

**BEFORE THE ENVIRONMENTAL PROTECTION AUTHORITY
AT WELLINGTON**

**IN THE MATTER of the Exclusive Economic Zone and Continental
Shelf (Environmental Effects) Act 2012**

AND

**IN THE MATTER of a decision-making committee appointed to
hear a marine consent application by Trans
Tasman Resources to undertake iron ore
extraction and processing operations offshore in
the South Taranaki Bight**

**EXPERT EVIDENCE OF
CATHERINE IORNS MAGALLANES AND DALE SCOTT
IN SUPPORT OF TE KAAHUI O RAURU**

24 JANUARY 2017

We, Catherine J. Iorns Magallanes and Dale Scott, affirm

I, Catherine Iorns, am a Reader in Law at Victoria University of Wellington (NZ) and the Academic Adviser to the NZ Council of Legal Education. My qualifications include a Master of Laws (Yale University, USA, with Honours grades), LLB(Hons) (Victoria University of Wellington; first in class) and BA (Victoria University of Wellington). I have been employed at the Faculty of Law, Victoria University of Wellington, since 1999 and the NZCLE since 2006. Previously, I taught law at the University of Waikato (NZ) and Murdoch University (Western Australia).

My research is focused on human rights and environment, in both international and domestic law, and most recently on the intersection of these topics. I have published extensively in these areas including articles specifically on the precautionary principle in New Zealand law. One article, written with PhD candidate Greg Severinsen on the approach to precaution to be taken under the EEZ&CS Act 2012, won a Resource Management Law Association Thompson Reuters Publication Award in 2015. An article of mine on the intersection between indigenous rights and environment in NZ law won that same prize in 2016.

I, Dale Scott, am a Consultant with Visory Limited. My qualifications are Master of Laws (Victoria University of Wellington) and a LLB (Victoria University of Wellington). I obtained my LLM by thesis on the topic of the precautionary principle in New Zealand law, focusing on the formulation in s.61 of the EEZ and Continental Shelf Act 2012. My work experience includes working as a law clerk and then solicitor at Russell McVeagh as well as working as an in-house lawyer at both the Civil Aviation Authority and Environmental Protection Authority. I have also undertaken environmental related research and consultancy work for a number of organisations, including the Victoria University of Wellington on a contractual basis.

We confirm that we have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Practice Note dated 1 December 2014. We agree to comply with this Code. This evidence is within our area of expertise.

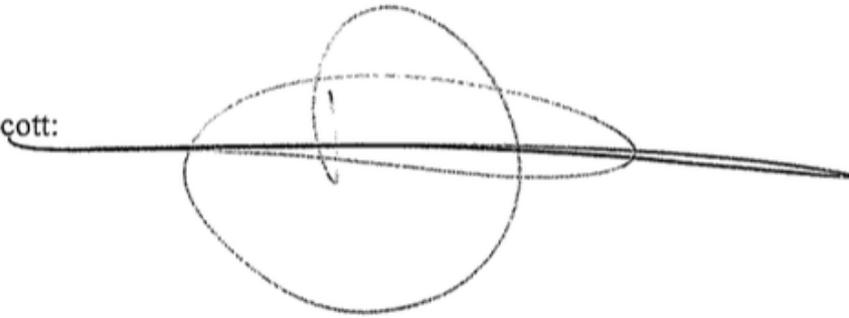
This evidence does not constitute legal advice. This evidence is provided pro bono in our roles as academic researchers.

Signed:

Catherine Iorns Magallanes:

A handwritten signature in black ink, consisting of a large, stylized initial 'C' followed by a series of loops and a long horizontal tail.

Dale Scott:

A handwritten signature in black ink, featuring a large, circular loop with a vertical line through its center, and a long horizontal line extending to the right.

Summary

The precautionary principle in s.61 of the EEZ Act appears short and simple and – being relatively young - without any history or baggage to encumber its interpretation and application. However, despite the Act being only a few years old, and there having been few chances to apply it, we hope we have shown that there is indeed a number of important matters to take into account in its application. The principle itself has a lengthy history at international law, and it has been applied by New Zealand courts for many years under different laws and policies. There is thus plenty of material for useful comparison with different formulations of it.

One of the most important factors to take into account is the subject matter it is being applied to. Application in the marine environment has been widely recognised as requiring a stronger precautionary approach than other settings. This is primarily due to the fact that less is known about the marine environment itself, with more reliance for predictions of future effects on scientific modelling that is necessarily incomplete. They may represent the best scientific knowledge available today, but that itself is incomplete. Thus legal formulations of the principle requiring stronger environmental protection have been chosen for the marine environment worldwide, and including in the EEZ Act.

The key elements to work through in applying section 61 to any given set of facts are detailed in this submission. In summary they include:

- (1) The threshold of threat of harm – whether significant adverse effects might result;
- (2) the level of risk and the certainty about that risk or level of harm that might result: some evidence is needed of a risk, mere speculation is not enough, but an amount significantly lower than the level of a legal burden of proof; these levels will likely be lower – ie more cautious - for the kinds of activities being considered in the marine environment under the EEZ Act;
- (3) that at the appropriate levels of harm and risk (ie appropriate for the situation and activities in question), action must be taken to address the risk and to favour caution;

- (4) that such action must also favour environmental protection;
- (5) the more uncertain the threat is, the more cautious we must be in our action taken:
- (i) *at the strong end of the response spectrum*, where the potential harm may be high and/or the lack of knowledge about their nature and potential to manifest is also high, a decision-maker should decline a decision; and
 - (ii) *at the mid point of the response spectrum*, again, on the basis of moderate harm and uncertainty and even high harm and moderate uncertainty, conditions could be imposed that require certain effects to be avoided (and if they cannot be avoided then the activity is not allowed);
 - (iii) *at the low end of the response spectrum*, where the potential harm is low to medium and the associated uncertainty is low but still persistent, conditions to avoid and/or mitigate (if avoidance is not possible), and measures capable of overcoming lower levels of uncertainty, such as adaptive management, may be appropriate.
- (6) that adaptive management may be able to be used, as per s.61(3); it may enable real data to be gathered (as opposed to relying on models) but cannot be conflated with precaution under s.61(2);
- (7) harm minimisation: that all harm must be minimised as much as possible rather than seeking to identify levels of tolerable insult.

I Introduction

This submission addresses the different legal elements and thresholds included in s.61 of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (“EEZ Act”). The approach of s.61 is new to NZ, even while based on a principle that has been recognised in different forms in other NZ legislation as well as in international law. It is thus helpful to explain its requirements fully, including their background, so that decision-makers can apply it properly, such that their decision can withstand legal challenges to this important aspect of their decision.

An informed interpretation of the section 61 version of the precautionary principle requires, first, an understanding of its core elements and key characteristics. Secondly, it requires an understanding of the contextual matters surrounding it, that bear heavily on the interpretation and application of any given formulation of the principle. To this end, Parts II to III of this submission provide the base knowledge that is essential to properly interpreting and applying section 61. Parts IV and V then comment on the key considerations that in our view the Decision Making Committee ought to turn its mind to and address, in the course of applying the precautionary principle as stated in section 61 to the facts of the present case. We do not undertake this application but merely aim to provide the background information on the law so as to better enable the DMC to do so.

II *The Precautionary Principle in a Nutshell*

The common sense notion that care and foresight are required in the face of an uncertain future is an abiding and universal notion exemplified by measures such as checking our driving mirror before overtaking and fastening our seatbelts to avoid injury in the event of a motor accident.¹ Common to each example is the combination of a particularly significant threat of *harm* (e.g. significant property and bodily damage), coupled with a level of *uncertainty* (e.g. as to the nature of the threat, and, likelihood of it materialising), preconditions that, if present, trigger a perceived need to exercise caution.²

Over the last 35-plus years this common-sense notion has crystallised into a legal principle, and more recently a binding legal norm,³ which is now referred to as the precautionary principle or precautionary approach (these terms are now treated as interchangeable).⁴

¹ James Cameron and Juli Abouchar “The Status of the Precautionary Principle in International Law” in David Freestone and Ellen Hey (eds) *The Precautionary Principle and International Law: The Challenge of Implementation* (Kluwer International, Hague, 1996) 29 at 29. David Vanderzwaag “The Precautionary Principle and Marine Environmental Protection: Slippery Shores, Rough Seas, and Rising Normative Tides” (2002) 33 *Ocean Development & International Law* 165 at 166. Arie Trouwborst *Evolution and Status of the Precautionary Principle in International Law* (Kluwer Law International, The Hague, 2002) at 7. Tim O’Riordan “The Politics of the Precautionary Principle” in Ronnie Harding and Elizabeth Fisher *Perspectives on the Precautionary Principle* (The Federation Press, Sydney, 1999) 283 at 283.

Earl RC “Common-Sense and the Precautionary Principle: an Environmentalist’s Perspective” (1992) 24 *MPB182* at 182.

² Arie Trouwborst, above n 1, at 7.

³ Specifically, more prescriptive and directive versions of the precautionary principle containing objective minimum standards as to what decision-makers can and cannot do, have been incorporated into some international instruments, and increasingly, various pieces of domestic environmental legislation in jurisdictions around the world.

⁴ Gary E Marchant “From General Policy to Legal Rule: Aspirations and Limitations of the Precautionary Principle” (2003) 111(14) *Environmental Health Perspectives* 1799 at 1799. See also James Cameron and Juli Abouchar, above n 1; Arie Trouwborst, above n 1.

A *Main Thrust of the Precautionary Principle*

Since its introduction to international law in the 1980s the precautionary principle has come to be viewed as being fundamental to environmental law.⁵ In fact, it is now widely believe that it occupies a central place in any realistic strategy for ensuring the environment is protected from the effects of human activities to the extent required to achieve sustainable outcomes.⁶ Thus, while the precise stated purpose of each precautionary principle formulation can vary, most stipulate some form of sustainability-based outcome as being their main objective, or rather, the purpose that they ultimately serve.⁷

The core definition of the precautionary principle reflects its common sense origins. In particular it provides⁸ that where there is a threat of environmental harm, in order to adequately protect the environment (both for its own sake and the well-being interests of future generations), decision-makers must take protective measures *in advance* of scientific certainty as to the causative relationship between, the consent activity in question, and, a potential resulting environmental harm.⁹ As one author

⁵ David Freestone “International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle” in Alan Boyle and David Freestone (eds) *International Law and Sustainable Development: Past Achievements and Future Challenges* (Oxford University Press, Oxford, 2001) 134 at 134.

⁶ Ibid.

⁷ Arie Trouwborst “Prevention, Precaution, Logic and Law: The Relationship between the Precautionary Principle and the Preventative Principle in International Law and Associated Questions” (2009) 2 *Erasmus Law Review* 105 at 108. Arie Trouwborst, above n 1, at 12. James Cameron “The Precautionary Principle: Core meaning, constitutional framework and procedures for implementation” in Ronnie Harding and Elizabeth Fisher, above n 1, at 40. Jacqueline Peel “The Precautionary Principle in Practice: Environmental decision-making and scientific uncertainty” (Federation Press, Melbourne, 2005) at viii. Arie Trouwborst, above n 1, at 12; James Cameron and Juli Abouchar, above n 1, at 40

⁸ Philippe Sands *Principles of International Environmental Law* (2nd ed, Cambridge University Press, New York, 2003) at 268-279; Arie Trouwborst, above n 1, at 245. David Freestone and Ellen Hey “Origins and Development of the Precautionary Principle” in David Freestone and Ellen Hey (eds), above n 1, at 13. John S Applegate “The Taming of the Precautionary Principle” (2002) 27 *Wm & Mary Env’tl L & Pol’y Rev* 13 at 14.

⁹ David Freestone and Ellen Hey, above n 8, at 13. Arie Trouwborst, above n 1, at 245.

further explains:¹⁰

...precaution means that the absence of scientific certainty – or conversely... scientific uncertainty – as to the existence or the extent of a risk should...no longer delay the adoption of preventative measures to protect the environment. *Put simply, the principle can be understood as the expression of a philosophy of anticipated action, not requiring that the entire corpus of scientific proof be collated in order for a public authority to be able to adopt a preventive measure.*

The “uniform core message” outlined above is most recognisably reflected in Principle 15 of the Rio Declaration,¹¹ which is the most widely adopted precautionary principle formulation globally.¹² Specifically, it provides:¹³

[i]n 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 evidence shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*

On the above basis it can be said that the *raison d'être* of the precautionary principle is the revised temporal relationship between scientific certainty and regulatory action that it proposes; namely, that (contrary to the traditional requirements imposed by the need to prove causation), in appropriate cases regulatory

¹⁰ Andrew Jordan & Timothy O’Riordan “The precautionary principle: a legal and policy history” in Marco Martuzzi and Joel Tickner (eds) *The Precautionary Principle: Protecting Public Health, the Environment and the Future of our Children* (World Health Organisation Europe, ISBN 92 890 1098 3, 2004), at 42. David Freestone and Ellen Hey, above n 8, at 13 (emphasis added).

