34.
[25] *Ibid*.
[26] *Idem,* at par 38.
[27] *Idem,* at par 39.6.

Ezulwini's interpretation of section 43(1) of the MPRDA, specifically the words "remains responsible" is too narrow, that it cannot be supported by the plain language of the section nor in the proper context of all relevant legislation and the purpose of the One Environmental System. Fabricius J consequently granted prayer 1 of the counter application in that Ezulwini remains responsible for the pumping and treatment of extraneous water from the underground workings until the Minister of Mineral Resources and Energy has issued a closure certificate or such longer period as contemplated in section 24R of NEMA.[28]

4.3. Petition to the Supreme Court of Appeal

Ezulwini petitioned the Supreme Court of Appeal for leave to appeal, which was granted. Ezulwini, in its heads of argument in the appeal before the Supreme Court of Appeal, contends that the court *a quo* erred in granting prayer 1 of Goldfields' counterclaim firstly, from its failure to have regard to the plain meaning of the language of both sections and in particular the words "remains responsible for…the pumping and treatment of extraneous water". Secondly, from its failure to contextualize both sections within the overarching scheme provided in the legislation for mine closure, and thirdly, from a failure to appreciate that the interpretation adopted by the court *a quo* leads to an obvious absurdity, namely that the cessation of mining operation gives rise to an obligation to pump extraneous or polluted water where such pumping is not necessary or desirable.[29] In her heads of argument, the Minister for Environmental Affairs, Forestry and Fisheries states that, in essence, Ezulwini sought permission — for the first time in the history of South African mining — that a defunct mine should be allowed to completely re-water the dolomitic groundwater compartment of the mine void that was created during the mining operation.[30]

Goldfields contend in its heads of argument that section 43 of the MPRDA and 24R of NEMA do not only envisage prolonging a current obligation of a holder of a mining right in its environmental authorisation approved under the present system. It casts a much wider net. Goldfields contend that the aforementioned appears from the fact that section 43(1) also

[28] *Idem,* at par 55. In this regard and notes on the case, also see G Viljoen, J Rantlo & Du Plessis W 'Notes on the legal liability of mining companies for the pumping of extraneous water from defunct underground workings: Legal uncertainties illustrated by Ezulwini Mining Company Pty Ltd v Minister of Mineral Resources and Energy [2021] ZAGPPHC 4' (2022) *Obiter*.
[29] Ezulwini heads of argument to the SCA in the matter of Ezulwini Mining Company (Pty) Ltd v Minister of Mineral Resources and Energy, under SCA case number 289/2021, at par 9.
[30] Minister of Environmental Affairs, Forestry and Fisheries heads of argument to the SCA in the matter of Ezulwini Mining Company (Pty) Ltd v Minister of Mineral Resources and Energy, under SCA case number 289/2021, at par 5.

includes that a previous holder of an old order right who has had its EMP approved in terms of prior legislation (which differed from the present legislation and made no reference to the responsibility for pumping and treating polluted or extraneous water) and persons who may not have held an approved EMP at all (such as the owner of the works). The intention of the legislature was clearly not to limit such persons' responsibility to their pre-existing responsibilities but to add to their responsibilities.[31]

5. Analysis of the perpetual liability through the lens of sustainable development

5.1. Preliminary remarks

The analysis of the notion of perpetual liability, specifically within the context of the continued pumping of extraneous water, through the lens of sustainable development is legally sound. Sections 24N and 24R of NEMA were inserted by act 62 of 2008[32] and came into operation on 1 May 2009. This was long after the Harmony case was decided, but well within the current Constitutional dispensation which means that it cannot conflict with the Constitution. In Chapter 2,[33] it was shown how the concept of sustainable development is entrenched in the Constitution. In Chapter 3 the notion of perpetual liability as contained in sections 24N and 24R of NEMA was discussed.

5.2. Perpetual liability in the Harmony case

The Harmony case centred on the sequential dimension of section 19 of the NWA.[34] The issue of perpetual liability was raised in argument in the court *a quo*. Makgoka J rejected the argument stating that the perpetual nature of the directive was only to the extent that Harmony Gold (and other stakeholders) failed to reach an agreement concerning the long-term management of water arising from mining activities in the KOSH area. The perpetuity, therefore, was only to be laid in the hands of Harmony Gold. This may have been the case then, but as alluded to in the previous Chapter, the liabilities to continue with the treatment of polluted, extraneous water is now a statutory liability, which means the disregard for the perpetual nature as Makgoka J held, is no longer applicable. As set out above, the risk is that as a result of the cumulative impacts of many mines in a region, water and other environmental

[31] Goldfields' heads of argument in the appeal to the SCA in the matter of Ezulwini Mining Company (Pty) Ltd v Minister of Mineral Resources and Energy, under SCA case number 289/2021, at par 42.
[32] National Environmental Management Amendment Act 62 of 2008.
[33] See *supra* Chapter 2 Section 3 at p. 32.
[34] T Humby 'The spectre of perpetual liability for treating acid water on South Africa's goldfields: Decision in Harmony II' (2013) *31 Journal of Energy and Natural Resources Law*, at 459.

impacts will eventually reside with the last operating mine and that the mine would be responsible and liable for the cumulative impacts, has led to the development of regional mine closure strategies.[35] Notwithstanding the *Harmony* case, this was also highlighted by the premature closure of the Stilfontein Gold Mine in 2005. The pumping of water from Stilfontein's Margaret shaft made mining possible in the lower-lying KOSH mining area and the sudden cessation of pumping as a result of the mine's closure placed the rest of the mines in the region at risk of flooding and subsequent closure.[36] It is true that had the Department of Water Affairs, as it then was, allowed Harmony to cease the pumping and treatment of the acidic water, it would have been in contravention of its laws.[37] But AMD may occur for decades, or centuries, which is problematic.[38] Notwithstanding the practical problems, the view in Harmony has now been legislated, as is apparent from section 23N and 24R of NEMA, and in section 43 of the MPRDA.

