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Considering ecological thresholds in the environmental decision-making process – An argument for application of the precautionary principle.

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This mini-dissertation is submitted in partial fulfilment of the requirements for the degree of Master of Laws in Environmental Law

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2025

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ACKNOWLEDGEMENTS AND DEDICATIONS

I dedicate this dissertation to:

1) my wife, Sam, for entertaining endless discussions on dissertation topic ideas, for being a constant source of inspiration and for never letting me rest on my laurels;

2) my mother, Jill, for sacrificing so much to ensure I received a tertiary education, without which this dissertation would not be possible; and

3) my late dog, Luna, for being a loyal study companion.

Thank you to Prof Kidd for all the guidance, support and teaching throughout both this dissertation and the LLM programme in general. I will be forever grateful to you for rekindling my passion for environmental law.

ABSTRACT

As human activities are now the greatest contributor to changes in Earth's systems, the planetary boundaries framework seeks to define key ecological boundaries within which humanity is to develop in order to maintain the planet in a state conducive to planetary wellbeing. Failure to do so presents catastrophic and potentially irreversible consequences for humanity. As uncertainty remains regarding the exact thresholds of the identified ecological systems as well as the consequences associated with surpassing them, the planetary boundaries framework provides for the adoption of a cautious approach through maintaining Earth's systems at the lowest levels of identified risk.

Despite the risks and uncertainty associated with transgressing ecological thresholds, evidence suggests that humanity has exceeded several planetary boundaries. This places critical Earth systems and processes in a zone of increasing and uncertain risk regarding the environmental consequences of human activities. As the planetary boundaries approach views the Earth as a single, complex and interconnected system, it is contended that non-global activities have implications for Earth's systems and processes on a planetary level. Whilst the framework was not designed for direct application to decisions made at a project or activity level, the planetary boundaries framework holds value for decisionmakers insofar as it creates measurable, science-based criteria against which proposed activities can be considered for their effects on the safe operating spaces for humanity.

The consideration of ecological thresholds has not formed an integral part of decision-making at project or activity level. In the course of this dissertation, the case is made for the consideration of ecological thresholds through the application of the precautionary principle of environmental law. South Africa's existing legislative framework obligates decisionmakers to consider and address uncertainty regarding the effects of an activity on the environment. It is argued that this requirement should extend to the impacts of activities on ecological thresholds. Through an analysis of both the interpretation and application of the precautionary principle by South African courts, an attempt is made to conceptualise a practical application of the suggested approach from the perspective of the decisionmaker.

ACRONYMS / ABBREVIATIONS

CO_2	Carbon Dioxide
CCA	Climate Change Act
NEMA	National Environmental Management Act
PPM	Parts per million
UNFCC	United Nations Framework Convention on Climate Change

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CHAPTER 1

INTRODUCTION

I INTRODUCTION

The greatest challenge facing humanity is the need to meet the needs of all whilst maintaining the integrity of Earth's systems.[1] In response to this challenge, the planetary boundaries framework has emerged as a platform that attempts to prescribe biophysical boundaries within which society is to develop in order to maintain Earth's systems and processes in a resilient and accommodating state.[2] Developing beyond these boundaries places key systems and processes at considerable risk of transgressing ecological thresholds beyond which these systems can abruptly transition from the current state, being the stable conditions favourable to life and the well-being of humanity, to a state with potentially devastating consequences.[3]

As it is difficult to pinpoint the exact location of each of the ecological tipping points, the planetary boundaries approach advocates for the adoption of a cautious approach by proposing that these key systems and processes be maintained at the lowest identified level of scientific uncertainty.[4] This translates into the boundaries being set at an appreciable distance from estimates of potential ecological thresholds. The setting of the boundaries at these levels caters for uncertainty associated with these systems and, in addition, provides sufficient time to correct the planet's trajectory before irreversible damage occurs.[5] By seeking to act proactively in the face of scientific uncertainty and to avoid irreversible harm before it is too late, it has been suggested that the planetary boundaries approach is grounded in the

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[1] Kate Raworth 'A Doughnut for the Anthropocene: humanity's compass in the 21st century'(2017) *Lancet Planetary Health* 1(2) e48-e49 at e48.

[2] Will Steffen, Katherin Richardson, Johan Rockström, Sarah E Cornell, Ingo Fetzer, Elena M Bennett, Reinette Biggs, Stephen R. Carpenter, Wim de Vries, Cynthia A. de Wit, Carl Folke, Dieter Gerten, Jens Heinke, Georgina M Mace, Linn M Persson, Veerabhadran Ramanathan, Belinda Reyers and Sverker Sörlin 'Planetary boundaries: Guiding human development on a changing planet' (2015) 347(6223) *Science* 1259855-1.

[3] Juan Carlos Rocha, Reinette Biggs and Garry D Peterson, 'Regime Shifts: What Are They and Why Do They Matter?' (2014) at 1 Available at http://www.regimeshifts.org/datasets-resources/details/15/26 (Accessed 5 February 2025).

[4] Edgar Fernandez Fernandez & Claire Malwe 'The emergence of the 'planetary boundaries' concept in international environmental law: A proposal for a framework convention' (2019) 28(1) *Review of European, Comparative & International Environmental Law* 48-56 at 49.

[5]Andrea Paulillo & Esther Sanye-Mengual 'Approaches to incorporate Planetary Boundaries in Life Cycle Assessment: A critical review' (2024) 17 *Resources, Environment and Sustainability* 1 https://doi.org/10.1016/j.resenv.2024.100169.

precautionary principle of environmental law with the boundaries representing 'buffer zones' within which to manage risks on a planetary scale.[6]

The precautionary principle, which is a fundamental pillar of sustainable development, seeks to address scientific uncertainty as to the impacts of activities on the environment through acting before all the risks and impacts of an activity are understood. [7] Whilst the principle has never required the proponent of an activity to remove all uncertainty regarding the anticipated impacts of a proposed activity on the environment, the principle acknowledges that certain harm to the environment may be irreversible and that measures are to be implemented to avoid or mitigate harm wherever possible.[8] The principle thus aids in balancing developmental needs, from a social and economic perspective, with environmental protection. In assessing the balance between socio-economic development and environmental protection, South Africa's current development pathway demonstrates the favouring of economic development needs over environmental protection at the risk of potentially irreversible consequences.[9]

As activities undertaken at a local level have potential implications for ecological thresholds at both a regional and planetary level, the impacts of such activities on the identified boundaries represent a relevant factor for consideration in the environmental management process. Whilst the planetary boundaries framework was not designed to cater for or aid in the environmental decision-making process at a project or activity level,[10] the framework holds value for decisionmakers as it offers measurable criteria that draws from the best available research regarding the cumulative consequences of human activities on Earth's systems and processes.

This dissertation argues that the incorporation of the precautionary principle into South Africa's legislative framework establishes a legal basis for the consideration of ecological thresholds at a project or activity level. As our knowledge of Earth's systems and processes and the effects of transgressing ecological thresholds is still being developed, it is contended that decisionmakers are mandated to consider the effects of activities on planetary boundaries and to apply precaution when making decisions that have uncertain consequences that cannot be adequately mitigated.[11] The dissertation seeks to achieve this by providing an overview of the

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[6] A Paulillo & E Sanye-Mengual 'Approaches to incorporate Planetary Boundaries' at 1.
[7] Jan Glazewski & Lisa Plit 'Towards the Application of the Precautionary Principle in South African Law' (2015) 26:1 *Stellenbosch Law Review* 190 at 191.
[8] Kidd M *Environmental Law* 2nd ed (2011) at 9.
[9] *Ibid.*
[10] Steffen *et al*. 'Planetary boundaries: Guiding human development on a changing planet' at 1259855-8.
[11] Section 2(4)(vii).

planetary boundaries framework, its development and application; by providing an overview of the precautionary principle, the incorporation of the principle into South Africa's environmental decision-making process, an analysis as to the manner in which our courts have sought to interpret the principle; and, finally, conceptualising the alignment of the precautionary principle with the planetary boundaries approach through a discussion of the facts relevant to the case of *Earth Life Johannesburg v Minister of Environmental Affairs.*[12] Finally, an attempt is made to conceptualise the practical application of the suggested approach from the perspective of the decisionmaker.

II PURPOSE OF STUDY

The purpose of the study is conceptualise a basis for consideration of ecological thresholds or safe operating spaces as part of the environmental decision-making process at a project or activity level under the National Environmental Management Act.[13] This study will focus on whether the precautionary principle of environmental law can be relied upon as a basis for the consideration of the impacts of proposed activities on ecological thresholds.

III RESEARCH QUESTION

The study seeks to determine whether it is possible for ecological thresholds to form part of the environmental decision-making process at a project or activity level through the application of the precautionary principle of environmental law.

IV METHODOLOGY OF THE STUDY

This study has adopted a doctrinal method of study. The study has made use of and has relied upon primary and secondary resources. The information considered for the purposes of this study includes textbooks, case law, journal articles, legislation, internet articles and other sources. The study will also utilise the facts of a case study to which the investigation will

[12] [2017] 2 All SA 519 (GP).
[13] 109 of 1998.

apply. The facts relevant to the case study have been adopted from online newspaper articles and publicly available court documents.

V STRUCTURE OF THE STUDY

The remainder of this dissertation is divided in five chapters:

Chapter 2 introduces the planetary boundaries approach as a framework for 'safe and just' sustainable development. This chapter provides and overview of the framework by detailing the origins of the framework as well as the findings of recent assessments. This chapter will further discuss previous studies undertaken wherein South Africa's development pathway is assessed within the identified local, national and global boundaries. Lastly, the chapter will consider previous attempts to utilise the planetary boundaries framework to review decisions made by competent authorities.

The first part of Chapter 3 provides an outline of the environmental decision-making process in South Africa and the relevant factors to be considering by decisionmakers.

The second part of Chapter 3 provides a brief history and overview of the precautionary principle, the incorporation of the principle into legislative instruments, an analysis as to the different formulations of the principle as well as criticisms of the principle.

Chapter 4 provides an analysis of the way the precautionary principle under NEMA has been interpretation by our courts and considers the alignment of the planetary boundaries framework with the principle.

In conceptualising the basis for utilising the precautionary principle to ecological thresholds in the environmental decision-making processes, chapter 5 considers and applies the facts relevant to *Earth Life Johannesburg v Minister of Environmental Affairs*. A conceptual model for use by decisionmakers is provided.