¹¹ Arie Trouwborst, above n 1, at 245. James Cameron, Will Wade-Gery and Julie Abouchar “Precautionary Principle in Future Generations” in Emmanuel Agius and others *Future Generations in International Law* (Routledge, London 1998) at 98-99.

¹² Daniel Bodansky “Deconstructing the Precautionary Principle” in David D Cameron and Harry N Scheiber (eds) *Bringing New Law to Ocean Waters* (Martinus Nijhoff Publishers, Berkeley/Boston, 2004) 381 at 383. Philippe Sands, above n 8, at 269. John S Ahteensuu “The Taming of the Precautionary Principle” 27 (2002) *Wm & Mary Envtl L & Pol’y Rev* 13 at 13. Simon Marr *The Precautionary Principle in the Law of the Sea: Modern Decision Making in International Law* (Martinus Nijhoff Publishers, New York, 2003) at 7.

¹³ John S Ahteensuu, above n 12, at 13. Simon Marr, above n 12, at 7 (emphasis added).

action should precede scientific certainty (i.e. certainty as to the fact that such action is necessary).¹⁴ While there is often considerable variance in how the many precautionary principle formulations that exist are defined, at a minimum all share and are built around the above core definition. Furthermore, all share the same basic overarching structure.¹⁵

B The Predecessor to Precaution

The above approach advocated by the precautionary principle supplants the pre-existing ‘traditional approach’. The traditional approach provides that action to protect the environment from the adverse effects of an activity is only justified when those opposing it provide conclusive evidence that the activity *will* cause damage (i.e. in the absence of preventative and abatement measures).

This pre-existing approach is based on a “permissive regulation” paradigm, under which environmental regulation operates from the starting point that an activity should be permitted unless proven otherwise.¹⁶ Belief in the validity of this approach was premised on three beliefs:

- (1) “Assimilative capacity”,¹⁷ which asserts that it is permissible to allow human activities to inflict certain levels of detrimental impacts on a receiving

¹⁴ David Freestone and Ellen Hey, above n 8, at 13. John S Applegate, above n 7, at 26.

¹⁵ Per Sandin “Dimensions of the Precautionary Principle” (1999) 5.5. *Human and Ecological Risk Assessment: An International Journal* 889 at 890. M Matthee and D Vermersch “Are the Precautionary Principle and the International Trade of Genetically Modified Organisms Reconcilable?” (2000) 12 *JAEE* 59 at 61. A Epiney and M Scheyli “Strukturprinzipien des Umweltvölkerrechts” (Nomos Verlag, Baden-Baden, 1998) at 109-110. James Cameron and Juli Abouchar, above n 1, at 45. Arie Trouwborst *Precautionary Rights and Duties of States* (Martinus Nijhoff Publishers, Leiden, 2006) at 30. Daniel Bodansky “Deconstructing the Precautionary Principle” in David D Cameron and Harry N Scheiber (eds), above n 12, at 386. Gary E Marchant, above n 4, at 1800. Stephen Gardiner “A Core Precautionary Principle” (2006) 14(1) *J Polit Philos* 33 at 36.

¹⁶ RC Earll “Common Sense and the Precautionary Principle - An Environmentalist’s Perspective” (1992) 24(4) *Marine Pollution Bulletin* 182.

¹⁷ Note that for simplicity however, most literature provides that the traditional approach is based on assimilative capacity. Michael M’Gonigle and others “Taking Uncertainty Seriously: From Permissive Regulation to Preventative Design in Environmental Decision Making” (1994) 32(1) *Osgoode Hall*

ecosystem, because of a belief that each ecosystem possesses an enduring capacity to assimilate a given level of impact, without suffering any significant harm as a result,¹⁸ plus the belief that any harm generated by unassimilated impacts (i.e. impacts that exceed the receiving ecosystems capacity to assimilate them) can always be made good ex post facto;

- (2) The belief that science can and will (primarily through measures such as predictive modelling)¹⁹ provide decision-makers with the information and means necessary to prevent humans from encroaching upon the carrying or assimilative capacity of ecosystems at the time they need it;²⁰ and
- (3) The view that regulators can, having placed faith in the above, permit activities (such as the release of substances) within and up to the limits of that receiving ecosystems assimilative capacity (also referred to as carrying capacity).

C The Precautionary Principle Rationale

The rationale behind the adoption of the precautionary principle is a dual one. In particular, two overarching scientific insights account for the rejection of the assimilative capacity concept (upon which the traditional approach was based),²¹ and subsequently the precautionary principle's widespread adoption.

Law Journal 99. Owen McIntyre and Thomas Mosedale "The Precautionary Principle as a Norm of Customary International Law" (1997) 9 JEL 221 at 221. Arie Trouwborst, above n 1, at 18.

¹⁸ In other words, up to a "specified limit which purportedly reflects "safe" levels", the impact of such activities will not harm the receiving environment. See K Stairs and P Taylor "Non-Governmental Organisation and the Legal Protection of Oceans: A Case Study" in A Hurrell and B Kingsbury (eds) *The International Politics of Environment* (Clarendon Press, Oxford, 1992) at 132. JF Whitehouse "Will the Precautionary Principle Environmental Decision Making and Impact-Assessment" in Ronnie Harding and Elizabeth Fisher, above n 1, at 59. Owen McIntyre and Thomas Mosedale, above n 17, at 222. Charmian Barton "The Status of the Precautionary Principle in Australia: Its Emergence in Legislation and as a Common Law Doctrine" (1998) 22 Harv Envtl L Rev 509 at 512.

¹⁹ Arie Trouwborst, above n 1, at 18.

²⁰ Ellen Hey "The Precautionary Concept in Environmental Policy and Law: Institutionalizing Caution" (1992) 4 Geo Int'l Envtl L Rev 303 at 307 and 308. Charmian Barton, above n 18, at 511.

²¹ Note that each of these overarching insights themselves is the end product of (i.e. a culmination of) a

The first insight concerns harm. Specifically, it became apparent that ecosystems are much more vulnerable than first thought.²² This is for a number of reasons that disprove the assimilative capacity position that human impacts are readily assimilated and can always be made good.²³ Consequently, the ecological harm caused by human activities is often much graver and pervasive than previously thought, difficult or impossible to undo, and above all else, capable of being long-term or irreversible in nature.²⁴

series of more specific scientific insights. See Dale Scott *Application of the Precautionary Principle During Consenting Processes in New Zealand: Addressing Past Errors, Obtaining a Normative Fix and Developing a Structured and Operationalised Approach* (LLM Thesis, Victoria University of Wellington, 2016) at Part IV and V.

²² This insight was the product of the following: First we came to acknowledge that the industrial nature and scale of the increasingly technological activities we conduct in the environment makes the effects of such activities much graver, pervasive and voluminous. Second, advances in our understanding of ecosystems led to the realisation that: (1) human activities often inflict harm more readily and acutely than first thought; (2) such harm often irreversibly compromises the affected ecosystem; and (3) due to the non-linear way many ecosystem processes operate, small human-induced changes to an ecosystem component that form part of a given non-linear ecological process can sometimes produce sudden and disproportionate harmful changes to another part of the ecosystem. Dale Scott, above n 21.

²³ For example, detrimental impacts such as global warming, the hole in the ozone layer and like events. Furthermore, we came to understand that where human activities induce a deviation from the parameters of variance tolerated by receiving ecosystems, this can trigger “ecosystem shifts” which are likely impossible to correct. H Osterblom and others “Making the Ecosystem Approach Operational – Can Regime Shifts in Ecological and Governance Systems Facilitate the Transition?” (2010) 34 *Marine Policy* 1290 at 1293. Decision V/6 by the Conference of the Parties to the Convention on Biological Diversity at its fifth meeting (COP), Nairobi, 15-26 May 2000, UNEP/COP/5/23. As Schettler and Raffensperger explain: [w]hen change is sufficient to cause a system to cross a threshold, it operates within a new dynamic equilibrium that has its own stability and does not change...These new interactions become the norm...from which there is not turning back...When systems exist near a threshold, small perturbations at a critical point may be sufficient to cause a shift to a new dynamic equilibrium or more chaotic activity...” Ted Schettler and Carolyn Raffensperger “Why is a Precautionary Approach Needed” in Marco Martuzzi and Joel Tickner (eds) *The Precautionary Principle: Protecting Public Health, the Environment and the Future of our Children* (World Health Organisation Europe, ISBN 92 890 1098 3, 2004) at 64, 67 and 84.

²⁴ Konrad Von Moltke “The Relationship Between Policy, Science, Technology, Economics and Law in the Implementation of the Precautionary Principle” in David Freestone and Ellen Hey (eds), above n

The second realisation concerns scientific uncertainty. In particular, improved understanding of how interconnected, complex, non-linear, variable and chaotic ecosystems are, in turn led to the realisation that science has a very limited ability to detect, predict, understand, and ultimately prove the nature, gravity and probability of human impacts.²⁵ In addition, the scientific process of proving such effects typically takes years, if not decades, to develop the body of data and testing required to properly understand and establish that a given activity causes a given harm.²⁶ Put another way, it came to pass that science has a very limited ability to predict and prove cause-and-effect relationships, especially in advance of an activity having been undertaken for some time.²⁷

Owing to the above, most states now firmly recognise that requiring scientific proof that an activity will cause a given harm before taking steps to prevent that harm occurring is highly ineffective. It is ineffective because significant or irreversible

7 at 97-98. Arie Trouwborst “Prevention, Precaution, Logic and Law: The Relationship between the Precautionary Principle and the Preventative Principle in International Law and Associated Questions” (2009) 2 *Erasmus Law Review* 105, at 107. Timothy O’Riordan and James Cameron “The History and Contemporary Significance of the Precautionary Principle” in Timothy O’Riordan and James Cameron (eds), in T O’Riordan, and J Cameron (eds) *Interpreting the Precautionary Principle* (Cameron May, London, 1994) at 12. Philippe Sands, above n 8, at 3. Ronnie Harding and Elizabeth Fisher, above n 1, at 2. Alan Boyle and David Freestone (eds), above n 5, at 1. Durwood Zaelke, Donald Kaniaru and Eva Kruzikova (eds) *Making Law Work: Environmental Compliance and Sustainable Development Volume 1* (Cameron May, London, 2005) at 32.

²⁵ Ronnie Harding and Elizabeth Fisher “Introducing the Precautionary Principle” in Ronnie Harding and Elizabeth Fisher, above n 1, at 2.

²⁶ AJ Underwood “Precautionary principles require changes in thinking about planning and environmental sampling” in Ronnie Harding and Elizabeth Fisher, above n 1 at 255-256. Dinah Shelton “The Impact of Scientific Uncertainty on Environmental Law and Policy in the United States” in David Freestone and Ellen Hey (eds), above n 1, at 210. Charmian Barton, above n 18, at 511. HL Rouse and N Norton “Managing Scientific Uncertainty for Resource Management Planning in New Zealand” (2010) 17 *Australasian Journal of Environmental Management* 66 at 66.

²⁷ Because the ecosystems characteristics listed above make it difficult (even impossible), to accurately predict how a human activities impacts will resonate throughout the receiving ecosystem, it is often the case that we are only able detect, let alone prove a potential impact, after the activity had been occurring long enough for the harm to become sufficiently manifest. Konrad Von Moltke, above n 24 at 97-98. Charmian Barton, above n 18, at 510-511. Sumudu Arapattu, *Emerging Principles of International Law* (Transnational Publishers, New York, 2006) at 206, Philippe Sands, above n 8, at 203-204.

ecological changes will often have already taken place by the time that all three of the following requisite steps will have been taken:²⁸

- (1) before the given ecological harm generated by ecological impacts caused by an activity becomes sufficiently manifest to detect;
- (2) before scientists are afforded sufficient opportunity to investigate, understand and establish a causal relationship between the activity and alleged harm to the extent required by both scientific and legal standards of proof (something that can take years if not decades to achieve);²⁹ and
- (3) before the resulting proof marshals the relevant regulator decision-maker into conceiving of, and implementing the requisite protective, preventative or mitigation measures needed to abate or curb the effects of the identified resulting harm.

D Effecting a “Paradigm” Shift in the Approach to Environmental Management

The precautionary principle consequently emerged in response to the realisations and insights noted above. In particular, in response to the overarching insights outlined above, states implemented the precautionary principle in order to facilitate a wider paradigm shift (first at international law):

- (1) away from a permissive and reactive approach to environmental regulation,³⁰ which, owing to those insights and realisations outlined above, was unable to secure sustainable outcomes; and

²⁸ Dinah Shelton, above n 26, at 226. Arie Trouwborst, above n 15, at 195. Catherine J Iorns Magallanes “The Precautionary Principle in the New Zealand Fisheries Act: Challenges in the New Zealand Court of Appeal” (paper presented to Australasian Law Teachers Association, Melbourne, July 2006) at 5, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2079837.