5.3. Perpetual liability in the Ezulwini matter

According to Fuller, the law cannot prescribe the impossible.[39] 'To command what cannot be done is not to make the law; it is to unmake law, for a command that cannot be obeyed serves no end but confusion, fear and chaos.' This confusion and chaos become even more so when considering questions such as: what happens to the responsibility entrenched in section 24R of NEMA when the holder of the mining right is liquidated? Such as in the case of Ezulwini where the Applicant states that the financial obligation to continue pumping the extraneous water could lead to its insolvency. Although the State is legally authorised to act and would have to its disposal the financial security for rehabilitation as envisioned in section 24P of NEMA, even that would not last forever. Apart from the financial provisioning, and absent of any sort of fund or financial security to cover costs where the responsible party no longer exists, or is unable to pay, is a fundamental stumbling block.[40] According to Humby, in general, investors and mining companies would be cautioned to 'look before you leap' and diligently weigh the

[35] Dale (n 4 *supra*) 379.
[36] DM van Tonder, H Coetzee, S Esterhuyse, N Msezane, L Strachan, P Wade, T Mafanya, S Mudau "South Africa's challenges pertaining to mine closure – The concept of Regional and Mining Closure Strategies" (2008) AB Fourie, M Tibbett, IM Weiersbye, PJ Dye (eds.) *Australian Centre for Geomechanics, The University of Western Australia* 88.
[37] Humby (n 34 *supra*) 463.
[38] See *supra* Chapter 3 Section 5 at p. 63.
[39] L Fuller, *The Morality of Law* (1964) 36 – 37.
[40] Humby (n 34 *supra*) 465.

costs and benefits of undertaking a particular operation in the light of the significant environmental impacts and the associated liabilities it imposes.[41]

So, the question that arises, is where is the balance when it comes to this perpetual liability? In Chapter 2 the lens of sustainable development was found to be a tripod, with each leg representing the economy, the environment and society. The tripod has to adapt on a case-by-case basis. The notion of sustainable development is this balance that must be reached and maintained to meet the present need without compromising the ability of the future to also meet its needs. In the present context of perpetual liability, the economic leg seems to be sinking into the ground. It requires perpetual economic input, without extracting the economic benefit. And what about the future generations – who will be willing to inherit the perpetual liability of the continued pumping of extraneous water? The economic detriment was evident in the case of Harmony where Pamodzi Gold only lasted a year. Sure, its financial downfall would in all probability not only be as a result of the liability to continue pumping the extraneous water but when considering the financial obligation of R21 million per month of Ezulwini, subtract a few years in inflation, the brunt on Pamodzi could not have been small. This is one of the factors that is illustrated in Chapter 1's problem statement. From a societal point of view, several factors come into play. Firstly there is a right to an environment which is conducive to human well-being, as clearly highlighted in the *Hichange* case.[42] Secondly, in terms of the Mineral and Petroleum Resources Development Regulations, every application for a mining right must be accompanied by a social and labour plan.[43] The objectives of a social and labour plan are to promote employment and advance the social and economic welfare of South Africans and to contribute to the transformation of the mining industry.[44] A social and labour plan is also required to ensure those holders of mining rights contribute towards the socio-economic development of the areas in which they operate.[45] The implication hereof is that while there is still a holder of a mining right and before a closure certificate has been issued, the surrounding society will benefit.[46] Once the holder of the mining right no longer exists or is no longer able

[41] *Idem*, at 466.
[42] *Hichange Investments (Pty) Ltd v Cape Produce Company (Pty) Ltd t/a Pelts Products and Others* 2004 (2) SA 393 ECD.
[43] Regulation 42 of the Mineral and Petroleum Resources Development Regulations published in GN R527 in GG 26275 dated 23 April 2004.
[44] *Idem*, at Regulation 41(a) and (b).
[45] *Idem*, at Regulation 41(c).
[46] Regulation 43 of the Mineral and Petroleum Resources Development Regulations published in GN R527 in GG 26275 dated 23 April 2004 states that the social and labour plan remains valid until a closure certificate has been issued.

to operate or there is no other potential holder who is willing to take on the perpetual liability, society no longer benefits.

Then there is the third component, the environment, and the same question arises – what happens when the mining right holder no longer exists or is no longer able to meet the obligation caged in the notion of perpetual liability? It seems, much like what was stated in the Ezulwini case, that when the economic leg disappears, so does the environmental leg. Once the holder of the mining right is no longer able to meet the financial obligations associated with the continued treatment and pumping of extraneous water, it would just stop. This precipitates the environmental impacts associated with AMD.[47] When one considers the model of sustainable development as a tripod, it would appear as though the economic leg and the environmental leg are tied at the hip. If one collapses, so does the other. This is self-evidently in stark contrast with the balancing act that the notion of sustainable development requires.

The present statutory dispensation dealing with the liability to pump and treat extraneous water is necessary but symptomatic at the most. It is like a band-aid on a gunshot wound. The current environmental statutory dispensation addresses the most obvious and immediate impacts, but it does not solve the root the of problem. In fact, from what has been analysed above, the long-term effects cripple the notion of sustainability within that specific context.