Chapter 6 details the findings, recommendations and conclusions of the study.

CHAPTER 2

THE PLANETARY BOUNDARIES FRAMEWORK

I OVERVIEW OF THE PLANETARY BOUNDARIES FRAMEWORK

The planetary boundaries framework emerged as a new approach to sustainability in response to the effects of human activities on the Earth's climate and ecosystems.[14] As human activities are considered the largest contributing factor to changes in Earth's systems and processes,[15] the framework sought to define 'safe operating spaces' necessary to maintain the integrity of key systems in a manner conducive to human wellbeing. These 'safe operating spaces' were touted as 'planetary preconditions' that needed to be adhered to in order to avoid harmful or even catastrophic environmental change at continental to global scales.'[16] Operating beyond the safe operating spaces would, in turn, expose each system or process to a 'zone of increasing risk' characterised by potentially irreversible consequences.[17]

In setting the planetary boundaries, nine key Earth system processes were identified on the basis that they were 'scientifically proven to regulate the health of the planet.'[18] Predicting the precise location of each ecological tipping point as well as the effects associated with transgressing these thresholds remains a challenge.[19] This is due to a 'lack of scientific knowledge about nature of biophysical thresholds, the intrinsic uncertainty of how complex systems behave, the ways in which other biophysical processes interact as well as uncertainty regarding the allowed time of overshoot of a critical control variable in the Earth System before

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[14] Johan Rockström, Will Steffen, Kevin Noone, Åsa Persson, F. Stuart Chapin, III, Eric Lambin, Timothy Lenton, Marten Scheffer, Carl Folke, Hans Joachim Schellnhuber, Bjorn Nykvist, Cynthia A De Wit, Terry Hughes, Sander van der Leeuw, Henning Rodhe, Sverker Sörlin, Peter K Snyder, Robert Costanza, Uno Svedin, Malin Falkenmark, Louise Karlberg, Robert W. Corell, Victoria J Fabry, James Hansen, Brian Walker, Diana Liverman, Katherin Richardson, Paul Crutzen & Jonathan Foley 'Planetary boundaries: exploring the safe operating space for humanity' (2009) 14(2) *Ecology and Society* 32 at 33.

[15] Will Steffen, Paul J Crutzen and Johan R McNeill 'The Anthropocene: are humans now overwhelming the great forces of Nature?' (2007) 36(8) *Ambio* 614–621 at 614.

[16] *Ibid.*

[17] *Ibid.*

[18] Levke Caesar, Boris Sakschewski, Lauren Seaby Andersen, Tim Beringer, Johanna Braun, Donovan Dennis, Dieter Gerten, Adrian Heilemann, Jonas Kaiser, Niklas H. Kitzmann, Sina Loriani, Wolfgang Lucht, Josef Ludescher, Maria Martin, Sabine Mathesius, Anja Paolucci, Sofie te Wierik & Johan Rockström (2024) Planetary Health Check Report 2024. Potsdam Institute for Climate Impact Research, Potsdam, Germany. Available at https://www.planetaryhealthcheck.org/storyblok-cdn/f/301438/x/a4efc3f6d5/planetaryhealthcheck2024_report.pdf (Accessed 5 February 2025).

[19] Rockstrom *et al.* 'Planetary Boundaries' at 33.

a threshold is crossed.'[20] In addition, some boundaries carry more uncertainty than others with further research being required to improve our understanding of these systems.[21]

To cater for the limitations to our knowledge of biophysical thresholds, the planetary boundaries were set at an appreciable distance away from the estimated position of ecological thresholds following a scientific-based assessment of each system or process.[22] The intention behind the setting of the planetary boundaries at these levels was to afford humanity a sufficient buffer within which to redirect the current trajectory and to avoid the potentially irreversible harm associated with exceeding a tipping point.[23] The 'safe zones' within which the framework requires humanity to operate are thus informed by the best available scientific evidence and reflect levels which demonstrate a 'low probability of crossing a critical threshold or substantially eroding the resilience of the Earth system.'[24] The planetary boundaries framework thus provides for a cautious approach by proposing to maintain Earth's systems or processes at the lowest identified level of scientific uncertainty.[25]

Nine earth systems processes were identified as part of the initial planetary boundaries framework published in 2009.[26] These were that of Climate Change, Ocean Acidification, Stratospheric Ozone, Global Phosphorus and Nitrogen Cycles, Atmospheric Aerosol Loading, Freshwater Use, Land Use Change, Biodiversity Loss and Chemical Pollution. [27] For each system or process, the framework established a control variable for assessment, a threshold or state to be avoided and a planetary boundary necessary to be maintained in order avoid an ecological tipping point.[28] In proposing the planetary boundaries, Rockstrom *et al*. acknowledged the existence of varying degrees of understanding regarding each of the identified systems and considered both the availability of scientific evidence concerning each system or process as well as the consequential challenges associated with setting a corresponding planetary boundary. Consequently, it was only possible to quantify three

[20] Rockstrom *et al.* 'Planetary Boundaries' at 34.
[21] *Ibid* at 39.
[22] A Paulillo & E Sanye-Mengual 'Approaches to incorporate Planetary Boundaries' at 1.
[23] *Ibid.*
[24] Steffen *et al*. 'Planetary boundaries: Guiding human development on a changing planet' at 1259855-7.
[25] EF Fernandez & C Malwe 'The emergence of the 'planetary boundaries' concept in international environmental law' at 49.
[26] Rockstrom *et al.* 'Planetary Boundaries' at 32.
[27] Stockholm Resilience Centre 'Planetary Boundaries' Available at https://www.stockholmresilience.org/research/planetary-boundaries.html (Accessed on 9 November 2024).
[28] *Ibid.*

boundaries with a degree of confidence when the initial planetary boundaries framework was proposed.[29]

Whilst the exact position of the boundary is debated, the Climate Change planetary boundary represented a planetary boundary which *could* be quantified with a degree of confidence. The confidence in setting this planetary boundary arose due to the considerable body of scientific evidence underpinning our knowledge and understanding as to the underlying causes of Climate Change as well as consensus as to the effects associated with transgressing its associated threshold.[30]

Utilising the Climate Change planetary boundary as an example as to how the planetary boundaries were proposed, Rockstrom *et al*. considered atmospheric CO_2 concentrations due to their effects on the global mean surface temperature.[31] As a consequence, the planetary boundary was set at a global atmospheric CO_2 concentration of 350ppm as this level corresponded to a global mean surface temperature increase of 1°C above pre-industrial levels. According to Rockstrom *et al*., maintaining the system at this level significantly reduced the risk and uncertainty associated with transgressing an ecological tipping point. Operating below a global atmospheric CO_2 concentration of 350ppm thus represented the safe operating space within which humanity was required to develop to maintain the integrity of the system. Beyond this value represented a 'zone of uncertainty' wherein the consequences of human activities on the environment were increasingly uncertain and characterised by potentially irreversible changes to the functioning of Earth's systems.[32]

Setting the planetary boundaries for climate change at 350ppm of atmospheric CO_2 concentrations thus represents a cautious and precautionary approach towards the identified system which seeks to avoid the potentially catastrophic effects that exceeding an ecological tipping point may have on humanity. Whilst the precise tipping point of the system is unknown and coupled with the fact that the international community has sought to accommodate a higher global mean surface temperature increase,[33] evidence as to the irreversible damage associated

[29] Rockstrom *et al.* 'Planetary Boundaries' at 52.
[30] *Ibid* at 39.
[31] *Ibid*.
[32] Steffen *et al*. 'Planetary boundaries: Guiding human development on a changing planet' at 1259855-3.
[33] Reference is made to the Paris Agreement which sets the target for global mean surface temperature at 1.5°C above pre-industrial levels. https://unfccc.int/sites/default/files/resource/parisagreement_publication.pdf

with crossing the tipping point favours the setting of the boundary at the lowest level of identified risk.[34]

II ASSESSMENT OF EARTH'S SYSTEMS AND PROCESSES

In 2009, seven of the identified planetary boundaries were assessed with three quantifiable boundaries considered to have been exceeded.[35] In a subsequent assessment conducted in 2015, the nine boundaries were refined,[36] seven of the identified planetary boundaries were assessed with four boundaries having have been traversed.[37] Most recently and in 2023, a further assessment was undertaken wherein all nine identified planetary boundaries were quantified and assessed for the first time.[38] This assessment revealed that six of the nine boundaries have already been surpassed.[39]

The findings of the most recent assessment indicates that human activities have resulted in the planet operating within the 'zone of uncertainty' in respect of most of the systems and processes that are critical to human wellbeing, and which form the foundation upon which socio-economic development is to be achieved. Referring to the example of the Climate Change planetary boundary, the 2023 assessment demonstrated that the current atmospheric CO_2 concentrations were recorded at 417ppm which represented a value 67ppm above the defined planetary boundary of 350ppm and 137ppm above the Preindustrial Holocene base value.[40] Furthermore, the current levels indicated that humanity was approaching the value supplied for the 'upper end of zone of increasing risk' of 450ppm; a zone characterised by considerable uncertainty associated with crossing ecological thresholds and the potentially irreversible consequences associated therewith.[41]

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[34] K Richardson, W Steffen, W Lucht, J Bendtsen, S E. Cornell, J F. Donges, M Druke, I Fetzer, G Bala, W von Bloh, G Feulner, S Fiedler, D Gerten, T Gleeson, M Hofmann, W Huiskamp, M Kummu, CMohan, D Nogues-Bravo, S Petri, M Porkka, S Rahmstorf, S Schaphoff, K Thonicke, A Tobian, VVirkki, L Wang-Erlandsson, L Weber, Jo Rockstrom 'Earth beyond six of nine planetary boundaries' (2023) 9 *Science Advances* 1 at page 2.

[35] Rockstrom *et al.* 'Planetary Boundaries' at 33. The planetary boundaries identified as having been crossed were Biosphere Integrity, Climate Change and Biogeochemical flows.

[36] The planetary boundaries were recorded as being biosphere integrity, climate change, novel entities, stratospheric ozone depletion, atmospheric aerosol loading, ocean acidification, biochemical flows, freshwater use, and land-system change.

[37] Steffen *et al* 'Planetary boundaries: Guiding human development on a changing planet' at 1259855-4-5.