²⁹ As Tickner and Raffensperger note: “traditional research science attempts to gather nearly complete and perfectly supportive information before claiming a cause-and-effect relationship”: Joe Tickner and Carolyn Raffensperger *The Precautionary Principle in Action: A Handbook* (1st ed, Science and Environmental Health Network, Massachusetts, 1999) at 5.

³⁰ I.e. the traditional approach, which itself was premised on the assimilative capacity concept, which is now understood to be flawed.

- (2) *towards* an approach that anticipates and acts in advance of harm (e.g. by entitling or even compelling decision-makers to take action in advance of definitive scientific proof that an activity will cause a given harm),³¹ and related to this, towards an approach that operates from a starting point that environmental harm ought to be avoided, or at the very least minimised as much as possible.

In this respect it can be said that while the purpose of the precautionary principle is to achieve sustainable outcomes, its key function is to achieve sustainability by ensuring that decision-makers can and do take steps that have a meaningful ability to anticipate harm (i.e. act and prevent harm before it has occurred).

E Harm Minimisation Principle: A Practical Requirement

It is important to highlight that this paradigm shift also represents a move *away* from environmental management practices based regulation following science (i.e. to accurately gauge the health of the environment), to an understanding that effective environmental decision-making, will in appropriate circumstances, require regulators to go beyond available or established scientific knowledge.³²

Commentators agree that the harm minimisation aspect of this paradigm shift is inherent in the conceptual core of the precautionary principle, and forms part of its precautionary “essence”. In this respect the precautionary principle asserts, that in order to have any chance of achieving sustainable outcomes (i.e. through anticipatory action) we must shift:

- (1) *from* an environmental management approach that focus on determining acceptable levels of insult that receiving ecosystems can assimilate (i.e. operates from a starting point of asking how much total harm can be inflicted); and

³¹ David Freestone and Ellen Hey, above n 8, at 13.

³² PE Taylor “From Environmental to Ecological Human Rights: A New Dynamic in International Law?” (1998) 10 Geo Int’l Env L Rev 309 at 330.

- (2) *toward* an approach that focuses on minimising and containing harm as much as possible (i.e. operates from a starting point of trying to keep the harm inflicted as low as possible).

The rationale for the above is that the former approach is practically impossible given science's limited ability to accurately determine and predict what harm receiving ecosystems can assimilate (especially harm generated by cumulative and synergistic effects), and the fact the chaotic variable nature of ecosystem renders their assimilative capacity a moving target.³³ On this basis the precautionary principle asserts that we must leave "ecological space" as a buffer against our ignorance as to what types and levels of detrimental impact will trigger significant harm. Because of the above, and given the fact that an ecosystem's capacity to absorb a particular detrimental impact (i.e. without significant harm resulting) is always in a state of chaotic flux, the precautionary principle also requires that environmental tolerance thresholds "should not even be approached, let alone breached".³⁴ Thirdly, the precautionary principle requires that the above mentioned buffer will likely only be achievable in each instance if harm is minimised as much as possible through the use of best practices (e.g. employing clean methods of production) and technological advancements.³⁵ This third requirement is exemplified in the text of the 1991

³³ Other overlapping factors that contribute to this position include the: non-linear nature of ecosystem's response to human interference is such that seemingly minor insults to a receiving ecosystem can sound in comparatively grave harmful impacts; and, the fact each ecosystem is typically replete with structural and functional components that are constantly undergoing chaotic and variable shifts (each of which often occur on a multitude of different temporal and spatial scales), thereby making the level of impact an ecosystem can tolerate a constantly moving target. See Charmian Barton, above n 18 at 512. Timothy O'Riordan and James Cameron, above n 24, at 17. Simon Marr, above n 12, at 26. *Oceans and the Law of the Sea: Report of the Secretary General* GA Res 69(a) A/61/63, (2006) at [110] -[113], [150], and [154]. Donna R Christie "Implementing an Ecosystem Approach to Ocean Management: An Assessment of Current Regional Governance Models" (2005) 16 *Duke Envtl. L. & Pol'y F* 117 at 128. Karl-Hermann Kock and others "Fisheries in the Southern Ocean: An Ecosystem Approach" (2007) 362 *PhiL Trans' R' Soc' B* 2333 at 2333-2349. at 2342. H Osterblom, above n 23, at 1291. Erik Jaap Molenaar "Ecosystem-Based Fisheries Management, Commercial Fisheries, Marine Mammals and the 2001 Reykjavik Declaration in the Context of International Law" (2002) 17 *Int'l J Marine and Coastal L* 561 at 583. Secretariat of the Convention on Biological Diversity *The Ecosystem Approach* (CBD Guidelines, Montreal, 2004) at 18.

³⁴ Charmian Barton, above n 18 at 512. Timothy O'Riordan and James Cameron, above n 24, at 17.

³⁵ David Freestone and Ellen Hey, above n 8, at 12-13. Tim O'Riordan, James Cameron and Andrew Jordan "The Evolution of the Precautionary Principle" in Tim O'Riordan, James Cameron and Andrew Jordan (eds) *Reinterpreting the Precautionary Principle* (Cameron May, London, 2001) 9 at 19.

Convention on the Ban of Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes Within Africa, which states:³⁶

The parties shall cooperate with each other in taking the appropriate measures to implement the precautionary principle to pollution prevention through application of clean production methods, rather than pursuit of a permissible emissions approach based on assimilative capacity assumptions.

F The Common Structure

Also common to each of the various precautionary principle formulations is their structure, whereby each version is comprised of:³⁷

- (1) a “precautionary trigger”, which prescribes the factors or risk thresholds which, if met, trigger recourse to the precautionary principle (i.e. they stipulate the circumstances when precautionary measures are warranted);³⁸ and
- (2) a “precautionary response”, which prescribes what precautionary action is warranted (i.e. what the decision-maker can or must do when confronted with a given risk).³⁹

It is now common practice to break the above into four distinct dimensions. For example, the precautionary trigger can be further broken down into the:⁴⁰

- (1) “threat dimension”, which specifies the minimum level (i.e. gravity) of the potential harm; and

³⁶Arie Trouwborst, above n 1, at 19.

³⁷ Daniel Bodansky, above n 15, at 386. Commission of the European Communities “Communication from the Commission: on the precautionary principle” (COM 1, Brussels, February 2000) at 13. Noah M Sachs “Rescuing The Strong Precautionary Principle From Its Critics” (2011) (4) *University of Illinois Law Review* 1285 at 1338. John S Applegate, above n 7, at 17.

³⁸ Daniel Bodansky, above n 15, at 387.

³⁹ Daniel Bodansky, above n 15, at 386. Jon M Van Dyke “Evolution and International Acceptance of the Precautionary Principle” in David D Cameron and Harry N Scheiber n 12, at 359. Gary E Marchant, above n 4, at 1800.. Stephen Gardiner “A Core Precautionary Principle” (2006) 14(1) *J Polit Philos* 33 at 36.

⁴⁰ Per Sandin, above n 15, at 890. Runyu Wang “The precautionary principle in maritime affairs” (2011) 10(2) *WMU J Marit Affairs* 143 at 149. Daniel Bodansky, above n 15, at 386.

- (2) “uncertainty dimension”, which specifies the minimum level of scientific evidence that an activity is capable of causing an alleged harm to materialise, (e.g. scientific knowledge as to its nature, extent of impact and causal relationship with the activity in question).

Likewise, the precautionary response can also be further broken down into the:

- (1) “action dimension”, which specifies how to respond to the identified threat; and
- (2) “command dimension”, which specifies the strength of the decision-makers duty to implement the prescribed precautionary action (e.g. whether precautionary action is discretionary a or a compulsory response).

In applying the above analytical framework to the commonly-cited Rio Declaration formulation of the precautionary principle, it can be shown that it is comprised of:

- (1) a *threat dimension*, expressed as “threats of serious or irreversible environmental damage”;
- (2) an *uncertainty dimension*, expressed as “lack of full scientific certainty”;
- (3) an *action dimension*, expressed as “measures to prevent environmental degradation”; and
- (4) a *command dimension* expressed as “...[uncertainty] should not be used as a reason for postponing” the actions/measures.

This analytical framework is extremely useful when applying the precautionary principle in practice, as it provides a structured approach to the process of interpreting a given formulation. It thereby helps isolate and identify the legal content and parameters that one must be aware of when applying it in practice.

III Ambiguity and Lack of Normative Character

In the context of considering application of high-level precautionary principle formulations (such as the Rio Declaration and like formulations found in most international environmental law instruments) under domestic environmental management legislations, a frequently cited English judgement of the Queen's Bench notes:⁴¹

There is, at present, no comprehensive and authoritative definition of the precautionary principle. It is an expression which has in recent years been used in a number of international declarations, conventions and treaties...*In none of these documents is the principle comprehensively defined, although often the document describes what the principle is intended to mean in the context of the subject matter concerned.*

In other words, the Queen's Bench correctly observes that, once you go beyond the basic conceptual core, it is difficult to clearly identify the requirements entailed in the precautionary principle, as details crucial to its application in practice remain uncertain or await clarification.⁴²

A Exploring the Lack of Detail and Clarity

The stated lack of clarity occurs largely because most international law versions of the precautionary principle (upon which New Zealand and most other countries domestic equivalents are based) are "situated at a meta-level", and for this reason, "require[] explication and operationalization". International environmental lawyers have commented that the absence of a clear and sufficiently detailed definition in such meta-level formulations renders it difficult to operationalise and, in

⁴¹ *R v Secretary of State for Trade and Industry ex parte Duddridge* [1994] Env LR 226 (QB), J. Smith as cited in LJ Farquharson and J Dmith "The Status of the Precautionary principle in International Law: *R v. Secretary of State for Trade and Industry ex parte Duddridge and Others*" (1995) 7(2) *Journal of Environmental Law* at 224. [Court of Appeal decision, *The Times*, 26th October 1995] (emphasis added).

⁴² Simon Marr, above n 12, at 2. John S Applegate, above n 7, at 14.

turn, apply during a decision-making process.⁴³ For example, the precautionary principle at international law typically “does not specify how much caution should be taken”⁴⁴ nor “translate into a coherent set of performance obligations”.⁴⁵

In direct response to this issue, Boutillon states:⁴⁶

“[t]he issue is to determine the legal implications of the principle. What level of risk should trigger the implementation of the principle? Which costs should be offset, as against the environmental damage? Is the principle a procedural obligation, or does it carry an obligation to attain a certain result in terms of environmental protection.

On the above basis, such operational detail should, at the very least, entail criteria that are sufficiently specific and objective enough to enable any actor or decision-maker to:

- (1) determine whether the contemplated activity triggers the need to take precautionary measures (i.e. specific criteria that enable a decision-maker to properly understand what is required to meet a given formulations threat and uncertainty thresholds, and, ascertain whether they have been met in a given case);⁴⁷ and
- (2) identify those measures, that, at a general level are precautionary in nature, and, provide some guidance or principles that help one ascertain, which of those measures in a given case, are the minimum required to overcome the harm and uncertainty issues that the principle was created to address, and in turn ensure that the given harm can be anticipated and prevent it before it

⁴³ David Freestone and Ellen Hey, above n 8, at 14. John S Applegate, above n 7, at 13. Gary E Marchant and Kenneth Mossman *Arbitrary and Capricious: The Precautionary Principle in the EU Courts* (AEI Press, Washington, 2004) at 11.

⁴⁴ Per Sandin, above n 15, at 890. For others supporting this view see Gary Marchant and K Mossman, above n 43, at 11.

⁴⁵ Mark Geistfeld “Implementing the Precautionary Principle” (2001) 31 *Envtl L Rep* 11,326 at 11,326.

⁴⁶ Sonia Boutillon “The Precautionary Principle: Development of an International Standard” (2002) 23 *Mich J Int'l L* 429 at 431.

⁴⁷ James E Hickey and Vern R Walker, above n 56, 445. Arie Trouwborst, above n 15 at 132.

occurs, rather than react to harm ex post facto.⁴⁸

Thus, where such objective criteria are not provided, the precautionary principle is not considered ‘operationalised’ (e.g. capable of application under a consenting process).

Importantly, this process of identifying the more detailed content of the precautionary principle involves determining the precautionary principle’s relationship with other legal norms such as sustainable development and the similar concepts of intergenerational equity and ecosystem based management; these also inform its substantive content and how it ought to be applied.⁴⁹

B Reason for Definitional Ambiguity in international law

The lack of detailed content and clarity in the high-level precautionary principle appears to largely be due to the fact that most international law formulations, which New Zealand’s domestic formulations are directly based on and resemble, intentionally lack detail and precision. There are four main reasons for this.

First, this is because most international versions are only intended to serve as a “declaratory” statement or guiding principle, and as such, have been cast in broad and flexible terms.⁵⁰ Thus, subject to a handful of exceptions, these versions were not intended to operate as legal norms, complete with the requisite objective criteria;⁵¹ rather, they were intended to operate as very high-level non-binding guiding

⁴⁸ Nicolas de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules* (Oxford University Press, Oxford, 2002) at introduction section.