6. Chapter conclusion

The case of Harmony saw the rise of the notion of the perpetual liability to continue pumping extraneous water, even though Harmony no longer had any ties with the land itself. Harmony was decided prior to the enactment of various sections in NEMA and the MPRDA which codified this perpetual liability. This statutory perpetual liability requires the holder of a mining right who was responsible for the pumping of extraneous water, to remain liable. This liability extends even after a closure certificate has been issued, similarly to the Harmony case, even after there are no longer any ties to the land in question. There is no end to this liability. It extends over an indefinite period. Another aggravating factor to this endless liability is the nature of the extraneous water. Once it becomes acidic, that chemical process also continues for an indefinite period. As was analysed with reference to the Ezulwini matter, this perpetual liability is practically unsustainable.

[47] See *supra* Chapter 3 Section 5 at pp. 63 – 68.

The analysis of the notion of perpetual liability against the notion of sustainable development found that perpetual liability cripples the notion of sustainable development. The two concepts are therefore incompatible, to the extent that some external factor would have to come into play to stabilise the lens of sustainable development. This is dealt with in the Chapter under the heading of possible solutions, where various engineering solutions are presented. It appears that the only manner in which the holder of a mining right, who is subject to this perpetual liability would have to 'partner' with some of these engineering solutions in order to solve the root of the problem.

CHAPTER 5: CONCLUSION

"A process cannot be understood by stopping it. Understanding must move with the flow of the process, must join it and flow with it." – Frank Herbert, Dune

The overall aim of the study was to determine whether the concept of perpetual liability is compatible with the concept of sustainable development. More particularly, as the notion of perpetual liability is codified and applied in the South African environmental law context, with specific application in the mining sector. This stems from the problem that the current legislative framework binds mining houses to, amongst others, the pumping and treatment of extraneous water, even post-closure. This obligation does not cease at any point in time, which means that the holder of that specific mining right is bound to perform those obligations perpetually. The inability to keep up with the perpetual liability has been raised in several cases, the first being the Harmony gold case. The study further aimed to analyze the cases which featured the concept of perpetual liability and to determine by way of example, whether in general, the notion of perpetual liability is compatible with the notion of sustainable development.

1. Summary of the research findings

Sustainability has become a word that this generation is very familiar with. But understanding what sustainability means in practical terms as more and more policies and programmes seem to revolve around this concept. Each policy and programme has, of course, its implications, not to mention that in many cases it is still used as a political pawn. Notwithstanding the ambiguity in interpreting the concept, in its most basic form sustainable development essentially encapsulates a functional balance between three fundamental components – the environment, the economy, and society. These three components are of equal importance, intertwined in the matrix of these components is the intergenerational helix – the ability of the present generation to meet their needs without compromising future generations' ability to meet theirs.

A right to an environment which is not harmful and which is protected is codified in section 24 of the Constitution. This right includes and encapsulates the notion of sustainable development. The environmental rights in the Constitution has been held to be on par with other basic human rights. The principle of sustainable development has become the fundamental building block around which environmental legal norms have been fashioned,

Pure economic factors no longer play the leading role in the determination whether development is to proceed or not. As a result of the concept of sustainable development, environmental concerns play as much a role in that determination.

NEMA was enacted to give effect to section 24 of the Constitution, and the notion of sustainable development is thus a founding principle, which underpins all decisions relating to the environment, in NEMA. After the amendment of the MPRDA by the Mineral and Petroleum Resources Development Amendment Act 49 of 2008, most of the environmental issues relating to mining were repealed and replaced with provisions in NEMA. For the mining sector, this meant that all mining-related and incidental activities were, as it were, married to the provisions of NEMA. This is especially so because the sections dealing with applications for prospecting or mining right in the MPRDA specifically state that any applicant for a mining right must simultaneously make an application for an environmental authorization. The sections dealing with the granting of prospecting or mining rights then go further to state that such a right may only be granted if there is an approved environmental authorization. Therefore, a mining right cannot be given any effect without an approved environmental authorisation.

One of the most basic ways to picture sustainable development is to think of it as a chair with three legs, each of the three legs representing one of the essential components of sustainable development. However, in Chapter 2 it was illustrated that this model is too stoic and unyielding. In exploring the lens of sustainable development, Chapter 2 found that the proper practical model for the notion of sustainable development needs to be more adaptable, because not every situation where the notion of sustainable development is applicable, is necessarily the same. The notion, therefore, needs to adapt on a case-by-case basis. Chapter 2 suggests a model more akin to that of a tripod, where the three legs still represent each of the essential components of sustainable development, but that they are adjustable. To accommodate the ideal that people should not be placed ‘outside’ the environment and make it adapt to them, but instead, let society and the economy adapt to the environment (as it is made up of scientific laws), Chapter 2 further suggests that the environmental leg of the tripod be fixed, and let to the other two legs adapt to the surface on which the tripod stands, in order to keep the tripod level. On top of the tripod lies a disc representing intergeneration equity. Only when the tripod is level, can the disc remain in place, thus representing, as whole, sustainable development.

In Chapter 3 the meaning of perpetual was discussed. Perpetual is 'continuing forever' or everlasting. In exploring the concept of perpetuity, Chapter 3 firstly looked at the history of the concept in South African law. The concept of perpetuity in law dates back as far as 1897 when it first occurred in the form of a perpetual interdict. Thereafter it continued to appear in case law, especially concerning interdicts, but also later in the law of contract and the law of succession. Notwithstanding in the sphere of law it appears, and whether perpetuity attaches to a right or an obligation, Chapter 3 found that the point of departure when one considers the concept of perpetuity is that it is not limited to a specific time; it is indefinite and ever-lasting.