[38] Stockholm Resilience Centre Website 'Planetary Boundaries' Available at https://www.stockholmresilience.org/research/planetary-boundaries.html (Accessed 23 December 2024).

[39] Richardson *et al*. 'Earth beyond six of nine planetary boundaries' at 2.

[40] *Ibid* at 5.

[41] Steffen *et al*. 'Planetary boundaries: Guiding human development on a changing planet' at 1259855-3.

III APPLICATION OF THE PLANETARY BOUNDARIES FRAMEWORK

By providing a scientific framework within which humanity was to develop, the planetary boundaries framework was intended to employ a 'top-down' approach by guiding policymakers in developing regulations necessary to maintain the integrity of Earth's systems in a manner conducive to human wellbeing. The best example as to the practical implementation of 'planetary boundaries' thinking in action can be seen regarding the conclusion of the Paris Agreement.

The Paris Agreement, being a legally binding international treaty on climate change, seeks to halt and reverse the effects of climate change by ensuring the increase in the global average temperature is held to well below 2°C above pre-industrial levels and that efforts are pursued 'to limit the temperature increase to 1.5°C above pre-industrial levels.'[42] Whilst the temperature goals specified by the Paris Agreement exceeds the safe operating space for humanity defined in the planetary boundaries framework in respect of atmospheric CO_2 concentrations, the Paris Agreement reflects an acceptance as to the single, complex and integrated nature of Earth's systems on a planetary level and, furthermore, demonstrates consensus amongst the international community as to the acceptable levels of risk in balancing developmental needs with environmental protection.

South Africa, as a signatory to the Paris Agreement, has responded to the goals of the Paris Agreement through the passing of the Climate Change Act (CCA).[43] The CCA represents the measures to be adopted by South Africa in meeting the requirements stipulated by the United Nations Framework Convention on Climate Change (UNFCC), the Paris Agreement and any other global climate change agreement under the UNFCC.[44] South Africa seeks to meets its obligations under the Paris Agreement by *inter alia* establishing a national greenhouse gas emissions trajectory[45] and sectoral emissions targets[46] which align with the country's national trajectory. The national trajectory is required to specify a national greenhouse gas emissions reduction objective which is to be represented by quantitative description of the total amount of greenhouse gas emissions projected to be emitted during a specified period.[47] The

[42] United Nations Climate Change 'The Paris Agreement' Available at https://unfccc.int/process-and-meetings/the-paris-agreement (Accessed 6 June 2024).
[43] 22 of 2024.
[44] Section 2.
[45] Section 24.
[46] Section 25.
[47] Section 24(2)(a).

intention is for the national trajectory to be reviewed every five years or when necessary in light of monitoring and evaluation results, technological advances, the best available science, evidence or information or constraints and opportunities experienced in the implementation of policies and measures.

Of relevance from a domestic perspective is the need for policy alignment. In this regard, the CCA requires:

> (1) Every organ of state that exercises a power or performs a function that is affected by climate change, or is entrusted with powers and duties aimed at the achievement, promotion and protection of a sustainable environment, must review and if necessary revise, amend, coordinate and harmonise their policies, laws, measures, programmes and decisions in order to—
> (a) ensure that the risks of climate change impacts and associated vulnerabilities are taken into consideration; and
> (b) give effect to the principles and objects set out in this Act.

IV SHORTCOMINGS OF PLANETARY BOUNDARIES FRAMEWORK AND INCORPORATION OF SOCIAL CONSIDERATIONS

Whilst the planetary boundaries approach defines the ecological thresholds that are considered prerequisites for thriving societies around the world, the approach does not propose a method by which to meet societal needs within the confines of the ecological limits.[48] In addition, the framework does not account for the underlying basis or causation of transgressions of planetary boundaries, the associated and unequitable distribution of wealth benefits as well as future causes and effects.[49] Whilst there is undoubtedly the need to engage in discussions regarding these issues, this is beyond the scope of this dissertation. Irrespective of the causes and effects, maintaining the integrity of ecological systems relies upon an acceptance as to the current state of the ecological systems and a collective commitment to work together for the well-being of humanity.

The planetary boundaries framework was later expanded through an assessment of social boundaries that needed to be achieved within the ecological confines of the safe operating spaces for humanity. Accepting that large portions of the global population are deprived of

[48] Steffen *et al*. 'Planetary boundaries: Guiding human development on a changing planet' at 1259855-6.
[49] *Ibid*.

essential social needs, Raworth identified twelve social boundaries for assessment.[50] These boundaries were derived from the Sustainable Development Goals (SDGs) as the SDGs represented a consensus amongst the international community as to the minimum social standards to be achieved by 2030. In assessing social wellbeing, Raworth considered the degree to which the global population were deprived of the social boundaries considered essential for human wellbeing.[51] Realisation of the social boundaries was achieved where no persons were deprived of these essential human needs.

The framework proposed by Raworth resembles a 'doughnut shape' through the setting of an 'ecological ceiling', established through the planetary boundaries identified by Rockstrom *et al*. that are not to be transgressed, and a 'social floor' for development, representing the percentage of the population deprived from basic social needs. The revised framework, being a measure as to the achievement of social wellbeing and development within ecological limits, therefore provides for both environmentally safe and socially just spaces for human existence.

V SOUTH AFRICA'S SAFE AND JUST OPERATING SPACES

The planetary boundaries framework was never intended to be downscaled for use at a local or national level.[52] Despite this, there has been a recognition as to the benefits associated with an integrated approach towards planetary boundaries through the consideration of the boundaries at a national, basin or regional levels.[53] This, it is contended, represents the levels at which policy action occurs most often.[54] Recognising the value to be played in the quantification of boundaries at a national level, Cole, Bailey and New[55] attempted to utilise a downscaled framework for safe and just operating spaces, which included 20 social indicators and boundaries,[56] to assess whether South Africa's development pathway was sustainable.

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[50] The twelve boundaries that were identified were food security, water and sanitation, health care, education, income and work, peace and justice, political voice, social equity, gender equality, housing, networks, and energy.
[51] Megan J Cole, Richard M Bailey & Mark G New 'Tracking sustainable development with a national barometer for South Africa using a downscaled "safe and just space" framework' (2014) *PNAS* E4399-4408 at E4399.
[52] Steffen *et al*. 'Planetary boundaries: Guiding human development on a changing planet' at 1259855-8-9.
[53] *Ibid* at 1259855-8.
[54] *Ibid.*
[55] Cole *et al.* 'Tracking Sustainable Development' at E4399.
[56] The identified indicators that formed part of the assessment were Climate change, Ozone depletion, Freshwater use, Arable Land Use, Nutrient Cycle, Biodiversity Loss, Marine Harvesting, Air Pollution, Chemical Pollution, Energy, Water, Sanitation, Housing, Education, Health care, Voice, Jobs, Income, Household goods, Food security and Safety.

Through the utilisation of the best available scientific data, the assessment sought to consider dimensions and indicators of environmental stresses, as derived from the planetary boundaries framework, as well as dimensions and indicators as to the social deprivation of South African citizens, as derived from Raworth's refined framework for safe and just operating spaces. In the assessment of environmental stresses for South Africa, the current state of the environmental stress was considered against a defined boundary for the purposes of determining the proximity to the boundary. Each dimension was assigned an indicator, such as that of annual direct CO_2 emissions in respect of the climate change dimension, as well the current value of the indicator. The data source for the value of the indicator was specified as well as the as well as a confidence level being ascribed to the value.

Through a quantifiable analysis as to the proximity of indicator values to the defined thresholds and changes in deprivation of social indicators, the assessment revealed unacceptable levels of social deprivation of fundamental as well as considerable environmental risks associated with South Africa's current development pathway.[57] At the time of the assessment in 2014, South African was assessed to have exceeded boundaries in relation to climate change, freshwater use, marine harvesting and biodiversity loss.[58] Furthermore, the stresses associated with climate change and freshwater use were continuing to increase.

VI INCORPORATING PLANETARY BOUNDARIES APPROACH IN DEVELOPMENT OF JUDICIAL REVIEW

Building upon the planetary boundaries framework and the national barometer for sustainability, Humby considered the utilisation of the planetary boundaries framework as a mechanism to assist in reviewing the actions of the state in relation to the environmental right.[59] In developing her proposal for the utilisation of the ecological thresholds as a model for reasonableness review, Humby analysed the normative nature of the section 24 environmental right and argued that the right differed materially from other socio-economic rights on account of the complexities and multi-dimensional nature of the right.[60] This contention stemmed from

[57] Cole *et al.* 'Tracking Sustainable Development' at E448.
[58] *Ibid* at 6. The safe boundaries at the time were assessed to have exceeded the safe operating spaces by 2%, 34%, 45% and 37% respectively.
[59] T Humby 'The right to development-in-environment and its ecological and developmental thresholds' (2016) 32(2) *South African Journal on Human Rights* 219–247.
[60] *Ibid.*

the environmental right conferring both positive[61] and negative[62] obligations which was potentially problematic on account of the potential for internal conflicts to arise. An example of this was demonstrated through section 24(a) conferring a negative obligation upon the state to refrain from taking action which results in environmental harm to health or well-being, whilst at the same time conferring a positive obligation to ensure South Africans are progressing towards an environment that is both conducive to the health and wellbeing of its citizens.[63]

The potential for internal conflicts rendered the traditional review models of reasonableness and a limitations analysis ill-equipped in dealing with decisions that impacted upon the environmental right. In turn and with reference to the planetary boundaries approach, she argued that ecological thresholds could be utilised as the foundation for the development of a reasonableness review under section 24.[64]

Through reference to the national barometer of environmental stress and social deprivation for South Africa undertaken by Cole, Bailey and New,[65] Humby argued that development which fails to ensure the integrity of natural systems and overlooks the identified limits does not represent development which is ecologically sustainable or justifiable from a socio-economic perspective.[66] In her view, socio-economic development could only be deemed justifiable in instances where such development acts towards the realisation of an environment not harmful to health and wellbeing.[67]

The theoretical basis for the development of the model of reasonableness review proposed by Humby is to be commended. However, the development of a new model for review that includes consideration of ecological thresholds presents several challenges. Chief amongst these challenges is that the model requires an advanced understanding of the environmental right and its *sui generis* nature. Decisions emanating from our courts point to the environmental

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[61] Reference to the positive obligations provided for in section 24 refers section 24(b) insofar as it confers the right of to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that
i. prevent pollution and ecological degradation;
ii. promote conservation; and
iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

[62] Reference to the negative obligations is made with reference to section 24(a) insofar as it confers a right to an environment that is not harmful to their health or well-being.