⁴⁹ Tim O’Riordan, James Cameron and Andrew Jordan, above n 35, at 19. Sonia Boehmer-Christiansen “The Precautionary Principle in Germany – Enabling Government” in T O’Riordan, T and J Cameron, J (eds) *Interpreting the Precautionary Principle* (Cameron May, London, 1994) 31 at 38. Konrad Von Moltke, above n 24, at 101. James Cameron and Will Wade-Gery, above n 11, at 37-38.

⁵⁰ Derek Nolan “The Legal Standards of Proof to be Applied to Coastal Projects and Predictions of Coastal Behaviour, and the role of the Precautionary Principle” in *Pacific Coasts and Ports '97: Proceedings of the 13th Australasian Coastal and Ocean Engineering Conference and the 6th Australasian Port and Harbour Conference; Volume 1*. Christchurch, NZ: Centre for Advanced Engineering, University of Canterbury, 1997.

⁵¹ This was largely because at the time most negotiating states were unwilling to commit to a precaution principle that imposed binding obligations.

principle or aspirational statement, which did not fetter states' discretion to nonetheless manage their natural environments as they saw appropriate.⁵²

Second, most versions were kept high-level because more detailed formulations that were intended to operate in a more binding fashion (i.e. as a legal norm that constrained the discretion of states) prompted considerable disagreement between negotiating states. Thus, consensus on a given formulation was only possible if it was drafted in high-level language that left contentious aspects unresolved and provided little in the way of objective standards (against which states behaviour can be measured). Thus, such definitions were impregnated with considerable uncertainty regarding their normative meaning and application.

Third, as Fisher also notes, much of this definitional uncertainty is likely also in part due to the fact that, beyond the simple precautionary principle direction to act in advance of science:⁵³

...what is deemed to be the appropriate basis for a decision and the appropriate measures to be taken will vary depending on the circumstances...It will be influenced by legal and socio-political culture, the specific statutory regime, the nature of the particular environmental or public health problems, the availability and ease of implementation of 'precautionary measures', and more general understanding of legitimate decision-making"

As such, many international versions were likely kept vague on the understanding that negotiating states would develop, for implementation, more detailed versions that were suited to the domestic circumstances.

Fourth, even when teased out into a more fully-fledged state (for example, as

⁵² In this respect these permissive and open-ended versions of the precautionary principle were merely intended to operate as the international communities first of many steps towards the eventual adoption of the precautionary principle.

⁵³ Elizabeth Fisher and Ronnie Harding "The precautionary principle and administrative constitutionalism: the development of frameworks for applying the precautionary principle" in Elizabeth Fisher, Judith Jones and Rene von Schomberg (eds) *Implementing the Precautionary Principle: Perspectives and Prospects* (Edward Elgar, Cheltenham, 2006) at 113 and 116.

has been done under German environmental law),⁵⁴ the precautionary principle is not capable of being articulated as a self-contained and tightly prescribed set of clauses. Rather, it is a principle that combines a series of sub-set notions, which if properly applied, best enable one to properly anticipate harm.⁵⁵

On the above basis, the principle simpliciter is not a neatly defined and self-contained concept, but rather, covers a “territory of meaning” that states must tease out before it can be applied in an operational setting, and which intimately interacts intimately with overlapping environmental principle and norms.

C Implications of Conceptual Uncertainty

Commentators agree that a failure to provide objective criteria undermines the efficacy of as well as respect for the precautionary principle. As Hickey and Walker note, for example:⁵⁶

[v]ague references to covered activities can undermine a primary objective of the precautionary approach by creating the possibility that an activity is not known to be covered until after the environmental harm occurs. Identification of specific activities to which precaution applies enables private and governmental actors to plan their conduct, and provides them due notice concerning potential costs and penalties. Specification also helps to ensure that obligated states do not construe the covered activities too narrowly or too broadly.

Conversely, excess discretion afforded by the absence of operational detail or guidance can also result in excessively precautionary or restrictive outcomes that:

- (1) defeat the principle’s ability to strike the appropriate balance between use and protection and thereby serve its ultimate purpose of achieving sustainable development; and
- (2) operate to undermine its credibility amongst political, economic and public

⁵⁴ Sonia Boehmer-Christiansen, above n 49, at 38.

⁵⁵ Tim O’Riordan, James Cameron and Andrew Jordan, above n 35, at 11.

⁵⁶ James E Hickey and Vern R Walker “Refining the Precautionary Principle in International Environmental Law” (1995) 14 Va Env’tl LJ 423 at 445.

stakeholders.⁵⁷

Thus, attempting to apply vague and substantively “undercooked” meta-level formulation creates a live risk that regulators will impose too little or too much in the way of environmental protection measures, when applying it, and, will apply it inconsistently.

New Zealand’s own versions are largely modelled on these “meta-level” international law formulations. The above risks make it critical that New Zealand decision-makers recognise that our formulations are essentially short hand references to the much more complete conceptual whole of a properly “operationalised” and normative version of the precautionary principle. The operationalised principle, as discussed above in Part II, does contain objective and binding standards, as well as supporting principles and guidance for decision-makers,⁵⁸ although there is a range whereby different elements and standards are entailed in different formulations of the principle. Thus, where a precautionary principle formulation in New Zealand legislation is couched in general terms, without specifying this level of detail, decision-makers will first need to carefully elucidate what the relevant objective standards and supporting principles are before seeking to apply it.

We note that other New Zealand formulations of the precautionary principle have been interpreted by our courts and there is accordingly authoritative jurisprudence on the relevant thresholds and other elements. Interestingly, the Resource Management Act jurisprudence is arguably the most relevant to the interpretation of s.61 EEZ Act, despite not containing any explicit version of the precautionary principle itself and being implied by the courts.⁵⁹ However, even this is of most use only at the level of general approach and principle, rather than

⁵⁷ Stephen Gardiner, above n 39, at 36. HL Rouse and N Norton, above n 26, at 66.

⁵⁸ Elizabeth Fisher “Is the Precautionary Principle Justiciable?” (2001) 13(3) *Journal of Environmental Law* 315 at 318-319. This view was supported in the Australian cases *Vertical Telecoms Pty Ltd v Hornsby Shire Council* [2000] NSWLEC 172 and *Miltonbrook Pty Ltd v Kiama Municipal Council* [1998] NSWLEC 281.

⁵⁹ As discussed in Catherine J Iorns Magallanes and Greg Severinsen, “Diving in the Deep End: Precaution and Seabed Mining in New Zealand's Exclusive Economic Zone” (2015) 13 *NZJPIL* 201 at 210, the jurisprudence arising from formulations in the Fisheries Act 1986 and the HSNO Act 1986 is not as relevant. See *id.*, at 208-10, 215-16

operational detail. This is largely because, at the level of operational detail and application of the RMA, NZ courts have not agreed on their approaches to most aspects of application of the precautionary principle within the RMA regime.⁶⁰ It is thus necessary to go into the detail of the precise wording of s.61 from scratch, which we do in Part V below. In order to lay the groundwork for that, Part IV discusses the various options and background to the wording chosen.

⁶⁰ As discussed and cited in Iorns Magallanes & Severinsen, ‘Diving in the Deep End’, in “the case law that has developed around precaution under the RMA”, “[t]here is also not yet a single settled approach to any of the questions surrounding the correct standard of proof, burden of proof, or the role of precaution in the judgment of a consent authority.” Ibid at 217.

IV *Beyond the Precautionary Principle's Conceptual Core*

Beyond the relatively skeletal framework of the conceptual core and structure that is common to each version of the precautionary principle, there is a range of normative content, which is exemplified by different formulations. The main substantive differences that occur between formulations typically stem from one or more of the four “dimensions” identified above and, at general level, these differences primarily relate to the strength of environmental protection they afford.⁶¹ In this sense, all versions of the precautionary principle can be viewed as sitting along a continuum, ranging from weak to strong environmental protection.⁶²

A *Weak formulations*

Unsurprisingly, weak precautionary principle formulations, of which, the Rio Declaration version is a prime example, offer considerably less environmental protection. At a general level, such weakness stems from the fact that they are not sufficiently prescriptive to constitute legal norms, but rather, are typically cast as non-binding guiding principles. As discussed in Part III, such versions are intended to help guide environmental decision-making but, in doing so, do not constrain the decision-makers discretion in any way, or specify any specific objective standards to be met.

1 *Assessing the Harm and Certainty Dimensions*

The precautionary triggers of weak formulations (i.e. the harm and certainty dimensions), tend to impose much higher thresholds (e.g. as to the gravity of the potential harm, and degree of certainty that the activity will cause such harm), which must be met before the environmental protection afforded by a precautionary response can be made available. In this respect they typically feature a *high harm threshold*, for example, which provides that a precautionary response is only warranted when an

⁶¹ David Flemming “The Economics of Taking Care: An Evaluation of the Precautionary Principle” in David Freestone and Ellen Hey (eds), above n 1, at 147. Noah M Sachs above n 37 at 1338; John S Applegate, above n 7, at 17

⁶² David Flemming “The Economics of Taking Care: An Evaluation of the Precautionary Principle” in David Freestone and Ellen Hey (eds), above n 1, at 147. See also John S Applegate, above n 7.

activity presents “threats of serious or irreversible harm”.⁶³

High harm dimension thresholds offer less environmental protection as they only make the taking of precautionary action in favour of the environment available to particularly grave forms of environmental impact (i.e. which are deemed to meet the threshold standard), thereby leaving lesser forms of harm to be managed under the much less effective traditional approach. This is done presumably on the understanding that, notwithstanding those insights that gave rise to the precautionary principle, ecosystems possess the capacity to assimilate such lesser forms of harm.

In addition, high certainty dimension thresholds (i.e. which require a higher level of certainty that the relevant activity will cause a given alleged harm), still require persons asserting that the harm will result to furnish the decision-maker with more in the way of scientific evidence to corroborate this claim. As such, while these versions do not go so far as to demand the quality and quantity of scientific evidence required to prove causation (e.g. on the balance of probability), they do nevertheless require a considerable body of scientific proof before a precautionary response is triggered. In this sense these versions do not differ that much from the traditional approach as to a large degree they still require some level of proof before steps can be taken to protect the receiving environment from the asserted harm; thus, in practice, they can offer little respite from the demands of causation.

Common examples of weak formulations that impose a high threshold – and that thereby reside further towards the “balance of probabilities” end of the spectrum – include: “lack of full scientific certainty” (arguably the most widely endorsed internationally);⁶⁴ and, “scientific research has not fully proved a causal link”.⁶⁵

⁶³ Jonathan Wiener “Precaution” in Daniel Bodansky, Jutta Brunnee and Ellen Hey (eds) *The Oxford Handbook of International Environmental Law* (Oxford University Press, Oxford, 2007), at 604. Daniel Bodansky, above n 15, at 384. See, for example, *United Nations Rio Declaration on Environment and Development*, Principle 15, UN Doc.A/CONF.151/26 (vol. I) (1992); 31 ILM 874 (1002). *Convention on Biological Diversity* opened for signature 5 June 1992, 1760 UNTS 79, 142 (entered into force 29 December 1993), and *United Nations Framework Convention on Climate Change*, art 3(3), opened for signature 9 May 1992, 1771 UNTS 10.

⁶⁴ Rio Declaration on Environment and Development, Principle 15, June 14, 1992, U.N. Doc. A/Conf.151/5/Rev.1 (1992) Reprinted in 31 I.L.M. 874, 879 (1992). United Nations Framework Convention on Climate Change, art 3, 31 ILM 854 (opened for signature 9 May 1992, entered into

2 *Assessing the Command and Action Dimensions*

As to the “precautionary response”, weak versions usually only go as far as stating that lack of scientific certainty shall not be used as a reason for postponing taking steps to avoid harm.⁶⁶

First, the action dimension aspect of the above (e.g. “taking steps to avoid harm”) offers less in the way of environmental protection as it does not prescribe any specific precautionary measures that are to be taken in response to an identified threat, and in this sense, they do not provide any guidance as to what measures, are, in substance, precautionary in nature. As a result, a decision-maker applying such a vague formulation must, prior to applying it, extrapolate from the principle (e.g. by reference to its purpose and the various ecological and scientific problems it seeks to address), the kinds of actions that are inherently precautionary and will give effect to its purpose (i.e. overcome the problems it was created to address).

The command dimension of weak versions of the precautionary principle does not go so far as to impose a positive duty to act when the trigger thresholds have been met;⁶⁷ instead, they merely permit taking action ahead of scientific certainty rather than compel it.⁶⁸ Many commentators assert that, due to the above, such formulations lack the fundamental character of a legal norm because there is no objective behavioural standard that one is required to meet.⁶⁹

Finally, weak formulations often expressly incorporate into the decision of what response is appropriate, consideration of the cost of preventative measures and their

force 21 March 1994) and *Convention on Biological Diversity* 1760 UNTS 79, 142 (opened for signature 5 June 1992, entered into force 29 December 1993), preamble.