There is also the assumption in South African law that South African statutes are potentially perpetual in existence. The potential perpetuity of statutes lies in the fact that a formal amendment or a repeal procedure is required to abrogate its effect. The effect hereof is then that when a statute imposes an obligation on a party for an indefinite period, that obligation will remain in effect until such a time as the statute is either amended or repealed.

Concerning the specific obligations imposed on the mining sector are contained in NEMA and the MPRDA. In terms of NEMA, no person may commence with listed activities unless that person is the holder of an approved environmental authorisation. Such an environmental authorisation imposes further obligations on the holder, such as those contained in section 24N(7) of NEMA. Specific to this study is the obligation that the holder of an environmental authorisation remains responsible for the pumping and treatment of polluted or extraneous water. There is also the obligation that the holder of an environmental authorisation must provide financial provisioning for rehabilitation, even past closure of the mine. One of the most prominent obligations is that which is contained in section 24R of NEMA where the holder of an environmental authorisation remains responsible for any pollution or environmental degradation even after a closure certificate in terms of section 43 has been issued.

The perpetual nature of these obligations to continue with the treatment and pumping of extraneous water is not only codified in NEMA but further reinforced when regard is had to the perpetual nature of the statute itself. It is therefore not only the obligation but also the instrument containing the obligation which is perpetual nature. This perpetuity is further exacerbated by the fact that the presence of acid mine drainage has the potential to devastate the environment for a long time. Mineral resources such as coal and metal ores are generally high in sulphur content. Once exposed to water and air during mining, pyrite and other iron sulphide rocks release sulphuric acid. Once sulphuric acid is created, the pyrite dissolves in the

drainage water, releasing associated metals into the environment. Once started, the process becomes very difficult to stop and can occur indefinitely requiring mitigation and water treatment long after mining ends.

In Chapter 3 it was found that the liability to treat polluted and extraneous water is perpetual in nature as a result of three intertwined aspects. Firstly, the statutory obligations to do so as contained in NEMA and the MPRDA. Secondly, the fact that South African statute law is no longer subject to disuse by abrogation and as such both the NEMA and the MPRDA, and the statutory liabilities which they create, will remain in existence until they are amended or repealed and as long as the polluted or extraneous water is present. Thirdly, the nature of acid mine drainage in itself is perpetual in nature. This causes a unique problem to the extent that both the nature of the problem and the statutory liabilities which govern it, is perpetual.

In Chapter 4 it was illustrated that the case of Harmony saw the rise of the notion of the perpetual liability to continue pumping extraneous water, even though Harmony no longer had any ties with the land itself. The Harmony case was decided prior to the enactment of the various sections in NEMA and the MPRDA which codified this perpetual liability. As was analysed regarding the Ezulwini matter in Chapter 4, this perpetual liability is practically unsustainable. The analysis of the notion of perpetual liability against the notion of sustainable development found that perpetual liability cripples the notion of sustainable development. The two concepts are therefore incompatible, to the extent that some external factor would have to come into play to stabilise the lens of sustainable development. This is dealt with in Chapter 4 under the heading of possible solutions, where various engineering solutions are presented. It appears that the only manner in which the holder of a mining right, who is subject to this perpetual liability would have to 'partner' with some of these engineering solutions to solve the root of the problem.

2. Addressing the primary research question

The primary research question in this study is to what extent is the concept of perpetual liability in South African environmental law compatible with the concept of sustainable development. In addressing this question this research analysed the specific sections of the South African environmental legislation which contain perpetual liabilities. These sections were found in NEMA, as read with the MPRDA. More specifically, sections 24N and 24R of NEMA require that the holder of a mining right remains responsible for the continued pumping and treatment of extraneous water for an indefinite time. This requirement was then analysed against the

concept of sustainable development. Before this could be achieved, it was necessary to first determine or find a practical lens of sustainable development, because the concept is unfortunately notorious for ambiguous interpretation. In determining the practical lens of sustainable development, this study found it to align with the broader concept of the ideal, being the balance of the environment, economy and society in such a manner that enables present generations to meet their needs without compromising the ability of future generations to meet their needs. In addition to the aforementioned, this study however found that the balance of the three components needs to be adaptable as not every situation where it would find application would be the same. This precipitated the idea that the practical lens of sustainable development should be considered as a tripod, with the three legs each representing one of the three components, but each leg being able to adjust. That being said, the idea behind this model is that the environmental leg is fixed and the other legs adapt to the environment. When the notion of perpetual liability is analysed in terms of this model, it was found that the two concepts were not compatible. The findings suggest that perpetual liability cripples the ideal of sustainable development as it is impossible to find a balance — essentially, the economic leg is driven into the ground and as it is metaphorically tied to the hip of the environmental leg, the entire tripod topples.

3. Final comments and possible future research topics

On 12 June 2021, the Mail & Guardian reports that the Government has postponed its R10-billion long-term solution for acid mine drainage. More than a decade ago, the then Minister of Water Affairs directed the Trans-Caledon Tunnel Authority to implement short-term interventions to deal with acid mine drainage. This included the upgrading of the Western Basin acid mine drainage treatment plant in Randfontein in 2012 and the construction of the Central (Germiston) and Eastern (Springs) basins treatment plants in 2014 and 2016 respectively, at a cost of R 2.6 billion. The plants pump 180 million litres of acid mine water every day from the three underground basins, neutralise the acidic water and then discharge it into the Vaal River Systems and the Crocodile West river system, at a cost of R292 billion a year. However, due to the high salinity of the water, the water is still not fit for use. The 2nd phase, or long-term solution, was intended to produce fully treated water from the first phase for reuse, which would significantly increase the water supply to the Vaal River system. In an attempt to explain the significance of the problem resulting from acid mine drainage, the article refers to the acidic Rio Tinto in Spain, which flows a deep toxic red for 50km, after it was polluted in mining operations more than 50 000 years ago.