[63] Humby 'The right to development-in-environment' at 220.

[64] *Ibid* at 242-244.

[65] Cole *et al.* 'Tracking Sustainable Development'.

[66] Humby 'The right to development-in-environment' at 243.

[67] *Ibid.*

right still being interpreted in a manner consistent with other socio-economic rights insofar as it is believed to display distinctly positive and negative obligations. In support of this contention, the court in *HTF Developers (Pty) Ltd v The Minister of Environmental Affairs*[68] held that:

> Section 24(a) entrenches the fundamental right to an environment not harmful to health or well-being, whereas s 24(b) is more in the nature of a directive principle, having the character of a so-called second-generation right imposing a constitutional imperative on the State to secure the environmental rights by reasonable legislation and other measures.

Furthermore, the court in *Trustees for the time being of Groundwork Trust and Another v Minister of Environmental Affairs and Others*[69] held that section 24 established 'distinct rights, with a basic set of unqualified, immediately realisable entitlements.'[70] Such an interpretation of section 24(a) was 'reinforced by the principle that the 'negative' component of all socio-economic rights – the right to be free from interferences in the enjoyment of that right – is always unqualified and is not subject to any requirements of reasonableness'.[71] As to whether residents have a right to a safe and health environment here and now, the court went on to state that 'any denial of the section 24(a) right is a limitation which can only be permitted if it is authorised by a law of general application and passes the strict section 36 justification analysis.'[72]

These decisions indicate that we have a lengthy intellectual pathway to walk regarding our understanding of the section 24 environmental right. Considering the fundamental importance of this understanding to the review model proposed by Humby, considerable jurisprudential development will be needed before we will be able to adopt a reasonableness review that incorporates ecological thresholds. Considering the need for urgent action to address the threats posed by human activities on the environment, an approach which considers the basis for consideration of ecological thresholds within our existing legislative framework may provide for more immediate solutions.

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[68] 2006 (5) SA 512 (T) at para 17.
[69] (39724/2019) [2022] ZAGPPHC 208 (18 March 2022).
[70] Para 37.
[71] Para 38.
[72] Para 39.

VII BENEFITS OF INCORPORATING PLANETARY BOUNDARIES THINKING INTO DECISION-MAKING AT A PROJECT OR ACTIVITY LEVEL

The planetary boundaries framework was intended to inform policy consideration at a planetary level through viewing the planet as a single, complex and interconnected system.[73] For the science underpinning the planetary boundaries framework to be useful in a policy context, sufficient time is needed to allow humanity to steer away from ecological thresholds through implementing fundamental changes to the way in which we interact with the environment.[74] However, policy that serves to maintain the integrity of Earth's systems has no value where these systems are already irreversibly degraded. Implementation of policy is a characteristically slow process. If it is to be accepted that the planetary boundaries framework influenced the outcomes of the Paris Agreement, a period of seven years elapsed between the publishing of the initial planetary boundaries framework in 2009 and the incorporation of 'planetary boundaries thinking' into the Paris Agreement in 2016. From the perspective of South Africa, a further eight years passed before the policy filtered down to a national level through the passing of the CCA. Whilst the adoption of 'planetary boundaries thinking' appears to be gaining momentum, implementation through a top-down policy approach may simply be too slow to ensure sufficient time for humanity to respond before irreversible consequences arise.

Whilst it was not the intention for the framework to be divided proportionately between countries or scaled down for use at a regional or local level.[75], the incorporation of ecological thresholds into decision-making at a local level caters for the implementation of the science underpinning the framework at a greatly expedited rate when compared to implementation through policy. In addition, it allows decisionmakers to consider activities for their effects on global and regional boundaries which represents a holistic approach to environmental management.

By utilising the best available scientific evidence to determine the boundaries applicable to South Africa, the national barometer for sustainability effectively created a quantifiable metric by which to assess the sustainability of South Africa's development pathway. This is possible on account of the barometer containing tangible values which we can use to assess

[73] Steffen *et al*. 'Planetary boundaries: Guiding human development on a changing planet' at 1259855-8.
[74] *Ibid* at 2.
[75] *Ibid* at 8.

how effectively the country is balancing environmental protection against developmental needs of its citizens.

Whilst the intention was for the sustainability assessment to guide policy at a national level, the creation of a tangible and quantifiable boundaries holds value where decisionmakers are faced with activities that have potential implications for these boundaries. If the climate change boundary or dimension is considered for this purpose, the national boundary is concerned with the setting of a limit of CO_2 emissions per annum. As activities which purport to emit CO_2 will have a bearing on the value on this limit, this scientifically defined boundary should feature as part of the environmental authorisation process as it serves to realise ecologically sustainable development and to ensure an environment not harmful to the health and wellbeing of society. This is particularly relevant considering the national barometer for South Africa demonstrates that the current development pathway positions the country in a zone of increasing risk which, in turn, carries the potential for irreversible ecological consequences. Establishing a basis for the consideration of ecological thresholds in the environmental decision-making is thus of crucial importance to ensure development takes place in an ecologically sustainable manner.

By seeking to ensure that Earth's systems and processes are maintained at the lowest levels of scientific risk, the framework seeks to acknowledge the threats of irreversible harm and the need to prevent such harm through preventative measures. The boundaries thus represent the preventative measures necessary to address the uncertainty regarding the impacts on human activities on the environment. Consequently, the framework aligns with the precautionary principle of environmental law which aids decisionmakers in managing risk, preventing irreversible harm and catering for scientific uncertainty. As the precautionary principle forms part of the environmental decision-making process, it is argued through the remaining chapters that the precautionary principle represents the conceptual basis for the consideration of ecological limits at a project or activity level.

CHAPTER 3

OVERVIEW OF THE ENVIRONMENTAL DECISION-MAKING PROCESS, THE PRECAUTIONARY PRINCIPLE AND THE ALIGNMENT OF THE PLANETARY BOUNDARIES APPROACH

I RELEVANT FACTORS FOR CONSIDERATION IN THE ENVIRONMENTAL DECISION-MAKING PROCESS IN SOUTH AFRICA

In conceptualising the theoretical basis for the consideration of ecological thresholds in the environmental decision-making process through application of the precautionary principle, it is necessary to provide an overview of the current decision-making framework and the factors that need to be taken into account by decisionmakers.

The principle of sustainable development has been incorporated under section 24 of the Constitution of the Republic of South Africa, 1996 ('the Constitution') insofar as it confers a right upon citizens to have the environment protected for the benefit of both present and future generations, for the promotion of 'ecologically sustainable development' and in the use of natural resources in a manner that is both socially and economically justifiable.[76] In seeking to give effect to the environmental right, the National Environmental Management Act (NEMA)[77] represents the framework environmental legislation which details *inter alia* the mechanisms to be employed to ensure development is socially, environmentally and economically sustainable.[78] NEMA defines 'sustainable development' to be 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.'[79]

In integrating social, economic and environmental factors into the decision-making process, decisionmakers are required to balance competing needs and interests in order to realise the 'best practical environmental option'.[80] The best environmental option is the option that 'provides the most benefit or causes the least damage to the environment as a whole, at a

[76] Section 24(b)(iii).
[77] 107 of 1998.
[78] Long title of NEMA as amended by section 3 of Act no. 56 of 2002 and substituted by section 13 of Act no. 46 of 2003.
[79] Section 1 definitions.
[80] Section 2(4)(b).

cost acceptable to society, in the long term as well as in the short term.'[81] Achieving the best environmental option is catered for through a holistic and integrated approach towards decision-making that takes into account all relevant factors in the decision-making process. This integrated approach, referred to as Integrated Environmental Management, forms the basis of the environmental decision-making process in South Africa through the utilisation of tools designed to ensure that potential and actual consequences of activities are considered, investigated, assessed and reported to the relevant decision-making authority to allow for an informed decision to be made regarding a proposed activity.[82]

In arriving at a decision regarding a proposed activity, the primary objective of the decisionmaker is to ensure all relevant factors are considered.[83] These factors include a suite of environmental management principles which underpin the concept of sustainable development.[84] These principles include *inter alia* the precautionary principle, the preventative principle, the polluter pays principle as well as the duty of care to avoid harm to the environment. In assessing the role of the environmental management principles in the environmental decision-making process, the court in *Endangered Wildlife Trust and Another v Director General: Department of Water and Sanitation (Acting) and Another*[85] held that the principles:

> …do not constitute a checklist for ticking of each requirement that a proposed development has to comply with nor are these principles rigid rules of the positive law which must be complied with in each instance. These principles are normative guidelines, all of which have to be considered but none of which stands in any particular hierarchical relation to the other and all of which, after consideration may not necessarily find application in a particular set of circumstances or apply to the same extent.'[86]

The environmental authorisation process is thus an 'inherently open-ended and context specific' process.[87] To aid in the decision-making process, section 24O of NEMA details the criteria to be taken into account by competent authorities when considering applications for activities that carry the potential to significantly affect the environment. Competent authorities are thus mandated to take into account *all* relevant factors relevant to the proposed activity,

[81] Section 2 definitions.
[82] Section 24(1) of the National Environmental Management Act, 107 of 1998.
[83] Section 2(4).
[84] Glazewski & Plit 'Towards the application' at 190.
[85] [2023] ZAGPPHC 310; A155/2019 (10 May 2023).
[86] Para 137.
[87] Para 89 of *Earth Life.*

which may include any pollution, environmental impacts or environmental degradation likely to be caused if the application is approved or refused,[88] measures that may be taken to protect the environment from harm as a result of the activity as well as measures to prevent, control, abate or mitigate pollution, substantially detrimental environmental impacts or environmental degradation.[89]

Failure to consider all relevant factors in the decision-making process renders a decision capable of being reviewed and set aside. This was demonstrated in the case of *Fuel Retailers Association of SA (Pty) Ltd v Director General Environmental Management, Mpumalanga, and Others*[90] whereby the Constitutional Court was required to consider whether socio-economic impacts were considered by the competent authority in an application for the establishment of a new filing station. As the principle of sustainable development[91] requires the integration of social, economic and environmental factors into the decision-making process,[92] the court held that a failure to consider the principle of sustainable development and its various components in the decision-making process rendered the decision inconsistent with objectives of Integrated Environmental Management and the environment authorisation process.