⁶⁵ *United Nations Convention on the Protection and Use of Transboundary Watercourses and International Lakes*, opened for signature 17 March 1992, 31 ILM 1316 (1992) (entered into force 6 October 1996); *1994 Agreement on the Protection of the River Scheldt*, opened for signature 26 April 1994, 34 ILM 851 (1995); *1994 Agreement on the Protection of the (River) Meuse*, opened for signature 26 April 1994, 34 ILM 851 (1995).

⁶⁶ Daniel Bodansky, above n 15, at 384.

⁶⁷ Daniel Bodansky, above n 15, at 384.

⁶⁸ Jonathan Wiener, above n 63, at 604.

⁶⁹ Mark Geistfeld, above n 45, at 11,326, citing Christopher Stone “Is there a Precautionary Principle?” (2001) 31 ELR 10790 at 10795. Konrad Von Moltke, above n 24, at 101.

alternatives.⁷⁰ This operates to elevate the primacy of cost considerations as an express justification for not electing to take anticipatory protection. In the present case however, this is not relevant as the EEZ Act version of the precautionary principle does not include cost considerations.

B Strong formulations

In contrast, strong formulations offer more environmental protection for several reasons. First, their precautionary trigger typically entails a much lower harm threshold. Specifically, the stronger formulations often only require the mere presence of a threat, such as: “threat of a significant reduction or loss of biological diversity”;⁷¹ and “significant risks to nature or other adverse effects”.⁷² The certainty threshold of strong formulations will typically:⁷³

- (1) possess a low certainty threshold, which demands the production of considerably less scientific evidence of the risk of harm before the precautionary response is triggered; and/or
- (2) reverse the burden of proof, so that it is incumbent on the proponent of an activity to prove that an activity is safe before they may undertake it.

Finally, strong versions also sometimes entail a prescriptive precautionary response. However, even where the action dimension does stipulate more specific steps that are deemed to be precautionary in nature, they still often provide little in the

⁷⁰ Catherine J Iorns Magallanes, above n 28, at 5-6.

⁷¹ *Convention on Biological Diversity* 1760 UNTS 79, 142 (opened for signature 5 June 1992, entered into force 29 December 1993), preamble.

⁷² *World Charter for Nature*, Art 11, GA A/RES/37/7 48th plenary meeting 28 October 1982.

⁷³ Judith Jones and Simon Bronitt “The burden and standard of proof in environmental regulation: the precautionary principle in an Australian administrative context” in Elizabeth Fisher, Judith Jones and Rene von Schomberg (eds), above n 53, at 137-145. Jamie Benidickson et al “Practicing Precaution and Adaptive Management: Legal, Institutional and Procedural Dimensions of Scientific Uncertainty” Final Report Submitted to SSHRC and Law Commission of Canada (University of Ottawa, June 2005) at D-43 to D-44. The Royal Society of Canada *Elements of Precaution: Recommendations for the Regulation of Food Biotechnology in Canada* (Health Canada, Canadian Food Inspection Agency and Environment Canada, Expert Panel Report, January 2001) at 196 and 201-202. James Cameron and Will Wade-Gery, above n 11, at 18.

way of operational guidance. In addition the command dimension will create a positive duty to act (i.e. take such prescribed precautionary steps), once it has been demonstrated that the precautionary trigger thresholds are met. Such a positive duty may be absolute (i.e. compulsory), or subject to a tightly prescribed discretion (i.e. one that specifies a narrow range circumstances where nonetheless, precautionary measures may be foregone). It is these characteristics, which most commentators argue imbue the strong formulations of the principle with normative character and as such, separates them from those versions that are more characteristic of a guiding principle or aspirational statement. In this respect Tollefson and Thornback note that a distinction can be drawn between implementing the precautionary principle:⁷⁴

- (1) “as a discretionary consideration or background interpretive cannon” – in other words implement a weak version; and,
- (2) “in a more doctrinal fashion” whereby it is given “some specific work to do” – in other words, implement a strong version.

C The Uncertainty Dimension in Detail

It is worthwhile noting that the certainty dimension is especially important because, as noted above, the main thrust of the precautionary principle is that it entitles regulatory action to be taken, despite “a lack of certainty about cause and effect relationships, or the nature and extent of environmental harm”.⁷⁵ In legal terms, this (contrary to the traditional approach) entitles regulators to act without first being furnished with proof causation that meets the civil standard of proof, namely, on the balance of probabilities.

The certainty dimension built into each formulation of the precautionary principle prescribes the extent to which the balance of probabilities standard of proof

⁷⁴ Chris Tollefson and Jamie Thornback “Litigating the Precautionary Principle in Domestic Courts” (2008) 19 JELP 33 at 35.

⁷⁵ James Cameron “The Precautionary Principle: Core meaning, constitutional framework and procedures for implementation” in Ronnie Harding and Elizabeth Fisher, above n 1, at 35. Arie Trouwborst, above n 15, at 71.

is relaxed.⁷⁶ In other words, this second component of the “precautionary trigger” stipulates a lesser level or threshold of knowledge as to the possible harm to the environment, which must be met before protective measures must be taken, or in other words, before the precautionary response is triggered. As Bodansky notes, however:⁷⁷

this leaves open the question: Is any scientific evidence at all required of a potential threat before precautionary action is warranted, or justified, or required? And, if so, how much evidence? Or can mere speculation or fear trigger application of the precautionary principle?

It is readily accepted that mere speculation, something that has “no rational basis in sound science data at all” is insufficient to avail the ability to take precautionary steps.⁷⁸ There is however, considerable uncertainty as to what the maximum level of certainty a given formulation of the precautionary principle may demand without reverting back to the traditional approach of requiring proof of causation on the balance of probabilities. In an effort to identify an appropriate lesser alternative to balance of probabilities (i.e. an objective lesser standard of proof that sits at some point along the above continuum), commentators have attempted to elucidate what the substitute knowledge thresholds (i.e. certainty dimensions) of various existing precautionary principle formulations require. For example, in considering the thresholds of “reasonable scientific possibility” and “reasonable scientific probability” two lead authors note:⁷⁹

A reasonable scientific possibility could be said to exist whenever empirical

⁷⁶ Judith Jones and Simon Bronitt above n 73, at 137 to 145. Jamie Benidickson et al above n 73, at D-43 to D-44. The Royal Society of Canada *Elements of Precaution: Recommendations for the Regulation of Food Biotechnology in Canada* (Health Canada, Canadian Food Inspection Agency and Environment Canada, Expert Panel Report, January 2001) at 196 and 201 to 202. James Cameron and Will Wade-Gery, above n 11, at 18.

⁷⁷ Daniel Bodansky above n 15, at 388.

⁷⁸ Adrian Deville and Rodney Harding “Applying the Precautionary Principle” (The Federation Press, Sydney, 1997) at 33. Arie Trouwborst, above n 15, at 103. Alexander Gillespie, above n 79, at 372. Simon Marr, above n 12, at 25 to 26

⁷⁹ James E Hickey and Vern R Walker above n 56, at 499 to 450. Adrian Deville and Rodney Harding, above n 78, at 33. Arie Trouwborst, above n 15, at 103. Alexander Gillespie “Precautionary New Zealand” (2011) 24 NZULR 3 364 at 372. Simon Marr, above n 12, at 25 to 26.

scientific data (as opposed to mere hypotheses, speculation, or intuition) provide a rational basis that warrants drawing the conclusions from the data, even though reasonable scientific experts might disagree on whether that conclusion is the only valid, inference from the data. A reasonable scientific probability (or likelihood) exists whenever scientific experts generally agree that the available data and methods used to interpret the data are valid and reliable, and when there is also general acceptance by the relevant scientific community of the specific conclusions drawn from the data. "General acceptance" means something less than unanimity, but more than a minority opinion.

Discussing the level at which the certainty threshold is likely pitched by any given formulation Sandin points out “the greater the uncertainty allowed, i.e., the less plausible the threat has to be, the stronger (in the sense of more cautious) is the principle”.⁸⁰ In other words, the lower the level of certainty demanded, the more precautionary a formulation is.⁸¹ In this regard, Applegate notes that “[d]ifferent formulations of precaution envision different relationships between the existence or finding of uncertainty and the obligation to take regulatory action”.⁸²

D Rationale Behind Such Variance in Strength

In a comprehensive analysis of the precautionary principle’s application in the marine setting at international law, leading author Marr convincingly demonstrates that the principle “has been implemented differently in various sectors”. By this he means that different formulations are applied by international law instruments relating to distinctly different categories of human activity, such as: the management of pollution; the maintenance of marine biodiversity; hazardous substances; and the conservation and management of living resources.⁸³

Marr asserts that this variance, particularly in terms of the strength of environmental protection afforded by each version is because:⁸⁴

⁸⁰ Per Sandin above n 15, at 889 at 893.

⁸¹ Per Sandin above n 15, at 892 to 893.

⁸² John S Applegate, above n 7, at 28.

⁸³ Simon Marr, above n 12, at 2.

⁸⁴ Simon Marr, above n 12, at 3.

[i]n some sectors of environmental law the effects of human activity on the environment and health are sometimes easier to predict than others. Also the scope and intensity of environmental precautionary action could be completely divergent in different sectors.

In short, Marr concludes that the strength or weakness of the particular formulation that states employ, essentially “depends on the subject matter of the relevant instrument, and the corresponding level of scientific uncertainty and potential harm”.⁸⁵ Put another way, each version of the precautionary principle is consciously fashioned to be fit for the particular purpose. Fisher who is another lead author on the subject of the precautionary principle shares this view.⁸⁶ Garcia illustrates this point well in the course of pointing out the reasons for the stark difference between the strength of the precautionary principle formulation applied in the fisheries setting on the one hand and, in the pollution setting on the other. In doing so, Garcia notes that:⁸⁷

In considering the introduction of more precaution in fisheries management and development, the main differences between fisheries impacts and chemical industries pollution (for the control of which the precautionary principle was created) must be kept in mind:

- the assimilative capacity in relation to fisheries impact (i.e., the quantities of fish that can be removed without damaging the system's productivity) exists without doubt and can be determined with some accuracy, even though it varies, and
- the impacts are, in most cases, reversible and, as a result, the potential consequences of an error would rarely be dramatic, even though they can be significant in socio-economic terms.

In our view the above is correct, as this approach of tailoring the level of protection and caution to the circumstances (e.g. potential gravity of harm and

⁸⁵ Catherine J Iorns Magallanes, above n 28, at 5.

⁸⁶ Elizabeth Fisher “Precaution, Precaution Everywhere: Developing a 'Common Understanding' of the Precautionary Principle in the European Community” (2002) 9 Maastricht J Eur & Comp L 7 at 15.

⁸⁷ Serge Garcia “The Precautionary Approach to Fisheries and its Implications for Fisheries Research, Technology and Management: An Updated Review” in FAO Fisheries Technical Papers 350/2 (FAO, 1993) at 10-11.

inherent uncertainty associated with the activity in questions effects) is strongly aligned with, and gives effect to, the precautionary principle's purpose. In particular, it suggests that one needs to be more precautionary, and thus afford the environment more of the benefit of the doubt, where uncertainty is more prevalent and where the potential harm has the potential to be more pervasive and damaging. This approach also strongly accords with the overarching goal of sustainable development, which the precautionary principle exists to serve (i.e. which entails balancing protection and use, whereby protection limits use only insofar as it is necessary to preserve the sustainability of ecosystems).

IV *The EEZ Act Formulation of the Precautionary Principle*

The most recent and arguably most notable instance of the New Zealand legislature incorporating the precautionary principle into domestic legislation is the EEZ Act. As you are likely aware, the Act contains two express formulations;⁸⁸ however, in this instance it is the formulation set out in section 61 that is relevant. In setting out the EEZ Act version of the precautionary principle, section 61 provides (*emphasis added*):⁸⁹

- (1) When considering an application for a marine consent, the Environmental Protection Authority *must*—
 - (a) make full use of its powers to request information from the applicant, obtain advice, and commission a review or a report; and
 - (b) base decisions on the best available information; and
 - (c) *take into account any uncertainty or inadequacy in the information available.*
- (2) *If, in relation to making a decision under this Act, the information available is uncertain or inadequate, the EPA must favour caution and environmental protection.*
- (3) If favouring caution and environmental protection means that an activity is likely to be refused, the EPA must first consider whether taking an adaptive management approach would allow the activity to be undertaken.
- (4) Subsection (3) does not limit section 63 or 64.
- (5) In this section, best available information means the best information that, in the particular circumstances, is available without unreasonable cost, effort, or time.