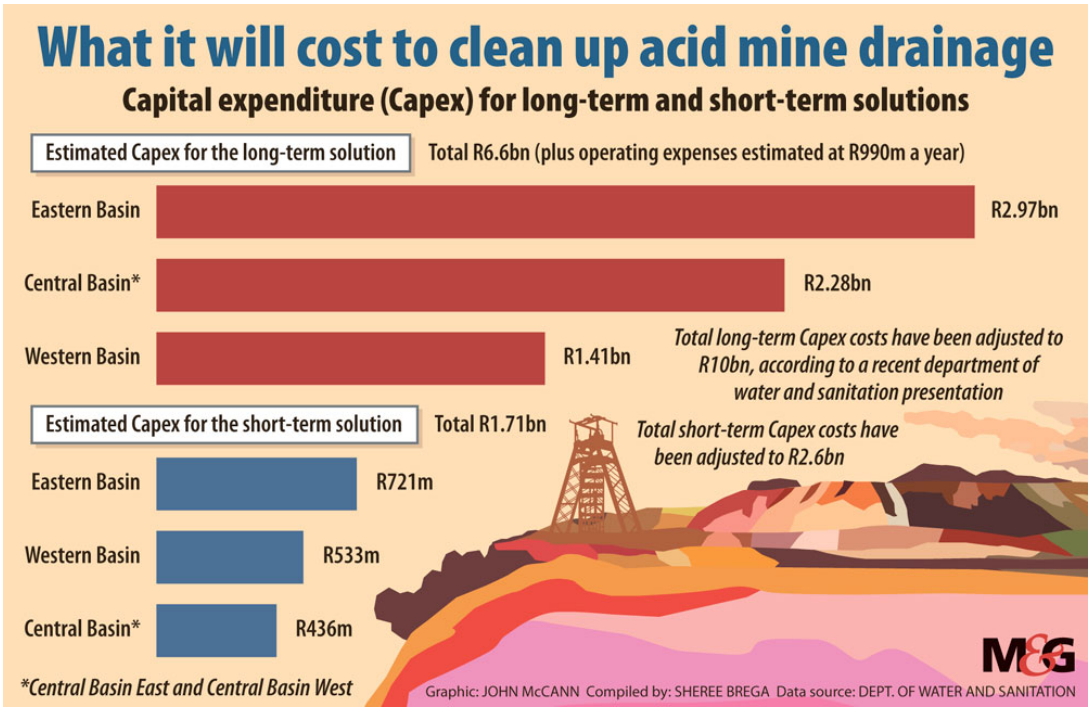

Figure 1-1[1]

Although the 2015 Financial Provisioning Regulations require that sufficient financial provisions must be made for rehabilitation, which includes the pumping and treatment of extraneous water, according to this article, one of the largest problems in the field of acid mine drainage is that the 'polluter pays' principle is not being properly enforced. Either because companies have been liquidated, or the foreign companies have gone on to sell their assets, and the Department of Water and Sanitation is loath to litigate against foreign companies, or the mining companies have gone on to sell to smaller mining companies which cannot afford the environmental liability.[2] This problem is a realistic and practical example of what was concluded in the previous chapter – that the current legislative framework which creates a perpetual liability is simply not sustainable.

In November 2020, Mining Weekly reported that a company called Trailblazer Technologies, a South African development had built a world-class demonstration plant on its premises situated in Krugersdorp, where acid mine water is turned into potable water. According to John Bewsey, the Technical Director of Trailblazer, the system recovers water at a -R2 per cubic metre, in other words, for each cubic metre of water the Trailblazer recovers, the company makes R2. Trailblazer's system has received both local and international interest,

[1] 'State halts its R10bn long-term plan to fully treat acid mine water' *Mail & Guardian* 12 June 2021.
[2] *Ibid*.

especially due to its exceptionally high recovery rate of at least 99% of the water, which is a major improvement on any other water recovery process, including reverse osmosis. Reverse osmosis can remove all the dissolved solids but this process delivers excellent water at a very high price while creating a brine that has to be stored forever.[3] Trailblazer's system separates the pollution in the water into cations and anions. In treating 15 megalitres of acid mine drainage a day, the system yields 49 000 tons of high-value potassium nitrate and 24 000 tons of ammonium sulphate. According to Bewsey, the sale of the potassium nitrate pays for the entire process and the company is left with usable water at no cost. Trailblazer's model is to build plants in partnership with funders and enter into contracts with mining companies to treat their acid mine water. The newly developed process can also be used to turn South Africa's considerable sustainable groundwater areas in arid regions into positive agricultural ground.[4]

Coal mines in South Africa mostly produce neutral effluent, which contains sodium sulfate and sodium chloride in large amounts. This effluent is created because the soil layer above all of South Africa's coal mines contains high levels of salt, which is said to have formed when the sea above the coal seam dried up millions of years ago. The process used by Trailblazer removes the acidity from the acid mine drainage by neutralizing it with Soda Ash. The effluent solution is then filtered and fed to an ion exchange plant that removes the cations and the anions. The loaded resins are regenerated using nitric acid for the cations and ammonia for the anions. The sodium nitrate solution is converted in a double decomposition reaction to sodium chloride and potassium nitrate. As sodium chloride is the least soluble salt in the mixture at boiling point, it will precipitate out when the solution is concentrated by evaporation and this is separated in a centrifuge, washed and dried for supply to the industrial market. The remaining solution is then cooled and potassium nitrate crystallizes out. This is centrifuged off, washed and dried, for supply to the hydroponics market. The overall result is that the dissolved solids in the acid mine drainage are converted to useful products, leaving clean and usable water.[5]