Due to the list of relevant factors being inexhaustive, it is submitted that the nature and scope of the proposed project or activity informs the criteria to be considered as part of the environmental authorisation process with requirements specified in NEMA and the regulations thereto setting out the minimum considerations. Where it is possible to sufficiently motivate that a factor is relevant for consideration and that the factor is necessary to ensure socially, environmentally and economically sustainable development, such factor must form part of the environmental authorisation process. Where relevancy of the factor can be established, a failure to consider the factor would, in turn, render the decision capable of being reviewed and set aside. This was demonstrated in *Earth Life Johannesburg v Minister of Environmental Affairs*[93] whereby the court was required to consider whether the competent authority was obliged to consider climate change impacts of a proposed power station before granting the authorisation.[94] Despite no express provision or obligation to undertake a climate change

[88] Section 24O(b)(i).
[89] Section 24O(b)(i).
[90] 2007 (6) SA 4 (CC) at para 61.
[91] Sustainable development is a principle of environmental management listed under section 2(4) of NEMA.
[92] Section 1 definitions regard with section 2(4)(a).
[93] 2017 2 ALL SA 519 (GP).
[94] Para 4.

assessment,[95] the court found that climate change impacts and mitigating measures *were* relevant factors to be considered as part of the environmental authorisation process.[96]

II OVERVIEW OF THE PRECAUTIONARY PRINCIPLE

Acting upon the premise that it may be costlier or impossible to remediate environmental damage after the damage has occurred, the precautionary principle provides for the adoption of preventative or mitigating measures when faced with scientific uncertainty regarding the impacts of activities on the environment.[97] Scientific uncertainty refers to the plethora of things we do not yet know.[98] Whilst no unequivocal definition has been applied to the precautionary principle,[99] the definition contained in principle 15 of the Rio Declaration on Environment and Development[100] has been widely recognised and provides that:

> In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

As it is difficult to predict with absolute certainty *all* the impacts that a proposed activity may have upon the environment, the precautionary principle is based upon the foundation that certain harm to the environment may be irreversible.[101] A precautionary approach has thus been held not to be concerned with the desirability of the proposed activity or development, but rather to the desirability of the mitigation measures to be adopted to prevent or mitigate environmental degradation.[102] The precautionary principle thus aims to establish an acceptable margin of safety within takes cognisance of the risks and the scientific uncertainty concerning a proposed action or activity.[103]

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[95] Para 88.
[96] Para 91.
[97]King ND, Strydom HA & Retief FP (eds) *Fuggle & Rabie's Environmental Management for South Africa*, 3rd ed (2018) at 78.
[98] Kegge at 116.
[99] Kegge at 113.
[100] United Nations Rio Declaration on Environment and Development, 1992 Available at https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_CONF.151_26_Vol.I_Declaration.pdf (Accessed on 17 June 2024).
[101] Kidd *Environmental Law* at 9.
[102] *Endangered Wildlife Trust and Another v Director General: Department of Water and Sanitation* WT03/17/MP [2019] ZAWT 3 (22 May 2019) at para 74.
[103] Michael Purdue 'Integrated pollution control in the Environmental Protection Act 1990: A coming of age of environmental law? (1991) 54 *Modern Law Review* 534 at 536.

The principle recognises that an element of scientific uncertainty exists regarding every proposed activity or development and that these risks are to be avoided.[104] If not possible for the risks to be avoided, they should be mitigated as far as possible. Where the potential consequences of activities remain uncertain and the damages have not occurred yet, the precautionary principle requires of the proponent of the activity to detail sufficient scientific evidence as to the magnitude of the effects associated with the activity.[105]

III THE CODIFICATION OF THE PRECAUTIONARY PRINCIPLE IN THE ENVIRONMENTAL DECISION-MAKING PROCESS AND ITS UTILISATION AS A DECISION-MAKING TOOL

The precautionary principle underpins the principle of sustainable development as it seeks to safeguard the environment against irreversible harm and to assist in achieving the best practical outcome for both humans and the environment.[106] The precautionary principle has been specifically codified under NEMA by providing for the adoption of caution in the face of scientific uncertainty. Through its incorporation under the section 2 principles of environmental management, decisionmakers are required to adopt a 'risk averse and cautious approach which takes into account the limits of current knowledge about the consequences of decisions and actions.'[107] By requiring decisionmakers to recognise limitations regarding our understanding of the environment and to guard against taking unnecessary risk, it is submitted the precautionary principle forms an integral part and needs to be considered whenever scientific uncertainty arises regarding the impacts of an activity on the environment.[108] This applies to any decision made by an organ of state in relation to a proposed policy, programme, process, plan or project.[109]

In addition to being incorporated under the principles of environmental management, Du Plessis has suggested that the precautionary principle has further been incorporated under the

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[104] *Ibid.*
[105] Kegge at 116.
[106] Thabiso John Morodi *The precautionary principle and public environmental decision-making in South Africa: an ethical appraisal* (unpublished DPhil thesis, Stellenbosch University, 2016) at 93.
[107] Section 2(4)(vii).
[108] Section 23(2)(a).
[109] *Ibid.*

duty of care and remediation of environmental damage provision under NEMA.[110] In this regard, clause 28 provides that every person who:

> ….causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.[111] (own emphasis)

Where scientific uncertainty exists regarding the impacts of a proposed development, NEMA further empowers the Minister of Forestry, Fisheries and the Environment to give effect to the precautionary principle by way of prohibiting or restricting 'the granting of an environmental authorisation by the competent authority for a listed or a specified activity in a specified geographical area for such period and on such terms and conditions as the Minister may determine.'[112] The power to employ such measures is conferred in instances where the Minster deems such action necessary to ensure the protection of the environment, the conservation of resources or sustainable development.[113]

Adopting the principle through in the environmental decision-making process thus requires an acknowledgment as to the importance of scientific uncertainty in the decision-making process and catering for this uncertainty.[114] Recognising the shortcomings with our existing knowledge requires a considerable degree of humility and reflection by both the proponents of activities and the competent authorities tasked with assessing applications for the proposed activities.[115] This represents a departure from a purely science-based approach to decision-making as determining the acceptable levels of risk should reflect the broader values of society. The principle broadens the scope of the environmental decision-making process by requiring the decisionmaker to make value judgments in determining the acceptable levels of risk to which society can be subjected.[116]

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[110] W du Plessis 'Hichange – A new direction in Environmental Matters? *Hichange Investments (Pty) Ltd v Cape Produce Co (Pty) Ltd t/a Pelts Products & Others'* (2004) 11 *SAJELP* at 140.
[111] Section 28(1).
[112] Section 24(2A)(a).
[113] Section 24(2A)(a).
[114] Morodi *The precautionary principle* at 77.
[115] *Ibid.*
[116] *Rogier Kegge 'The Precautionary Principle and the burden and standard of proof'* (2020) *Review of European Administrative Law* 13(2) 113-131 at 115.

IV CONTRASTING VIEWPOINTS ON THE PRECAUTIONARY PRINCIPLE

Despite its widespread adoption, the principle has received criticism on the basis of its alleged paralysing effect in the face of scientific uncertainty. In addition, the principle has been criticised as being arbitrary, unscientific and dangerous on account of its potential to threaten human development.[117] Such criticism stems from a 'maximalist' or 'more is more' approach towards development which is premised on a belief that 'scientists can accurately predict environmental and health threats; scientists can provide technical solutions to these hazards; and the most cost-effective approach is to take action when hazards arise.'[118]

The minimalist approach, in turn, views the principle as being a useful tool to assist in reducing or avoiding serious environmental hazards.[119] The minimalist interpretation of the principle is inherently cautious and founded upon the premise that 'scientists cannot accurately predict environmental and health threats; the environment is inherently vulnerable; there are alternative procedures and products that are less hazardous.'[120]

It is submitted that the correct application of the principle lies somewhere between the maximalist and minimalist interpretations. If absolute scientific certainty regarding the impacts of a proposed activity were required before activities were permitted to commence, this would lead to an overly cautious approach which could paralyse the decision-making process and retard development. However, exercising a degree of caution is necessary as the risk of future harm is always uncertain. Conversely, an approach which suggests that scientists can always accurately predict environmental, and health threats associated with an activity is fundamentally flawed. For these reasons, the utilisation of the principle as a means to strike a balance between caution and risk should be favoured.

V BURDEN OF PROOF

Formulations of the precautionary principle have differed from a weak interpretation, requiring those advocating for precaution to demonstrate the harm associated with inaction, to a stronger and more progressive interpretation requiring the proponent of an activity to demonstrate that

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[117] European Parliamentary Research Services 'The Precautionary Principle Definitions, applications and governance (In-depth Analysis)' (2015) at 12.
[118] *Ibid.*
[119] *Ibid.*
[120] European Parliamentary Research Services 'The Precautionary Principle Definitions, applications and governance (In-depth Analysis)' (2015) at 12.

significant harm will not result.[121] Whichever formulation is to be applied, it is accepted that the principle is to be applied where 'scientific evidence suggests that a lack of action may result in serious or irreversible harm to the environment, or where there are divergent views on the risks of action.'[122]

In a discussion as to the application of the precautionary principle in the case of *WWF South Africa v Minister of Agriculture, Forestry and Fisheries and others*[123], the court referred with approval to Australian decision in *Telstra Corporation v Hornsby Shire Council*[124] which provided for the application of the principle only when a threat of serious or irreversible environmental damage and when the scientific uncertainty regarding such environmental damage had been established.[125] For the principle to apply, the scientific uncertainty needed to be considerable. This was only established when 'empirical data (as opposed to hypothesis, speculation or intuition) make it reasonable to envisage a scenario, even if it does not enjoy unanimous support.'[126] Once these two conditions have been met, the court, relying on *Telstra*, suggested that the evidentiary burden to shifts to the proponent of the activity to demonstrate that the proposed activity does not pose a serious risk or that the risk is negligible.[127]

As the proponents of an activity are likely to receive more benefits from the activity than the public, Morodi favours a stronger and more progressive application of the burden of proof in relation to the precautionary principle. He suggests that the burden of proof to demonstrate the absence of harm to the environment associated with an activity should lie with the proponents of such activity.[128] In support of this argument, he contends *inter alia* that a financial imbalance exists between proponents of activities and those seeking to protect the environment.[129] As such, he advocates for a greater level of protection to be afforded to natural resources. In addition, he is of the view that the public have a right to protection against decisions which may cause damage to the environment that cannot be compensated as well as a right to 'environmental integrity' which affords the public the ability to determine whether to proceed with an activity which potentially threatens natural resources.[130]

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[121] Morodi *The precautionary principle* at 1-2
[122] King ND, Strydom HA & Retief FP (eds) *Fuggle & Rabie's Environmental Management for South Africa*, 3rd ed (2018) at 78.
[123] [2018] 4 ALL SA 889 (WCC).
[124] [2006] NSWLEC 199.
[125] Para 15.
[126] *Telstra* at para 147-148.
[127] Para 16.
[128] Morodi *The precautionary principle* at 92.
[129] *Ibid.*
[130] *Ibid.*

VI CONCLUSION

Whilst the precautionary principle has been criticised for its paralysing effect on development, the application of the principle does not purport to create a permanent bar towards development or a proposed activity. Rather, the principle seeks to avoid potentially irreversible consequences where there is a lack of scientific uncertainty regarding the impacts of an activity. If our knowledge regarding the impacts of a proposed activity was to develop to the point where the scientific uncertainty can be sufficiently addressed, the precautionary principle would not serve to impede such an activity from proceeding.