⁸⁸ Specifically, it is included in section 31, which prescribes how the Minister for the Environment must deal with scientific uncertainty when promulgating regulations; and another, in section 61, which prescribes how the Environmental Protection Authority must respond when confronted with scientific uncertainty during the decision-making process.

⁸⁹ Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, s 61.

More specifically, the Act’s formulation of the precautionary principle is spread across sections 61(1)(c) and 61(2) that, again, employ similar high-level drafting to those international law formulations above, which are described as incomplete “meta-level” definitions.

While the strength of section 61’s precautionary principle formulation is considered in detail below, it is worth mentioning up front that it contains the strongest formulation incorporated into New Zealand law to date. This is primarily because its command dimension creates an obligatory duty to act once its precautionary trigger thresholds are met,⁹⁰ which as noted above, is a defining feature of strong formulations of the precautionary principle. As noted in the 2014 Trans-Tasman Resources decision, it can be distinguished from the RMA formulation on following basis:⁹¹

Section 61(2) contains an important direction. We must “favour caution and environmental protection” where the information is uncertain or inadequate. This provision is an explicit statement that, within the context of the EEZ Act, the promotion of sustainable management requires a cautious approach. The taking of risks in this environment is not encouraged, and *we note that this direction is not to be traded off against the attainment of economic wellbeing*. In other words, the requirement to favour caution and environmental protection in the face of uncertain or inadequate information is an absolute one, and we remind ourselves of section 10(3), which makes it clear that applying the information principles in section 61 is one of the ways the purpose of the EEZ Act is achieved.

We strongly agree with the above as it is plain on the face of the statutory language in section 61.

⁹⁰ This view is supported by Greg Severinsen “A cautionary tale: treatment of uncertainty under the EEZ Act” (2015) 11 BRMB 22. We note the suggestion that, with this formulation, “the legislature has chosen to adopt a weak form of precaution by prescribing an adaptive management approach to be taken in the event of uncertainty”. Ceri Warnock. “Regulating the environmental impact of oil and gas activities in the exclusive economic zone and extended continental shelf” (2011) 9 BRMB 76. However, adaptive management is not prescribed as an action, even while it must be considered. See also Daniel Bodansky, above n 15, at 387.

⁹¹ Exclusive Economic Zone and Continental Shelf (Environmental Effects) Bill 2011(321-2) (explanatory note).

A *Critical Context*

As Part V discusses at page 22, it was envisaged that States would develop and implement under domestic law, more fully-formed and operationalized precautionary principle formulations (“operational formulations”), which are derived from and give effect to their meta-level counterparts found in relevant international agreements.⁹² Furthermore, as noted in the Fisher quote, the full normative content that a state deems appropriate for inclusion in an operational formulation will vary depending on pertinent circumstantial factors it is required to operate within. Such factors include *inter alia*:

- (1) the social-political culture and values;
- (2) the specific statutory regime that it operates within;
- (3) the nature of the particular environmental problems and
- (4) the availability and ease of precautionary measures.

As Marr also notes in relation to the nature particular environmental problems, the harm and uncertainty to be managed typically dictates the strength afforded to a given formulation.⁹³ For this reason, this section quickly considers some key contextual matters that, in our opinion, bear on how section 61’s precautionary principle ought to be interpreted.

1 *Legislative Development Context*

The EEZ Act formulation arguably represents Parliament’s most decisive effort to create a normative and operational version of the precautionary principle (e.g. as opposed to a more general guiding principle version). First, this is evidenced through the decision to move the precautionary principle from the “Purpose and principles” subpart in the first reading of the Exclusive Economic Zone and

⁹² E.g. A fully formed operational formulation of the precautionary principle found domestic legislation that governs dumping at sea, would ideally be based on, and align with, the meta-level formulation of the precautionary principle found in those international agreements regarding dumping at sea, which the state had signed and ratified. The same would apply in relation to fishing, drilling and so on.

⁹³ See above n 12, at 3 and page 28 above.

Continental Shelf (Environmental Effects) Bill’s preliminary provisions,⁹⁴ to the operational “Marine Consents” “Decisions” provisions in the second reading version of the Bill.⁹⁵ In explaining these changes the Local Government and Environment Committees notes under the heading “Achieving the purpose of the Bill”:⁹⁶

Moving the requirements in clauses 12 and 13 to the substantive decision-making clauses of the bill *would strengthen the connection between decision-making and the relevant considerations, including the need for caution in the event of uncertainty*. We note that the need for caution would only apply to...and the consideration of consent applications or reviews...

Drawing on the comments of Tollefson and Thornback to characterise this amendment, it can be said it clearly demonstrates an intention to incorporate the precautionary principle into the EEZ Act “in a more doctrinal fashion” whereby it is given “some specific work to do”, rather than as a discretionary consideration, or, background interpretive cannon”.⁹⁷ This factor likely distinguishes the EEZ Act formulation of the precautionary principle from those found in the Resource Management Act and Fisheries Act, which are cast in more discretionary terms, and merely require that the decision maker “take in to account” the need for caution when information regarding adverse effects is uncertain.

As discussed below, the above position is further reinforced by the fact that section 61(2) provides that the EPA “must favour caution and environmental protection” where the precautionary trigger thresholds have been met. As such, it imposes a positive legal duty on the decision-maker to implement precautionary or protective measures in such circumstances.

Given the legal normative character conferred by the EEZ Act’s precautionary principle formulation, it can be said that a considered and doctrinal approach is required when applying section 61. We propose that, in this respect, the best approach is to employ the analytical framework discussed at pages 17 to 18 above (“*The Common Structure*”) and break down the section 61 precautionary principle into the

⁹⁴ EEZ Bill 321-1, cl 13 (in Part 1, Sub-part 2).

⁹⁵ EEZ Bill 321-2, cl 60A (in Part 2, Sub-part 2).

⁹⁶ EEZ Bill 321-2, at 3 (emphasis added).

⁹⁷ Chris Tollefson and Jamie Thornback, above n 79.

four dimensions. This in turn better enables the decision maker to derive the relevant objective standards that this legal norm formulation of the principle requires be applied (e.g. the relevant thresholds that apply to the precautionary trigger threat and certainty dimensions, and the required response demanded by the action and command dimensions).

2 *Legislative Recognition of the Link with Sustainable Management*

Much like the international formulations that inspired the section 61 version of the precautionary principle, the EEZ Act closely pairs sustainable management (New Zealand’s domestic equivalent to sustainable development),⁹⁸ and precaution, in a manner that makes it clear that Parliament is of the view that the EPA’s ability to successfully secure sustainable management outcomes will often hinge on the proper application of the precautionary principle.

The above is strongly supported by section 10(1) of the EEZ Act, which expressly states “[t]he purpose of this Act is to promote the sustainable management of the natural resources of the [EEZ]” and that “[i]n order to achieve the purpose, decision-makers must...apply the information principles...” (i.e. the precautionary principle) “to the consideration of applications for a marine consent”.⁹⁹

The decision to cast the precautionary principle in binding normative terms and move it to the operational parts of the EEZ Act also strongly supports the contention that Parliament was of the view that the principle would be decisive in achieving the Act’s sustainable management purpose.

2 *The Operational Context: Harm, Uncertainty and Marine Ecosystems*

The operational context further supports the prominence accorded to the precautionary principle. In particular it provides the rationale behind Parliament’s view that it is essential to securing outcomes that achieve sustainable management and corroborates the view that Parliament intended to impose a strong formulation. In particular, when drafting section 61 it was acknowledged that when conducting those

⁹⁸ In essence, “sustainable management” is New Zealand’s domestic equivalent to sustainable development.

⁹⁹ EEZ Act, s 10.

activities that the EEZ Act regulates in a marine environment, uncertainty and harm come together in considerable abundance.¹⁰⁰

Regarding harm, the EEZ Act swiftly followed the Gulf of Mexico Deepwater Horizon and Rena disasters, incidents that put in sharp relief the potential magnitude of harm that those activities the EEZ Act regulates can render on receiving ecosystems. This was expressly acknowledged in the discussion paper which gave rise to the Bill which notes, that “[d]ue to the nature of the activities, [their] effects could be severe (e.g. destruction of significant benthic communities)”.¹⁰¹ This view was further expressed in Hansard. For example, as Jaqui Dean notes, referring to the harm that activities regulated under the EEZ Act can cause:¹⁰²

That environmental harm could impact on a lot of things: on marine life, on marine habitats, and also on marine biodiversity. Because of the nature of some of the activities that occurred, occur, and might occur in the exclusive economic zone, some of those impacts could be quite severe—for example, oil spills and the destruction, due to dredging of the seabed, of significant benthic

¹⁰⁰ The EEZ Act represents New Zealand’s first attempt to properly manage and protect 400 million hectares of exclusive economic zone marine space and 170 million hectares of extended continental shelf area, which spans from the subtropics to the Sub-Antarctic. This move to regulate the marine space was triggered by an expected rise in the number of people wanting to undertake a variety of relatively new and technological industrial activities such as seabed mining, petroleum activities, energy generation, carbon capture and storage, and marine farming, which the Act now regulates. See Ministry for the Environment above n 16, at vii and ix. Cabinet Paper 2011 above n 16 at 2.

¹⁰¹ Ministry for the Environment “Managing our Oceans: A Discussion Document on the Regulations Proposed under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Bill” (May 2012) ME 1090, at 9.

¹⁰² See also Andrew Little’s comment: “the world has become much more sensitive to, and aware of, the impact on the environment of this type of intervention, when it comes to harnessing and trying to get those resources.” https://www.parliament.nz/en/pb/hansard-debates/rhr/document/50HansD_20120816_00000020/exclusive-economic-zone-and-continental-shelf-environmental. Ruth Dyson makes similar comments: “Well, it sounds like every single member of the National Government, and perhaps even John Banks, who I know has a strong commitment to environmental protection as well as to economic development, and understands that you cannot just trade off one for the other, and that some things are beyond repair, once they are damaged, and those are the things that we have a responsibility to protect”. https://www.parliament.nz/en/pb/hansard-debates/rhr/document/50HansD_20120718_00000016/exclusive-economic-zone-and-continental-shelf-environmental

communities.

It is also worth highlighting that, owing to the fluid (i.e. water) medium that they exist in, the complex interconnections, interconnections and co-dependencies that exist between the innumerable component parts that make up a marine ecosystem persist in unparalleled abundance (i.e. compared to terrestrial ecosystems).¹⁰³ Significantly, such interconnectivity makes the marine space considerably more vulnerable to the adverse effects of human activities (e.g. because the survival and wellbeing of one organism is contingent on the survival and wellbeing of another), hence the prominence of the precautionary principle, and in particular, strong formulations of it, in the ocean management setting.

In addressing the uncertainty that must be contended with, Cabined noted in its “Proposal for Exclusive Economic Zone environmental effects legislation” that:¹⁰⁴

[t]he EEZ is an environment *about which relatively little is known, and the decision-making framework for the legislation needs to acknowledge those uncertainties.* The Fisheries Act deals with this issue by using information principles to guide decision-makers.

The above view was also reflected in Hansard.¹⁰⁵ In this respect, as Quinn notes

¹⁰³ In explaining this point further Steel notes: “First marine ecosystems explicitly include the interactions among organisms and the viscous, energetic environment then inhabit...The fluid medium of the ocean connects marine populations, communities, habitats and pools of biochemical far more intimately than their terrestrial counterparts. Second, marine ecosystems implicitly exhibit some form of integrity reflected in emergent properties (i.e. the whole is greater than the sum of the parts...) and organisational or thermodynamic closure (i.e. internal transformations exceed trans boundary fluxes).” J Steele “The Ocean Landscape” (1989) 3 *Landscape Ecology* 185 at 185 to 192 at 185-192. BG Hatcher “Coral reef ecosystems: How much greater is the whole than the sum of the parts?” (1997) 16 *Coral Reefs* 77. *Oceans and the Law of the Sea*, above n 33, preamble.

¹⁰⁴ Cabinet Paper “Proposal for Exclusive Economic Zone Environmental Effects Legislation” (May 2011) Cab 07-C-0751 <http://www.mfe.govt.nz/more/cabinet-papers-and-related-material-search/cabinet-papers/proposal-exclusive-economic-zone>, at 5 (emphasis added).

¹⁰⁵ As Gareth Hughs noted: “We have got the fifth-largest exclusive economic zone in the world. It is internationally significant. It contains some amazing ecosystems. But it is also something that we know very little about. The National Institute of Water and Atmospheric Research has only scratched the surface, if you will, of what is in our oceans and what is down in the benthic environment, and we really do risk trashing not only that valuable “clean, green” brand but also some special, unique

discussing section 10 of the Fisheries Act:¹⁰⁶

It is appropriate that the precautionary principle has first been applied to the marine environment and its resources. In general, far less is known about marine ecosystems than terrestrial ones, and it is this uncertainty and ignorance which necessitates a precautionary approach.