In March 2021, Barrick Gold reported that it is ready to go ahead with the mine closure project of the Golden Sunlight Mine[6] in Jefferson County, Montana. According to Barrick, the project involves the reprocessing of tailings to remove and concentrate iron sulphur/pyrite that

[3] Accessed at https://www.tbtech.co.za/knew-process.html, accessed n 29 July 2021.
[4] 'Coal mine on point of turning acid mine drainage into potable water at no cost' *Mining weekly* 23 November 2020
[5] n 3 *supra*.
[6] 'Barrick Gold Corporation announces mine closure project' *Global Mining Review* 24 March 2021.

will then be sold and used in gold production in Nevada. The remaining benign material will then be used to backfill the Mineral Hill pit. Barrick further contends that besides being useful, the removal of the iron sulphide/pyrite will also prevent groundwater pollution.[7]

In October 2021, an article was published stating that Anglo American is considering pumping underground water from flooded mines to use in hydroelectric power installations in South Africa.[8]

[7] 'Barrick sees win-win strategy in Golden Sunlight mine closure project' *Mining.com* 23 March 2021, accessed at https://www.mining.com.
[8] 'Anglo considering supplying SA with hydro power using water from flooded mines' *MiningMX* 13 October 2021, accessed at https://www.miningmx.com/news/energy/47800-anglo-considering-supplying-sa-with-hydro-power-using-water-from-flooded-mines/.

BIBLIOGRAPHY

Primary sources

Treaties and conventions

United Nations Conference on Environment and Development *Agenda 21, Rio Declaration, Forest Principles* (New York, 1992)

Case Law

Agri SA v Minister of Minerals and Energy 2013 (4) SA 1 (CC)

AngloGold Ashanti Limited v Sibanye Gold Limited t/a Sibanye Stillwater & Others, Case No: 12784/2020

BP Southern Africa (Pty) Ltd v MEC for Agriculture, Conservation and Land Affairs 2004 (5) SA 124 (W)

Case concerning the construction of the Gabčikovo-Nagymaros Project (Hungary / Slovakia) (1998) 37 ILM 162

Corporation of Durban v The Trustees of the Mahomedan Mosque and Madressa (1897) 18 NLR 83

Crossfield & Son, Ltd v Crystallizers, Ltd 1925 WLD 216

Director: Mineral Development, Gauteng Region, and Another v Save the Vaal Environment and Others 1999 (2) SA 709 (SCA)

Ezulwini Mining Company (Pty) Ltd v Minister of Mineral Resources and Energy & Others JDR 0052 (GP)

Fuel Retailers Association of Southern Africa v Director-General: Environmental Management, Department of Agriculture, Conservation and Environment, Mpumalanga Province and Others 2007 (6) SA 4 (CC)

Global Environmental Trust and Others v Tendele Coal Mining (Pty) Ltd & Others [2019] 1 All SA 176 KZP

Harmony Gold Mining Co Ltd v Regional Director, Free State Department of Water Affairs and Others 2014 (3) SA 149 (SCA)

Harmony Gold Mining Co Ltd v Regional Director, Free State Department of Water Affairs, unreported decision, North Gauteng High Court, Case No 68161/2008, 26 June 2012

Hichange Investments (Pty) Ltd v Cape Produce Company (Pty) Ltd t/a Pelts Products and Others 2004 (2) SA 393 ECD

Retief v Louw 1874 4 Buch 165

Trojan Exploration Co (Pty) Ltd and Another v Rustenburg Platinum Mines Ltd and Others 1996 (4) SA 499 (A)

Union Government (Minister of Railways and Harbours) v Rumsey's Executors 1913 AD 192

Statutes

The Cape Statute Law Revision Act 25 of 1934

The Cape Statute Law Revision Amendment Act 32 of 1939

The Constitution of the Republic of South Africa 1996

The Expropriation Act 64 of 1975

The Financial Provisioning Regulations 2015 published in Government Notice 1540, Government Gazette 19519.

The Marine Living Resources Act 18 of 1998

The Minerals Act 50 of 1991

The Mineral and Petroleum Resources Development Act 28 of 2002

The Mineral and Petroleum Resources Development Amendment Act 49 of 2008

The Mineral and Petroleum Resources Development Regulations published in GN R527 in GG 26275.

The National Environmental Management Act 107 of 1998

The National Environmental Laws Amendment Act 25 of 2014

The National Environmental Management Amendment Act 2 of 2022

The National Water Act 36 of 1998

The Orange Free State Law Revision Act 33 of 1936

The Pre-Union Statute Law revisions Acts 78 of 1967, 44 of 1968, 42 of 1970, 36 of 1976 and 43 of 1977

Secondary sources

Books

CB Prest, *Interlocutory interdicts,* (Juta & Co Ltd, 1993)

DH Meadows, DL Meadows, J Randers & WW Behrens, *The limits to growth: A report for the club of Rome's project on the predicament of mankind*, (Universe Books, New York, 1972)

D Worster, *The wealth of nature: environmental history & ecological imagination* (1993)

F Dodds, M Strauss & M Strong, *Only one earth: The long road via Rio to sustainable development* (Routledge, 2012)

F Herbert, *Dune* (Hadder & Stoughton, 1965)

Hahlo & Kahn, *SA Legal System & its Background* (Juta & Co Ltd, 1968)

HA Strydom, ND King & FP Retief, *Fugle & Rabie Environmental management in South Africa* (Juta, 2018)