Whilst criticism of the precautionary principle and the manner to which it is to be applied are likely to remain, it is submitted that considering, acknowledging and addressing scientific uncertainty as part of decision-making processes ultimately results in better decisions being made. Decisions which account for our lack of understanding provide for increased objectivity and humility in the decision-making process and aid in balancing risk with caution. As such, the incorporation and adopted of the precautionary principle into South Africa's environmental decision-making process is to be celebrated as it acts both as a safety net against irreversible environmental harm as well as to foster further research and understanding regarding the impacts of activities on the environment.

CHAPTER 4

INTERPRETATION OF PRECAUTIONARY PRINCIPLE UNDER NEMA AND ALIGNMENT WITH PLANETARY BOUNDARIES FRAMEWORK

I INTRODUCTION

As the perceived benefit of the incorporation of ecological thresholds into the environmental decision-making process as well as the alignment of the planetary boundaries approach with the precautionary principle has been established, it is necessary to consider the application of the planetary boundaries framework within the context of the legislative requirements concerning environmental decision-making in South Africa. This chapter seeks to consider several South African judgments for the purpose of analysing the manner in which the precautionary principle has been interpreted and applied by our courts. In reviewing an analysing these decisions, attempts will be made to conceptualise the basis upon which the *ratio* applied by the courts could be extended to include considerations as to ecological thresholds in the decision-making process.

II THE FUEL RETAILER'S ASSOCIATION OF SOUTHERN AFRICA v DIRECTOR GENERAL: ENVIRONMENTAL MANAGEMENT, DEPARTMENT OF AGRICULTURE, CONSERVATION AND ENVIRONMENT, MPUMALANGA PROVINCE

Fuel Retailers Association of Southern Africa v Director General: Environmental Management, Department of Agriculture, Conservation and Environment, Mpumalanga Province and Others[131] concerned an application to review and set aside a decision by a provincial department to authorise the construction of a petrol station in White River, Mpumalanga. At the heart of the application was a contention that a failure by the department to consider socio-economic considerations of the proposed activity rendered the decision reviewable.

The court held that NEMA made it abundantly clear that socio-economic factors were deemed 'an integral part' of the responsibilities conferred upon the environmental

[131] 2007 (6) SA 4 (CC).

authorities.[132] In addition, it was held that an assessment of socio-economic impacts included considerations of both the benefits and disadvantages of a proposed activity as well as 'the impact of the proposed activity on existing socio-economic conditions which must of necessity include existing developments.'[133] In support of this position, the court relied upon section 24(7) of NEMA (as it then was) which provided for an 'investigation of the potential impact, including cumulative effects, of the activity and its alternatives.'[134]

The court held that the precautionary approach was particularly important considering the need to consider the cumulative impacts of the development on the environment and socio-economic conditions.[135] As the proposed filing station was near an existing filling station, the court held that an:

> An increase in the risk of contamination of underground water and soil, and visual intrusion and light, for example, are some of the significant cumulative impacts that could result from the proliferation of filling stations. Subsection 24(7)*(b)* specifically requires the investigation of the potential impact, including cumulative effects, of the proposed development on the environment and socioeconomic conditions, and the assessment of the significance of that potential impact.

In assessing the decision made by the competent authority and considering the proposed fuel storage tanks being in proximity to a borehole, the court went on to state that:

> The environmental authorities and Water Affairs and Forestry did not seem to take seriously the threat of contamination of the underground water supply. The precautionary principle required these authorities to insist on adequate precautionary measures to safeguard against the contamination of underground water. This principle is applicable where, due to unavailable scientific knowledge, there is uncertainty as to the future impact of the proposed development. Water is a precious commodity; it is a natural resource that must be protected for the benefit of present and future generations.

Whilst section 24(7) of NEMA has been amended, the tools adopted by NEMA to give effect to the objective of Integrated Environmental Management, being the basic assessment process and the Scoping and Environmental Impact Report, both require the consideration of

[132] Para 62.
[133] Para 77.
[134] Para 81.
[135] *Ibid.*

cumulative impacts[136] through the undertaking of the risk assessment process.[137] In applying the precautionary principle, the court found that the lack of a proper assessment as to the impacts of the underground fuel storage tanks on the borehole created uncertainty regarding the impacts of the proposed activity on the water resource.[138]

Fuel Retailers demonstrates that the uncertainty regarding a proposed activity can arise in various scenarios. Uncertainty can arise where a dispute exists regarding the effect of an activity on the environment as well as where insufficient evidence is before the decisionmaker as to the effects of the activity on the environment. In the case of *Fuel Retailers,* the court seemed to suggest that the uncertainty apparent with the proposed activity could be addressed by way of a further investigation.[139] The investigation would reduce or remove some uncertainty regarding the proposed activity or propose certain mitigation measures to address the underlying uncertainty.

It is, however, not always possible for further investigations to be conducted to improve our knowledge or understanding regarding the impacts of an activity on the environment. This can arise due to various factors including the scientific complexities involved as well as the costs associated with the investigation. By comparison, Earth System science represents a relatively new and extremely complex scientific discipline which is characterised by varying degrees of uncertainty regarding key systems and processes. Whilst the planetary boundaries are continually being refined and modified based upon further research, uncertainty regarding Earth's systems and process and the precise position of ecological thresholds is likely to remain for a considerable time to come.

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[136] Cumulative impacts are, in relation to a proposed activity, defined as 'the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

[137] Appendix 1 of EIA Regulations provides that the objective of the risk assessment process is to, through a consultative process :

(d) Through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine—
  (i) The nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
  (ii) The degree to which these impacts—
  (aa) can be reversed;
  (bb) may cause irreplaceable loss of resources; and
  (cc) can be avoided, managed or mitigated;

[138] Para 98-99.

[139] Para 99.

The court in *Fuel Retailers* further commented on the need to consider the cumulative impacts of the proposed activity.[140] As a new approach to sustainability, the planetary boundaries framework essentially provides for the consideration of the cumulative impacts of human activities on Earth's systems and processes on a planetary level. Consistent with this approach, it can therefore be accepted that activities at a local level have potential implications for systems and processes at both a regional and planetary level. By considering cumulative impacts of activities as part the environmental decision-making process, it is contended that the same approach can be extrapolated and be applied in circumstances where activities carry the potential to affect the safe operating spaces for humanity.

III SUSTAINING THE WILD COAST NPC v MINISTER OF MINERAL RESOURCES AND ENERGY

In *Sustaining the Wild Coast NPC and Others v Minister of Mineral Resources and Energy and Others,*[141] the court was tasked with considering the legality of an exploration right granted for the exploration of potential oil and gas reserves along the Transkei coast.[142] In order to determine the presence of oil and gas reserves, a seismic survey was proposed to be conducted within the marine environment. The survey was to be carried out by a seismic vessel towing a 6-kilometere-long array of airguns behind it which would discharge pressured air.[143] The pressured air would create sound waves which would then be directed towards the sea floor. The waves would rebound off the sea floor and the frequency collected from receivers would serve to indicate whether the geological formations of the seafloor carried the potential for oil and gas deposits.[144]

The applicants, being an assortment of parties including non-profit companies, local community members and associations, brought an application to review and set aside the decision made by the Minister of Mineral Resources to grant the exploration right on the grounds of procedural unfairness, a failure by the Minister to take into account relevant

[140] Para 98.
[141] 2022 (6) SA 589 (ECMk).
[142] Para 1.
[143] Para 23.
[144] *Ibid.*

considerations and a failure to comply with the applicable legal prescripts which applied to the granted to the exploration right.[145]

The failure to take relevant considerations into account when granting the exploration right related *inter alia* to the absence of considerations as to the anticipated harm to marine and bird life off the Eastern Cape Coast as a consequence of the seismic survey.[146] The applicants contended that the anticipated harm to marine and bird life was a fundamental consideration and that evidence was required to be provided to rule out significant risk of harm before the activity was to be permitted.[147] In support of their contention, the applicants submitted expert evidence which demonstrated a reasonable apprehension of harm to marine and bird life and, in turn, alleged that the mitigation measures proposed by the holders of the exploration rights did not serve to adequately address the anticipated harm.[148] The existence and significance of the harm alleged by the applicants was disputed by experts appointed by the rights holders. Consequently, a dispute arose as to the harm to marine and bird life associated with the seismic survey.