It should be kept firmly in mind however, that, as noted at pages 32 to 34 of this submission, the effects of activities such as resource extraction and their attendant activities in the marine setting are considerably more unpredictable, uncertain, and harmful than those associated with fishing, hence the propensity for the former to be subject to much stricter formulations (particularly at international law).¹⁰⁷

On the above basis it can be said that the strength and status of the EEZ Act formulation appears to have been calibrated to suit the specific threat and uncertainty circumstances that it is required to operate in.

B Strength of the EEZ Act Formulation

The following section considers the strength of the section 61 formulation of the precautionary principle in terms of environmental protection. In doing so, it also seeks to identify what is required under each dimension, in order to provide a more helpful operational description of the EEZ Act precautionary principle.

ecosystems in this rush for minerals and extractions.” https://www.parliament.nz/en/pb/hansard-debates/rhr/document/50HansD_20120828_00000016/exclusive-economic-zone-and-continental-shelf-environmental. See his similar comments at https://www.parliament.nz/en/pb/hansard-debates/rhr/document/50HansD_20120816_00000020/exclusive-economic-zone-and-continental-shelf-environmental David Clendon also notes referring to the marine space the EEZ Act governs “we know very little about that environment”

¹⁰⁶ Marguerite Quin “The Fisheries Act 1996: Context, Purpose, and Principles” (1999) 8 AULR 503. Also see Chapter II discussion on the unique nature of the marine space. Specifically, as with section 10 of the Fisheries Act 1996, section 61 of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 is titled “information principles”, contains both “information management” principles and the precautionary principle, and employs similar language to express these components (as was recognised by Hon Dr Nick Smith during the third reading of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Bill).

¹⁰⁷ In this respect it is important to also keep in mind the ecological context. As one author notes, marine ecosystems are far more interconnected than terrestrial ecosystems, and as a result, are more vulnerable

Applying the analytical framework explained in Part II it can be shown that the section 61 formulation of the precautionary principle is comprised of:

- (1) a *threat dimension*, that is implicitly set as “significant adverse effects”;
- (2) an *uncertainty dimension*, expressed as “information available is uncertain or inadequate”;
- (3) an *action dimension*, expressed as “favour caution and environmental protection”; and
- (4) a *command dimension*, expressed as “the EPA must”.

C Content and Strength of Section 61’s Harm Threshold

Regarding the threat dimension, while section 61 does not make express reference to a particular level of harm, it is well established that the Act is concerned with “significant adverse effects”; these are widely regarded as being those effects that are “not insignificant or negligible” or “more than minor”.

Importantly, this harm dimension threshold is significantly lower than the “serious or irreversible damage” threshold, and as such, is geared more towards environmental protection (i.e. constitutes a strong formulation). As there is an abundance of case law regarding what constitutes more than minor harm there is no need to discuss this further, other than to point out that the threshold is much lower than that found in the Rio Declaration version of the precautionary principle.

Although the New Zealand threat dimension formulations do not expressly include the qualifier that threats must be irreversible, it is important that one understands what this entails in practice because:

- (1) “significant effects” can also be irreversible, a characteristic which informs how significant an effect in fact is;
- (2) as intergenerational equity is at the core of the precautionary principle’s purpose, where irreversible effects are potentially in play, this further directs decision-makers to take precautionary action, and, in this respect has significant implications as to what is appropriate precautionary response

required under the action dimension (e.g. extent of the response required).

Irreversible effects are those that allow no practical opportunity to correct the environmental damage once it has occurred.¹⁰⁸ The notion of irreversibility and what must be met before an effect is deemed to be irreversible has some difficulties. For example, in a scientific sense, all change is irreversible because the precise structure of the world that pertained before “cannot come into being”.¹⁰⁹ Conversely, over long time-scales, many impacts can also remediate naturally.¹¹⁰ Furthermore, harm may not be irreparable for physical reasons (that is, technically it may be possible to remediate); however, the cost of doing so may be so prohibitive that in all practicality it is irreversible.¹¹¹ In light of such difficulties, commentators argue that irreversibility means:¹¹²

Long-term damage that is not in *stricto sensu* irreversible, is nonetheless so enduring and/or unlikely to be undone that it is deemed “practically”, “virtually”, “apparently”, “essentially” or “effectively” irreversible. Thus, the 1982 CCAMLR and 1985 ASEAN Agreement on the Conservation of Nature and Natural Resources, both of which are among the first international instruments to introduce the concept of irreversibility in to their operative terms, respectively require parties to prevent changes or minimise the risk of changes to ecosystems “*which are not potentially reversible over two or three decades*” and which are not reversible over a reasonable time.

Given that securing inter-generational equity forms part of the precautionary principle’s conceptual core, the adoption of such a workable approach under the EEZ Act makes sense, particularly as part of an expanded operational definition of section 61.

¹⁰⁸ James E Hickey and Vern R Walker, above n 56, at 446

¹⁰⁹ Julian Morris *Rethinking Risk and the Precautionary Principle* (Butterworth-Heinemann, Oxford, 2000) at 14.

¹¹⁰ European Environmental Agency *Late Lessons from Early Warnings: The Precautionary Principle 1986 to 2000*, Environmental Law Issues Report No. 22 Copenhagen 2001 at 171. I M Goklany “Applying the Precautionary Principle in a Broader Context” in Julian Morris in Julian Morris, above n 109.

¹¹¹ Arie Trouwborst, above n 15, at 61.

¹¹² Decision VII/11 of the Conference of the Parties to the Convention on Biological Diversity at its seventh meeting, Kuala Lumpur, 20 February 2004 UNEP/COP at 61 (citations omitted).

D *Content and Strength of Section 61's Certainty Threshold*

The certainty dimension of section 61 also appears to be geared strongly in favour of environmental protection. In fact, like many of the strong formulations found in international law agreements, it appears to require only that there is uncertain or inadequate information regarding a given alleged harm.¹¹³ However, in doing so it does not expressly stipulate a certainty threshold (i.e. the extent to which the balance of probabilities standard of proof is relaxed – or put another way, a minimum level of certainty needed, beyond mere speculation, that the alleged harm will result).

Such low thresholds typically feature in formulations that arise in marine dumping, hazardous substances and modified organisms context.¹¹⁴ Given the nature of the activities governed by the EEZ Act it seems fitting that this is also the threshold imposed under section 61.¹¹⁵ As discussed above, Bodansky notes, however, that:¹¹⁶

this leaves open the question: Is any scientific evidence at all required of a potential threat before precautionary action is warranted, or justified, or required? And, if so, how much evidence? Or can mere speculation or fear trigger application of the precautionary principle?

While *prima facie* section 61 does not appear to impose a minimum proof threshold, it makes sense - as has been done at international law - to read in that the

¹¹³ Arie Trouwborst above n 15, at 103.

¹¹⁴ 1996 Protocol to the Prevention of Marine Pollution by Dumping of Wastes and other Matter, 1972 and Resolutions Adopted by Special Meeting 36 ILM 7 (opened for signature 7 November 1996, not yet in force). For examples of other marine dumping formulations also see the Convention on the Protection of the Marine Environment of the Baltic Sea Area, art 3(2), BNA 35:0401 (opened for signature 9 April 1992, entered into force 17 January 2000), which instructs decision-makers to act "when there is reason to assume" harm will result. *Ministerial Declaration of the Third International Conference on Protection of the North Sea*, 7-8 March 1990, which allows action "even where there is no scientific evidence to prove a causal link between emissions and effects...". the *Convention for the Protection of the Marine Environment of the North East Atlantic*, opened for signature September 22 1992, 32 ILM 1069, Art 2 (entered into force 25 March 1998) ('*OSPAR Convention*'), which entitles action where "there are reasonable grounds for concern".

¹¹⁵ This is unlike the Rio formulation, which requires something less than full scientific certainty in terms of evidence of harm to be adduced before a precautionary response is triggered.

¹¹⁶ Daniel Bodansky above n 15, at 388; see discussion above n77 and accompanying text.

plain theoretical possibility of environmental damage is not sufficient to trigger the application of the precautionary principle. In this respect it is worth reciting the court's decision in the "MOX" plant case where it was held that:¹¹⁷

[T]he risk of harm occurring must in some measure be a real risk. It cannot be simply the merest suggestion that harm might occur. While this is not to suggest that the threshold is one of the probability of harm occurring, it must be more than the hypothetical or remote possibility of such harm.

However, the question that then arises is what level of proof that harm may be caused by a proposed activity is instead required? Arguably this threshold is to be set low because when drafting the section 61 formulation Parliament expressly acknowledged how very little we know about the marine space, before subsequently opting to not expressly specify a prima facie threshold.

We expect however that the risk of harm to be asserted in the present application by TTRL will, as was the case in the 2014 application, be backed by sufficient scientific reasoning and evidence. As such, we do not need to explore what an alternative threshold may be (particularly as this would entail a lengthy discussion).¹¹⁸

E Strength and Content of Section 61's Command Dimension

The express statutory language on action -- that once the requisite harm and uncertainty thresholds are met the EPA "*must* favour caution and environmental

¹¹⁷ Written Response of the United Kingdom, dated 15 November 2001 at [184].

¹¹⁸ For completeness, we note that when considering what revised threshold (i.e. standard of proof) this certainty dimension likely requires in practice, you could look to the Daubert criteria for guidance. This criteria has been used by the New Zealand courts to determine the probative value of evidence and, as such, considers criteria that are likely relevant or useful when assessing whether a certainty, or rather, evidential threshold, has been met. These factors include:

- (a) The degree of testing to which the theory or technique has undergone;
- (b) The extent of peer review and the publication of the theory or technique;
- (c) The known or potential margin of error for a particular technique together with its methodological reliability
- (d) The level of general acceptance within the relevant scientific community.

protection” -- is cast in strong environmental protection terms. As noted above, this is one of the main features that distinguish the EEZ Act’s formulation of the precautionary principle from those found in other environmental law legislation and regulations. As Iorns and Severinsen notes in their careful analysis of section 61:¹¹⁹

The requirement in s 61(2) is strong and directive. While the principle in the Fisheries Act exhorts the Minister to be cautious, and to ensure uncertainty is not used as a reason to fail to achieve the purpose of the Act (which includes both utilisation and sustainability), s 61(2) requires both caution and environmental protection (not simply the achievement of sustainable management). The favouring of environmental protection where there is uncertainty in information is itself deemed to be an integral part of achieving sustainable management. This clear link between precaution and the overall purpose of the Act is an important step forward.

This view appears to have been accepted in the 2014 *Trans-Tasman Resources* marine consent decision where, in discussing the requirement to favour caution under s 61, the decision-making committee states:¹²⁰

Section 61(2) contains an important direction. We must “favour caution and environmental protection” where the information is uncertain or inadequate. This provision is an explicit statement that, *within the context of the EEZ Act*, the promotion of sustainable management requires a cautious approach. *The taking of risks in this environment is not encouraged*, and we note that this direction is not to be traded off against the attainment of economic wellbeing. In other words, the requirement to favour caution and environmental protection in the face of uncertain or inadequate information is an absolute one, and we remind ourselves of section 10(3), which makes it clear that applying the information principles in section 61 is one of the ways the purpose of the EEZ Act is achieved.

¹¹⁹ Catherine J Iorns Magallanes and Greg Severinsen above n 49, at 210.

¹²⁰ Environmental Protection Authority, *Trans-Tasman Resources Ltd Marine Consent Decision*, June 2014 at [139].

The Iorns and Severinsen analysis above also supports this view. In the same article noted above, they also state:¹²¹

Treating precaution simply as another matter to be weighed would be to ignore the absolute wording of the statutory obligation. Section 61 provides highly directive language, as noted by the EPA: the decision maker must *favour caution and environmental protection* in the event of uncertainty or inadequacy in information, not just have regard to or weigh the need for caution. It is thus an obligation that must operate independently from the discretionary weighing exercise under s 59. Analogous objections have been made by the Supreme Court in the King Salmon decision, where it was held that treating directive policies in the NZCPS as simply another matter to be weighed ignores the firm direction in the Act that such policies must be "given effect to" essentially as bottom line requirements.

A sensible interpretation of s 61(2) is therefore that it requires some concrete action, in the event of scientific uncertainty, to address that uncertainty. It does not simply require caution to be weighed, and possibly outweighed, in a balancing exercise. In this sense, precaution cannot get lost amongst considerations in favour of economic development, and the section can be interpreted as a relatively liberal approach to precaution. This approach is consistent with the EPA's implicit findings that s 61(2) has at least some substantive value.

In *Chatham Rock Phosphate*, the decision-making committee also appears to adopt the same view.¹²²

F Strength and Content of Section 61's Action Dimension

As noted at page 14 of Part II, the action dimension prescribes the protective measures that (under a formulation with a mandatory command dimension) must be taken when the harm and uncertainty thresholds have been met.¹²³ Most formulations employ very similar language to describe the action required. For example:

¹²¹ Catherine J Iorns Magallanes and Greg Severinsen, above n 49, at 221.