Herbstein and Van Winsen, *Civil Practice of the High Courts and Supreme Court of Appeal of South Africa 5th ed* (Juta, 2009)

I Currie & J de Waal, *The bill of rights handbook, 5th Ed*, (Juta & Co Ltd, 2005)

J Glazewski, *Environmental Law in South Africa 2nd Ed* (LexisNexis Butterworths, Durban, 2005

L du Plessis, *Re-interpretation of Statutes*, (LexisNexis, 2002)

L Fuller, *The morality of law*, (Yale University Press, 1964)

M Dale *et al*, *South African Mineral and Petroleum Law*, (LexisNexis, 2005)

M Ryan *Geometry for dummies 2nd Ed* (Wiley Publishing Inc, 2007)

SA Roosa, *Sustainable Development Handbook 2nd Ed*, (The Fairmont Press Inc, 2010)

Oxford English Dictionary 3rd Ed (Oxford University Press, 2005)

Book chapters

Cordes J 'Normative and Philosophical Perspectives on the Concept of Sustainable Development' in Otto JM and Cordes J (*eds*) *Sustainable development and the future of mineral investment* (2000)

Jacobs JA & Testa SM 'Acid drainage and sulphide oxidation: Introduction', in Jacobs, Lehr & Testa (*eds*), *Acid Mine Drainage, Rock Drainage and Acid Sulfate Soils: Causes, Assessment, Prediction, Prevention and Remediation* (John Wiley & Sons Inc, 2014); Chapter 1.

Jacobs JA & Vance 'Biochemistry of Acid Drainage' in Jacobs, Lehr & Testa (*eds*), *Acid Mine Drainage, Rock Drainage and Acid Sulfate Soils: Causes, Assessment, Prediction, Prevention and Remediation* (John Wiley & Sons Inc, 2014); Chapter 3.

Kidd MA 'Environmental Management' in Joubert WA, Faris JA & Harms LTC (*eds*), *The Law of South Africa 3rd Ed Volume 17* (LexisNexis, Durban, 2018).

Minnaar A 'Water Pollution and Contamination from Gold Mines: Acid Mine Drainage in Gauteng Province, South Africa' in Eman K, Meško G, Segate L, Migliorini M (*eds*), *Water, Governance and Crime Issues*, (Springer, Cham 2020); Chapter 12.

Mujuru M; Mutanga, S & Dyosi Z 'Formation of acid mine drainage', S Mutanga & M Mujuru (*eds*) *Management and mitigation of acid mine drainage in South Africa: Input for mineral beneficiation in Africa* (Africa Institute of South Africa 2016); Chapter 3.

Schwartz P 'Polluter Pays Principle' in Fitzmaurice M, Ong D, Merkouris P (*eds*), *Research Handbook on International Environmental Law* (Oxform University Press, 2015); Chapter 12.

Van den Bergh JCJM & Van der Straaten J 'The significance of sustainable development for ideas, tools and policy', JCJM van den Bergh & J van der Straaten (*eds) Toward sustainable development: Concepts, methods and policy* (Island Press, Washington DC & California 1994); Chapter 1.

Journal articles

Berke PR & Manto-Conroy M 'Are we planning for sustainable development? An evaluation of thirty comprehensive plans' (2002) *Journal of the American Planning Association* 66(1)

Blackmore, A 'The relationship between NEMA and the Public Trust Doctrine: the importance of the NEMA principles in safeguarding South Africa's biodiversity' (2015) *South African Journal of Environmental Law and Policy*.

Couzens, ED 'Expropriation as a weapon for environmental protection in South Africa' (2010) 127(1) *South African Law Journal* 18 – 29.

Dawe, NK & Ryan KL 'The faulty three-legged stool model of sustainable development' (2003) Vol 17, No 5 *Conservation Biology* 1458 – 1460.

Du Pisani, JA 'Sustainable development – historical roots of the concept' (2006) 3(2) *Environmental Sciences* 83 – 96.

Feris, L 'The public trust doctrine and liability for historic water pollution in South Africa', 8/1 *Law, Environment and Development Journal* (2012) 1 – 18.

Haughton G 'Environmental justice and the sustainable city' 18 *Journal of Planning Education & Research* (1999) 235 – 237.

Holden E, Linnerud K & Banister D 'Sustainable development: Our common future revisited' (2014) 26 *Global Environmental Change* 130 – 131.

Humby Tracy-Lynn, 'The spectre of perpetual liability for treating acid water on South Africa's goldfields: Decision in Harmony II' (2013) 31 *Journal of Energy and Natural Resources Law* p. 453 - 466

Hundloe T, 'Sustainable development: environmental limits and the limits of economics', (Australian Development Studies Network, Australian National University, 1992) sourced from openresearcch-respoistory.anu.edu.au.

Johnson DB & Hallberg KB, 'Acid mine drainage remediation options: review' (2005) 338 *Science of the total environment* 3 – 14.

Johnson DB & Hallberg KB, 'Microbiology of a wetland ecosystem constructed to remediate the drainage from a heavy metal mine' (2005) 338 *Science of the total environment* 53 - 66.

McCarthy, TS 'The impact of acid mine drainage in South Africa' (2011) 107(5/6) *South African Journal of Science*.

Moore, FC 'Toppling the tripod: sustainable development, constructive ambiguity, and the environmental challenge' (2011) 5 *Consilience Columbia University* 141 - 150

Repetto, R 'Population and Development Review' (1985) Vol 11, No.4 *JSTOR*

Simate GS & Ndlovu S 'Acid mine drainage: Challenges and opportunities' (2014) 3 *Journal of Environmental Chemical Engineering*.