The applicants contended that the threat to marine and bird life justified a cautious approach.[149] Considering the presence of scientific uncertainty, they submitted that the decision to grant the exploration right was inconsistent with the precautionary principle.[150] As a consequence of the dispute that existed between the experts as to the adequacy of the mitigation measures adopted in order to minimise the known effects of the seismic surveys, the court agreed with the applicants and held that a cautious approach should have been adopted by the decision-maker.[151]

In a review of this decision, Kidd has argued that the threshold adopted by the court as to when to apply the precautionary principle may have been too slight as it suggests that the precautionary principle may be invoked *whenever* scientific uncertainty exists.[152] If this approach is to be accepted, it may be possible for the precautionary principle to be abused by objectors through reliance upon a single piece of evidence as to scientific uncertainty regarding

[145] Para 84.
[146] Para 107.
[147] Para 108.
[148] *Ibid.*
[149] Para 31.
[150] *Ibid.*
[151] Para 109.
[152] M Kidd 'Seismic surveys (Offshore mining, environmental authorisations and public participation)' *JQR Environmental Law* 2022 (3).

the impacts of a proposed activity. According to Kidd, this does not reflect the correct application of the principle.[153]

Kidd further suggests that the proponent of an activity is required to adduce evidence that serves to outweigh that of the objector.[154] In applying the above to the planetary boundaries framework, the application of the precautionary principle would either require the proponent to adduce evidence to demonstrate that operating beyond the safe operating spaces, both locally and globally, did not present as significant a risk as that contemplated by the framework or, alternatively, that the mitigation measures proposed by the proponent were sufficient to maintain the integrity of the systems or processes.

IV AFRICAN CENTRE FOR BIODIVERSITY NPC v MINISTER OF AGRICULTURE, FORESTRY AND FISHERIES (HC)[155]

This matter concerned an application by Africa Centre for Biodiversity (ACB), a non-governmental advocacy organisation to review and set aside decisions that approved the general release of MON 87460, a genetically modified variety of maize.[156] The variety of maize was believed to have commercial benefit insofar as it displayed reduced yield loss in water limited conditions. ACB submitted expert evidence wherein it raised several fundamental concerns regarding the decisions to approve the release. These included *inter alia* the absence of substantiating evidence to prove lack of potential for scientific hazards, concerns regarding the unsubstantiated basis for claims that the variety would not give rise to allergic reactions as well as the absence of history of the safe use of MON87460 in the form in which it was expressed. Based on the concerns raised, ACB alleged that the decisionmaker should have applied the precautionary principle.

During the review proceedings, the court was tasked with considering whether the decisions complied with section 5(1)(a) of the Genetically Modified Organisms (GMO) Act.[157] The GMO Act provides for the establishment of an Executive Council[158] which is tasked with advising the Minister of Agriculture, Forestry and Fisheries on all aspects concerning activities

[153] M Kidd 'Seismic surveys' *JQR Environmental Law* 2022 (3).
[154] *Ibid.*
[155] [2023] ZAGPPHC 520; 27524/2017 (27 June 2023).
[156] Para 1.
[157] 15 of 1997.
[158] Section 3.

relating to genetically modified organisms, and ensure that such activities are performed in accordance with the GMO Act.[159] Section 5 of the GMO Act, which lists the powers and responsibilities of the Council, includes the requirement under section 5(1)(a) to ensure that:

> where an applicant applies in the prescribed manner for a permit to conduct activities in respect of genetically modified organisms determine whether that applicant must, in addition to his or her application, submit an assessment in accordance with the relevant provisions of the National Environmental Management Act, 1998 (Act No. 107 of 1998), of the impact on the environment and an assessment of the socio-economic considerations of such activities;

ACB contended that the decisions that provided for the release of MON 87460 did not comply with section 5(1)(a) since an assessment in accordance with NEMA was not undertaken. ACB argued that the decisions were procedurally unfair and that the precautionary principle was not followed.[160]

In assessing the contention that the decisions lacked compliance with the precautionary principle, the court held that the principle was 'not directly applicable in review proceedings' as review proceedings were not concerned with the merits of the matter, but rather whether a decision was lawful, reasonable and procedurally fair.[161] The court found that invoking the precautionary principle would require the court to evaluate the expert evidence presented and make a finding on the merits thereof before being satisfied that invoking the precautionary principle was appropriate.[162] The court went on to state that it was bound to rely upon the evidence submitted by the respondents' experts unless it could be proven that such evidence was untenable.[163] Furthermore and in the absence of an enquiry as to the merits of the case that could only be achieved through the leading of oral evidence, it was held that the court was bound to accept the evidence of the respondents' experts.[164]

[159] Section 4.
[160] Para 12.
[161] Para 17.
[162] *Ibid.*
[163] *Ibid.*
[164] *Ibid.*

V AFRICAN CENTRE FOR BIODIVERSITY NPC v MINISTER OF AGRICULTURE, FORESTRY AND FISHERIES AND OTHERS (SCA)[165]

Following the dismissal of the application, ACB approached the Supreme Court of Appeal. On appeal, ACB alleged that the expert evidence which was presented by their experts *should* have triggered the application of the precautionary principle on the basis that there was a lack of scientific data supporting the safe release of MON 874680 as well as the conflicting data which supported the concerns raised against health risk associated by the release.[166] The court considered the application of the precautionary principle as it was central to the issues in dispute between the parties.

In addressing the court *a quo*'s finding that the precautionary principle did not find application in review proceedings, the court held that such approach:

> …disregards the fundamental role the precautionary principle plays in directing decisionmakers in the exercise of their discretion. The current state of knowledge and uncertainty, the potential for serious and irreversible harm and the adoption of a cautious approach is clearly consistent with the subject-matter, scope and purpose of the Act.[167]

The Supreme Court of Appeal thus found that the High Court had conflated the obligation arising from section 5(1)*(a)* of the GMO Act with the applicability of the precautionary principle.[168] Such an interpretation would only require the need for an environmental impact study to be undertaken in the circumstances where the precautionary principle had been triggered.

Due to several fundamental concerns being raised by experts regarding the release of MON 874680, the court found that these concerns represented 'precise circumstances' which required the decisionmaker to adopt a cautious approach until such time as the identified risks associated with the release had been adequately addressed.[169] Whilst the proponents of the activity were likely to have contrasting views to the issues raised by the applicants, the application of the precautionary principle necessitated consideration of the scientific

[165] (934/2023) [2024] ZASCA 143 (22 October 2024).
[166] Para 11.
[167] Para 18.
[168] Para 24.
[169] Para 21.

uncertainty and the risks associated with the release before a decision could be made to approve the application.

The court found that the precautionary principle was triggered by the concerns raised by the appellant and should have been applied.[170] The court thereafter set aside the decisions that approved the general release of MON 87460.[171]

It is apparent that the planetary boundaries framework aligns with the precautionary principle in several fundamental ways. From a risk management perspective, the planetary boundaries approach recognises the risks and uncertainties regarding Earth's systems and processes and the environmental consequences of transgressing ecological thresholds. To mitigate against this uncertainty, the framework seeks to implement mechanisms to safeguard these systems whilst further research is undertaken to better understand the nature of these systems and the effects of human activities. This is sought to be achieved through the safe operating spaces framework which seeks to maintain these systems at the lowest identified levels of scientific risk reflect levels. These levels represent a 'low probability of crossing a critical threshold or substantially eroding the resilience of the Earth system.'[172]

[170] Para 24.
[171] Para 25.
[172] Steffen *et al*. 'Planetary boundaries: Guiding human development on a changing planet' at 1259855-7.

CHAPTER 5

CONCEPTUAL APPLICATION OF PLANETARY BOUNDARIES FRAMEWORK THROUGH PRECAUTIONARY PRINCIPLE

In conceptualising the manner in which ecological thresholds are to be incorporated into the environmental decision-making process through the application of the precautionary principle, the facts relevant to the case of *Earth Life Johannesburg v Minister of Environmental Affairs* will be considered.

The decision in *Earth Life Johannesburg v Minister of Environmental Affairs*[173] dealt with concerns that were raised about the environmental impacts associated with a decision to build a 1200MW coal-fired power station near Lephalale in the Limpopo Province.[174] The applicants, being a non-profit organisation whose mandate was to raise awareness around environmental issues,[175] contended that the competent authorities failed to comply with the provisions of NEMA insofar as they failed to take into consideration all relevant factors when deciding to grant an environmental authorisation for the power station.[176]

It was contended that the competent authority was obliged to consider climate change impacts of the proposed power station before granting the authorisation.[177] The court ultimately held that climate change impacts and mitigating measures *were* relevant factors to be considered as part of the environmental authorisation process.[178] This was despite no express provision or obligation to undertake the assessment existing.[179] *Earth Life* submitted that the emissions that were to emanate from the power station would have an impact on the receiving environment and contribute towards climate change.[180] As section 24O of NEMA required consideration of all relevant factors in deciding the application, the applicants contended that a climate change assessment was necessary to be carried out to consider the extent to which the power station would contribute towards climate change over its lifetime, the resilience of the power station to the effects of climate change and how these impacts could be avoided,

[173] 2017 2 ALL SA 519 (GP).
[174] Para 1.
[175] Para 3.
[176] Para 11.
[177] Para 4.
[178] Para 91.
[179] Para 88.
[180] Para 4.

mitigated or remedied.[181] The court was thus required to consider whether climate change impacts were relevant factors to be considered in the environmental authorisation process and, if so, if there was a failure by the Chief Director to take such factors in account when grating the environmental authorisation. Whilst *Earth Life* did not make the submission that the Chief Director failed to apply the precautionary principle when granting the environmental authorisation, it is submitted for present purposes that a ground of review premised on this basis may have held merit if reliance were to be placed on the uncertain and potentially irreversible consequences posed by the proposed power station.

In the application of the precautionary principle within the environmental decision-making process under NEMA, decisionmakers are required to a adopt a 'risk averse and cautious approach which takes into account the limits of current knowledge about the consequences of decisions and actions.'[182] As it has been established in previous chapters, this approach does not seek to prevent development from taking place, but rather to assess the adequacy of mitigation measures where the potential effects of the activity are significant and uncertain. The application of the precautionary principle would therefore concern the measures to be adopted to address the uncertainty regarding the impacts of the proposed activity.

Whilst scientific uncertainty was not a direct issue raised in the proceedings, it is submitted that the proposed activity contained a significant degree of scientific uncertainty as to the impacts of the activity on the environment when viewed within the context of the safe operating spaces for humanity and the climate change planetary boundary. This is borne out of the fact that the proposed activity, through its direct CO_2 emissions, would contribute towards both the global atmospheric concentration of CO_2 as well as the annual volume of CO_2 emitted by South Africa as a country. When viewed within the context of the scientifically defined parameters for both the planetary and local scales, the CO_2 emissions which were likely to be emitted from the power station would undoubtedly push both South Africa, and the planet as a whole, further beyond the defined climate change planetary boundary and into zones of increasing risk wherein ecological thresholds existed. The court held that climate change was undoubtedly a relevant consideration under NEMA as it:

> …poses a substantial risk to sustainable development in South Africa. The effects of climate change, in the form of rising temperatures, greater water scarcity, and the increasing frequency of natural disasters pose substantial risks. Sustainable development is at the same time integrally linked with the principle of

[181] Para 6.
[182] Section 2(4)(vii).

> intergenerational justice requiring the state to take reasonable measures protect the environment "for the benefit of present and future generations" and hence adequate consideration of climate change. Short-term needs must be evaluated and weighed against long-term consequences.[183]

It is therefore submitted that the uncertainty associated with the impacts of the activity on ecological thresholds, specifically climate change, was material to the decision and should have been considered as part of the decision-making process. If *Earth Life* had alleged a failure on the part of the decisionmaker to apply the precautionary principle in light of the existence of scientific uncertainty regarding the impacts of the power station and relied upon the scientific evidence underpinning the planetary boundaries framework in support of this contention, it is submitted that the proponent of the activity would need to demonstrate sufficient evidence to outweigh these claims. The proponent would thus need to provide evidence detailing the basis upon which the scientific evidence underpinning the planetary boundaries framework was insufficient to justify the adoption of a cautious approach due to the uncertainty associated with the activity or, alternatively, that the mitigating measures adopted by the proponent sufficiently addressed this uncertainty.

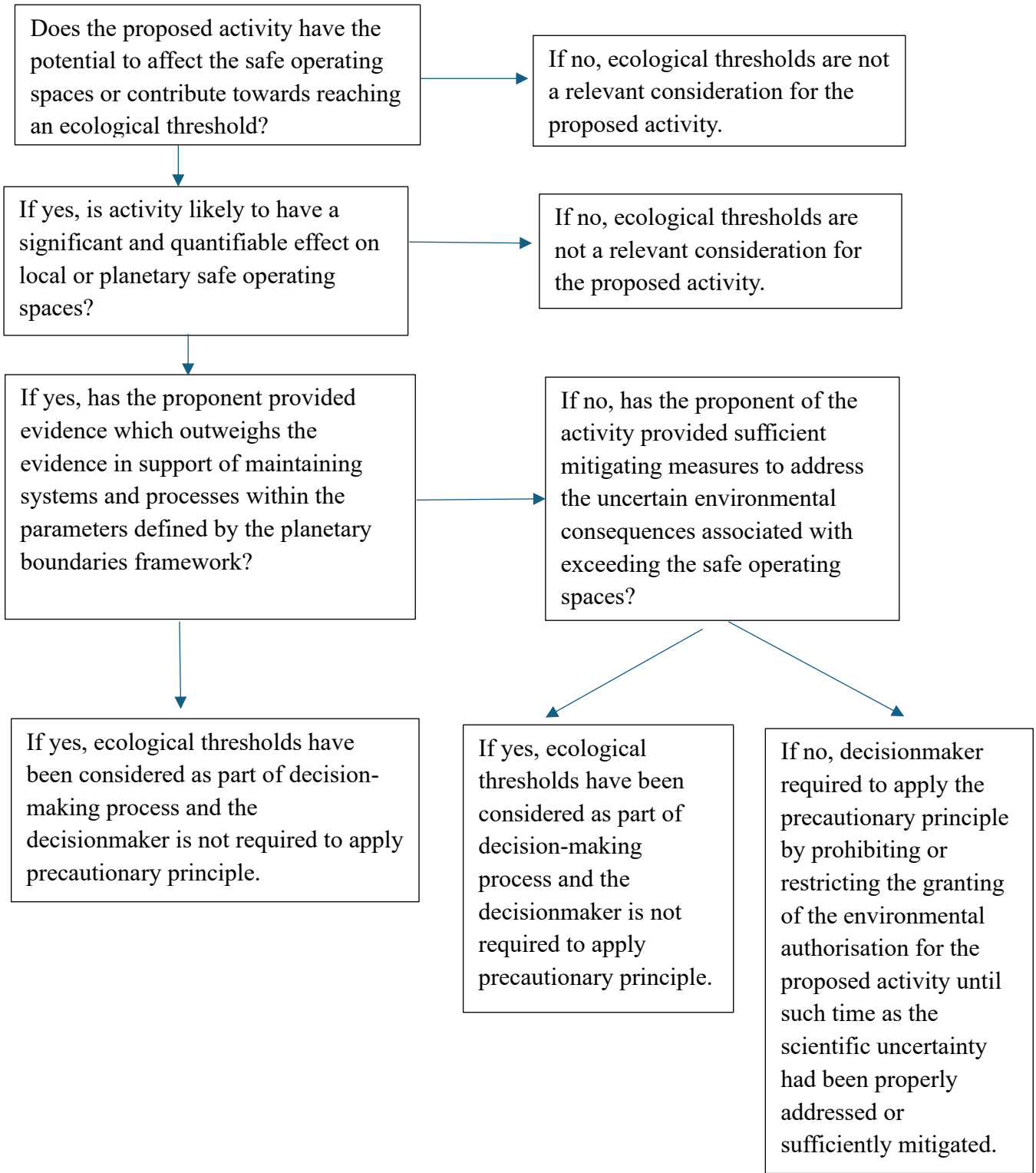
If the proponent was unable to discharge this onus, the application of the precautionary principle would require the decisionmaker to prohibit or restrict the granting of the environmental authorisation until such time as the scientific uncertainty had been properly addressed or sufficiently mitigated. Such an approach would not serve to deny the ability of the proponent to establish the power station in future, but that such ability would be deferred until such time as we had a better understanding as to the location of the climate change ecological tipping point and the consequences associated with exceeding these thresholds.

As the *Earth Life* example primarily has implications for the climate change boundary, motivating for the maintenance of CO_2 with the parameters specified by the planetary boundaries framework is less onerous for the objector as there exists a significant body of scientific work describing the effects of CO_2 on the environment and the potential consequences associated with transgressing an ecological threshold. However, other planetary boundaries have varying degrees of uncertainty regarding the position of ecological thresholds and the impacts associated with transgressing such thresholds. This arises on account of limited scientific knowledge about these systems or processes.

[183] Para 82 & 88.

Where great uncertainty exists regarding the effects of an activity on these systems or processes, it is submitted that the application of the precautionary principle requires an even greater approach towards caution to be adopted whilst further research is undertaken. Whilst mitigating measures can be adopted, it is difficult to comprehend the basis upon which mitigating measures can be assessed for their adequacy in addressing the uncertainty regarding the impacts of a proposed activity on the environment where considerable uncertainty exists regarding the systems and processes they seek to maintain.

In conceptualising the basis for consideration of planetary boundaries in the decision-making process, it is thus contended that the following approach be adopted.



CHAPTER 6

FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

Since its initial proposal in 2009, the planetary boundaries framework has been refined and developed as a new model for sustainability through viewing Earth's systems in an all-encompassing and holistic manner. Due to the uncertainty associated with biophysical thresholds within Earth's systems, the framework favours the adoption of a precautionary approach towards development by seeking to ensure critical systems and processes are maintained at the lowest levels of identified risk to avoid potentially catastrophic consequences. As the latest planetary boundaries assessment revealed that six of the nine planetary boundaries have already been transgressed, it is evident that the incorporation of the planetary boundaries framework through policy remains sluggish. As this delay carries the potential for key systems and processes to be subjected to irreversible damage, alternative approaches need to be considered that aid in correcting the planet's current trajectory.

The consideration of ecological thresholds at activity levels represents one such approach as it directs decisionmakers to view activities for their impacts upon national, regional and planetary boundaries. Whilst the framework was not designed for use at a project or activity level, consideration as to the potential impact of an activity on both regional and planetary boundaries is of relevance and should form part of the environmental decision-making process. This is made possible through the setting of quantifiable boundaries, which are continually being refined as our knowledge and understanding of biophysical thresholds develop, that proposed activities can be measured against. Incorporating the planetary boundaries approach at this level has noticeable advantages as the approach can be adopted immediately. Furthermore, it engenders a more holistic approach towards environmental management by ensuring activities are considered for their cumulative impacts from a local, regional and planetary perspective.

The incorporation of the precautionary principle as part of the environmental decision-making process and the requirement for decisionmakers to apply precaution in the face of scientific uncertainty represents the most practical means to ensure ecological thresholds are considered at a project or activity level. As exceeding the safe spaces for humanity represents a 'zone of uncertainty' regarding the integrity of Earth's systems and processes, a proper application of the precautionary principle requires proponents of activities that have

implications for these systems and processes to suitably address the scientific uncertainty associated with the activity before authorisation is to be provided.

As the environmental authorisation process is an inherently open and context specific process, the desired outcome for this dissertation would be to persuade interested and affected parties to consider utilising the precautionary principle as a ground of review where decisionmakers have failed to consider the potential impact of an activity on local, regional or planetary boundaries or where the impacts of the activity have not been properly mitigated to address the associated scientific uncertainty of exceeding an ecological threshold. If ecological thresholds can be demonstrated to be relevant considerations as part of the environmental decision-making process, their inclusion will serve to incorporate the planetary boundaries framework at a level where it can have an immediate and profound effect. Due to our current trajectory, this is essential if we are to ensure that the key systems and processes humanity relies upon are maintained in a resilient and accommodating state for the benefit of both present and future generations.

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UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

Mr Glynn Charles Kent (223138015)
School Of Law
Pietermaritzburg

Dear Mr Glynn Charles Kent,

Original application number: 00026275
Project title: Considering ecological thresholds in the environmental decision-making process An argument for application of the precautionary principle.

Exemption from Ethics Review

In response to your application received on 6 June 2024, your school has indicated that the protocol has been granted **EXEMPTION FROM ETHICS REVIEW.**

Any alteration/s to the exempted research protocol, e.g., Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through an amendment/modification prior to its implementation. The original exemption number must be cited.

For any changes that could result in potential risk, an ethics application including the proposed amendments must be submitted to the relevant UKZN Research Ethics Committee. The original exemption number must be cited.

In case you have further queries, please quote the above reference number.

PLEASE NOTE:
Research data should be securely stored in the discipline/department for a period of 5 years.

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

Yours sincerely,

[redacted]

Mr Matthew Blain Kimble
Academic Leader Research
School Of Law