Truta Rm, Bråhaita ID, Pop CI, Baciu C & Popita G, 'Batch experiment to test the limestone treatment on two types of acid mine water' (2017) Faculty of Environmental Science and Engineering, Babes-Bolyai University, Romania, Volume 9, Issue 11 *AES Bioflux* 92 – 98

Van Tonder DM, Coetzee H, Esterhuyse S, Msezane N, Strachan L, Wade P, Mafanya T, Mudau S 'South Africa's challenges pertaining to mine closure – The concept of Regional and Mining Closure Strategies', (2008) AB Fourie, M Tibbett, IM Weiersbye, PJ Dye (eds.) Australian Centre for Geomechanics, *The University of Western Australia* 87 – 98.

Viljoen G, Rantlo J & Du Plessis W 'Notes on the legal liability of mining companies for the pumping of extraneous water from defunct underground workings: Legal uncertainties illustrated by Ezulwini Mining Company Pty Ltd v Minster of Mineral Resources and Energy [2021] ZAGPPHC 4' (2022) *Obiter*.

Welch D & Southerton D 'After Paris: transitions for sustainable consumption', (2019) 15:1 *Sustainability: Science, Practice and Policy* 31 – 44.

Whitehead PG & Prior H 'Bioremediation of acid mine drainage: an introduction to the Wheal Jane wetlands project' (2005) 338(1/2) *Science of the total environment* 15 – 21.

Reports/Papers

Allatt B 'Lies and individuation: External and internal authority in the politics and anima of Dune' *Unpublished thesis Texas State University* (2015)

Bosman C & Kotze LJ 'Responsibilities, liabilities & duties for remediation & mine closure under the MPRDA and NWA' *Paper presented at the WISA Mine Water Division, Mine Closure Conference, Randfontein, 6 – 7 April* (2012), sourced through Google Scholar.

Clark WC & Munn RE (eds) 'Sustainable development of the Biosphere' Published on behalf of the International Institute for Applied Analysis (Cambridge University Press New York & Melbourne, 1986). Available at https://pure.iiasa.cic.at/id/eprint/2751/1/XB-86-703.pdf.

Cordes J 'Normative and philosophical perspectives on the concept of sustainable development' in James M. Otto and John Cordes (eds.) Sustainable development and the future of mineral investment (2000) at 1. Available at https://webdocs.unep.org/rest/bitstreams/13309/retrieve (last accessed 17 May 2018).

Johannesburg Principles on the role of law and sustainable development (adopted at the Global Judges Symposium held in Johannesburg, South Africa on 18 0 20 August 2002). Available at https://www.soas.ac.uk/cedep-demos/000_P514)IEL)K3736-Demo/treaties/media/2002%20WSSD%20Joburg%20Principles%20on%20the%20/Role%20of%20Law%20Development.pdf. (last accessed on 31 January 2021).

Liefferink, M 'Selected extracts from South Africa's environmental legislation: Challenges with the management of gold tailings within the Witwatersrand gold fields and case studies' (2019) *Australian Centre for Geosciences*.

Our common future, from one earth to one world (20 March 2987 World Commission on Environment and development) 41. Available at https://sustainabledevelopment.un.org/content/documents/5987our-common-future-pdf. (last accessed 17 May 2018).

The Global 2000 Report, accessed at http://www.jec.senate.gov/reports/96th%20Congress/The%20Global%202000%20Report%20(998).pdf.

The World Conservation Strategy (The Environment and Society Portal, a project of the Rachel Carson Centre for Environment and Society). Available at http://www.environmentandsociety.org. (last accessed on 21 January 2021).

White Paper on Environmental Management Policy, Department of Environment and Tourism. Available at https://www.environemtn.gov.za/sites/default/files/legislations/environmental_management_0.pdf. (Last accessed on 3 February 2021).

World Conservation Strategy: Living resource conservation for sustainable development, prepared by the Union for Conservation of Nature and Natural resources with the advice, cooperation and financial assistance of the United Nations Environment Programme and the World Wildlife Fund (1980). Available at https://earthmind.org/sites/default/files/1980-IUCN-WolrdConservationStrategy_0.pdf.

Online sources

Anglo considering supplying SA with hydro power using water from flooded mines. By David McKay, 13 October 2021, MiningMX. Available at https://www.miningmx.com/news/energy/47800-anglo-considering-supplying-sa-with-hydro-power-using-water-from-flooded-mines/ (Last accessed on 15 January 2022)

Barrick Gold Corporation announces mine closure project. By Jessica Casey, 24 March 2021, Global Mining Weekly. Available at https://www.globalminingreview.com/environment-sustainability/24032021/barrick-gold-corp-annouces-gold-mine-closure-project (last accessed 24 August 2022)

Coal mine on point of turning acid mine drainage into potable water at no cost. By Martin Creamer, 23 November 2020, Mining Weekly. Available at https://www.miningweekly.com/article/coal-mine-on-point-of-turning-acid-mine-drainage-into-potable-water-at-no-cost-2020-11-23/searchString:coal+mine+on+point+of+turning+acid+mine+drainage (last accessed 24 August 2022)

Sibanye Stillwater, *SA Gold Operations.* Available at: https://www.sibanyestillwater.com/business/southern-africa/gold-operations/ (last accessed 19 November 2020).

State halts its R10bn long-term plan to fully treat acid mine water Sheree Bega, Mail & Guardian, 12 June 2021. Available at https://mg.co.za/environment/2021-06-12-state-halts-its-r10bn-long-term-plan-to-treat-acid-mine-water/ (last accessed on 24 August 2022)

Trailblazer Technologies. Available at https://tbtech.co.za (Last accessed on 24 August 2022)

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