¹²² Environmental Protection Authority, *Chatham Rock Phosphate Limited* Decision, February 2015, at [827].

¹²³ See Chapter V discussion on this point. Also refer to Daniel Bodansky above n 15, at 387 and discussion on this point in the New Zealand Context in Alexander Gillespie, above n 79, at 371 to 373.

- (a) other New Zealand domestic formulations provide that decision-makers “should be cautious”,¹²⁴ “take into account the need for caution”,¹²⁵ or “adopt a precautionary approach”;¹²⁶ and
- (b) international formulations, upon which New Zealand’s domestic formulations were based, provide that decision-makers ought to take “precautionary measures”, “preventative measures” or like action in response.¹²⁷

1 *The “environmental protection” addition*

As outlined above at page 36, section 61’s action dimension provides that where the harm and certainty requirements are met, “the EPA must favour caution *and environmental protection*”. Thus, the EEZ Act’s action dimension adds an additional ingredient, by demanding that decision-makers favour environmental protection in addition to caution.

Arguably this additional wording suggests Parliament intended to place considerable emphasis on the need to act early and decisively in the marine

¹²⁴ Fisheries Act 1996, section 10(c).

¹²⁵ Hazardous Substances and New Organisms Act 1996, section 7.

¹²⁶ Department of Conservation *New Zealand Coastal Policy Statement* (2010), policy 3 at 12.

¹²⁷ *Agenda 21: A Programme for Action for Sustainable Development: Report of the UN Conference on Environment and Development*, Chapter 22.5,[(c)], UN Doc A./Conf. 151/26 (13 June 1992). *Vienna Convention on the Protection of the Ozone Layer*, opened for signature 22 March 1985, 1513 UNTS 293 (entered into force 22 September 1988). *Montreal Protocol on Substances that Deplete the Ozone Layer*, opened for signature 16 September 1987, 1522 UNTS 3 (entered into force 1 January 1989) (as amended 29 June 1990, 25 November 1992, 17 September 1997, and 3 December 1999). *United Nations Framework Convention on Climate Change*, opened for signature 9 May 1992, 31 ILM 854 (1992) (entered into force 21 March 1994). *International Convention on Oil Pollution Preparedness, Response, and Co-operation*, opened for signature 30 November 1990, 1891 UNTS 51 (entered into force 13 May 1995). *The 1984 Ministerial Declaration of the International Conference on the Protection of the North Sea* (1 November 1984). *Convention on the Protection of the Marine Environment of the Baltic Sea Area*, opened for signature 9 April 1992, BNA 35:0401 (entered into force 17 January 2000). *Convention for the Protection of the Marine Environment of the North East Atlantic*, opened for signature 22 September 1992, 32 ILM 1069 (entered into force 25 March 1998). 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 and Resolutions Adopted by the Special Meeting, opened for signature 7 November 1996, 36 ILM 7 (not yet in force).

environment. This is likely due to the operating environment described above, namely the particularly pervasive nature of the harm generated by the activities regulated under the Act coupled with the unparalleled uncertainty associated with the environment they are conducted in. Thus, in light of these circumstances, it may be argued that the addition of “environmental protection” was included to emphasize how this operating environment demands stronger steps be taken to guard against harm.

This approach accords with Marr’s sectorial view (discussed at page 28 in Chapter IV), whereby the strength of the given precautionary formulation is tailored to the specific risk (i.e. harm and uncertainty) that a given sector of environmental management must grapple with.¹²⁸

2 *Vague Nature of the Action Dimension and Proportional Response*

It is important to note that most formulations, including that found in the section 61, as well as other New Zealand formulations and international formulations, provide very little guidance as to what precautionary action must be taken in a given case.

As noted above, the action dimension in most formulations gives a very general direction to be cautious, favour caution or take precautionary measures etc. Again, this is due to the “meta-level” nature of the drafting and arguably accords with the idea that, what is ultimately required in a given setting, will always depend on the circumstances, and in particular, the nature of the harm and uncertainty in play.¹²⁹ Such flexible language also accords with Fisher’s view that the question as to what steps ought to be taken is a value laden one and thus, it is more appropriate that it is answered on a case by case basis. Thus, more prescriptive action dimension is not useful or may be limiting.¹³⁰ This view is also supported by Iorns and Severinsen who note:¹³¹

The strength of conditions and therefore precautionary outcomes under the Act will be largely dependent on the meaning of the term ‘favour’. This term

¹²⁸ See discussion in Chapter V under “Status of the precautionary principle in international law”.

¹²⁹ Alexander Gillespie, above n 79, at 373.

¹³⁰ Per Sandin, above n 15, at 894. Elizabeth Fisher and Ronnie Harding above n 53, at 113 and 116.

¹³¹ Catherine J Iorns Magallanes and Greg Severinsen, above n 49, at 222 to 223 (footnotes omitted).

was likely deliberately left vague, to enable responses to differ according to the circumstances of the case. *While the direction to 'favour caution' should certainly not be watered down, the meaning of the term 'favour' could legitimately vary according to the nature of potential harm.* This echoes Professor Gillespie's comment that a precautionary response should be proportionate to the threat. How the term is interpreted may depend on whether an application presents uncertainty relating to the matters specifically emphasised as important through their inclusion in ss 10 and 59, and also depend on the substantive provisions of regulations. At the stronger end of the spectrum of precaution, where potential impacts could be moderate, high or irreversible, conditions should be imposed that require certain effects to be avoided. While the Act does not specifically require this, it is still an action that is available to the EPA. At the weaker end of the spectrum, where effects were of lower magnitude and known to be reversible, favouring caution may well be achieved by the imposition of mitigation or adaptive management

Leading international authors on the precautionary principle support the above view, noting that the need to ensure precautionary actions must be proportional is implicit in the action dimension.¹³² This concept, which is of considerable importance to the principle's function essentially operates as a counter-balance to the effectiveness requirement.¹³³ As Trouwborst summarises:¹³⁴

Effectiveness ensures that the relevant purpose is served; proportionality ensures that this is all that happens and no more than that, by adjusting the means to the objective...From the start, proportionality has been a critical feature in the application of the precautionary principle...the notion is firmly anchored in pertinent state practice...*The more significant or the more serious the expected environmental impact, the more rigorous the abatement measures may, respectively be.*

In addition, Deville and Harding assert that the more uncertain the threat is the more

¹³² Timothy O'Riordan and James Cameron "The Precautionary Principle in Contemporary Environmental Law and Politics" in Raffensberger and Tickner "Introduction: to Foresee and Forestall" in Carolyn Raffensberger and Joel Tickner (eds) *Protecting Public Health and the Environment: Implementing the Precautionary Principle* (Island Press, Washington DC, 1999) at 2. . David Vanderzwaag, above n 2, at 167. Fisher above n 35, at 320.

¹³³ Arie Trouwborst, above n 15, at 149.

¹³⁴ At 150 (emphasis added).

cautious we must be.¹³⁵ This feature of the principle accords with the precautionary principle's core task of ensuring that the necessary steps are taken in order to avoid harm before it occurs. Logically, one can only achieve this if the precautionary measures taken are commensurate with the uncertainty faced, otherwise one is effectively back to operating on a traditional approach basis, whereby the requisite steps are only taken after one has proof that they are necessary to avoid harm.

3 *General Considerations when Determining the Appropriate Action*

Lead authors also note that the range of measures that can be undertaken in order to implement the precautionary principle are not novel and do not fall within the exclusive domain of the principle.¹³⁶ Whether a given environmental measure is, if implemented, truly precautionary in nature, depends on whether in the circumstances it is effective at giving effect to the precautionary principle's purpose.¹³⁷ As Freestone notes:¹³⁸

the distinctive feature of the precautionary principle/approach is not that it dictates specific regulatory measures: many different types of measures can be used to implement it. The distinctive characteristic is the way in which, and the time at which, the measures are to be adopted.

However, the precautionary principle entailed in other statutes has arguably not been properly applied in New Zealand (as well as elsewhere) to date.¹³⁹ A likely

¹³⁵ Deville and Harding above n 78, at 37.

¹³⁶ Arie Trouwborst, above n 15, at 179. Freestone above n 6, at 141. Andre Nollkaemper "What you risk reveals what you value, and Other Dilemmas Encountered in the Legal Assault on Risks" in David Freestone and Ellen Hey (eds) *The Precautionary Principle and International Law: The Challenge of Implementation* (Kluwer International, Hague, 1996) 73, at 80.

¹³⁷ Patricia Birnie and Alan Boyle *International Law and the Environment* (Oxford University Press, Oxford, 2002) at 676.

¹³⁸ Freestone above n 6, at 141.

¹³⁹ While a detailed examination of the relevant cases are beyond this note, such mis-application and variance in application arguably pervades application of the precautionary principle under the Fisheries Act 1986, and the Resource Management Act 1991. In relation to the Fisheries Act, see, eg, Catherine J Iorns Magallanes "The Precautionary Principle in the New Zealand Fisheries Act: Challenges in the New Zealand Court of Appeal" (paper presented to Australasian Law Teachers Association, Melbourne, July 2006) at 7, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2079837.

key contributor to this is a failure to provide some mode to carefully identify what steps are precautionary in nature and, once identified, which of those measures are appropriate in a given case. Furthermore, this is also the likely cause of inconsistency in the principle's application such that unjustified variance has occurred in the level of protection afforded to various activities that impose a similar level of threat.

This variability and frequent failure to take actions that are truly precautionary, even in response to the requisite harm and uncertainty thresholds being met, suggests that more specific guidance is necessary for decision-makers. Thus, to better enable a truly precautionary response, it is helpful to set out some objective criteria that preserve necessary flexibility, while also providing meaningful guidance.

First, as you are likely aware, at a general level and as mentioned in the Iorns & Severinsen quote starting on page 50, the potential precautionary action taken in response will entail:

- (1) *at the strong end of the response spectrum*, where the potential harm may be high and/or the lack of knowledge about their nature and potential to manifest is also high, a decision-maker may decline a decision; and
- (2) *at the mid-point of the response spectrum*, again, on the basis of moderate harm and uncertainty and even high harm and moderate uncertainty, conditions could be imposed that require certain effects to be avoided (i.e. and if they cannot be avoided the activity is not allowed);
- (3) *at the low end of the response spectrum*, where the potential harm is low to medium and the associated uncertainty is low but still persistent, conditions to avoid and/or mitigate (if avoidance is not possible), and measures capable of overcoming lower levels of uncertainty, such as adaptive management, may be appropriate.

This Paper identifies how the Fisheries Act version of the precautionary principle found in section 10 of the Act (which contains an action dimension that is comparable to the Rio version in terms of its vagueness), is applied to justify a course of action that is arguably contrary to its intended purpose. In relation to the RMA, see, eg, Catherine J Iorns Magallanes and Greg Severinsen, above n 49, at 222 to 223 (footnotes omitted).

4 *Effectiveness as a Key Consideration*

The overriding criteria that must be met in order for an action to qualify as being precautionary in nature is whether or not it is effective at achieving the precautionary principle's purpose.

Specifically, Trouwborst notes that in determining “how should we go about taking precautionary action, “effectiveness” is the fundamental determining factor. The condition of effectiveness is so logically apparent that it arguably exists within the precautionary principle tacitly by necessary implication.¹⁴⁰ A measure is effective if it is likely to produce the desired outcome.¹⁴¹ Whether “the measures envisaged...make it possible to achieve the appropriate level of protection”, depends on their ability to “anticipate, prevent, and attack the causes of environmental degradation” before they occur,¹⁴² rather than react to harm ex post facto.¹⁴³

On this basis, an action is only truly precautionary in nature if it is effective at overcoming and remedying the harm and uncertainty issues identified at page 11 to 14 in Part II that the precautionary principle ultimately exists to address.¹⁴⁴ Given that we cannot prevent all harms occurring, Kaiser states it must be: “designed to effectively reduce the likelihood of the perceived harm occurring” to acceptable levels.¹⁴⁵

Implicit in the requirement of effectiveness is the need to ensure that measures are comprehensive, integrated, account for the connected nature of ecosystems as well as temporal issues, such as the time-delayed and non-linear nature of ecosystem

¹⁴⁰ Arie Trouwborst above n 15, at 147 to 148.

¹⁴¹ European Commission *Communication from the Commission on the Precautionary Principle*, COM(2000) 1 final: 2000 Brussels at 18. Rene Lefeber *Transboundary Environmental Interference and the Origin of State Liability* (Kluwer Law International, The Hague, 1996) at 61. Arie Trouwborst above n 15, at 147 to 148.

¹⁴² At 149.

¹⁴³ De Saadler above n 48, see introduction section.

¹⁴⁴ Arie Trouwborst, above n 15, at 147 to 148.

¹⁴⁵ Matthias Kaiser “Fish-Farming and the Precautionary Principle: Context and Values in Environmental Science for Policy” (1997) 2FS *Environmental Science for Policy* 307 at 328.

changes and how such matters impact the manifestation and detectability of harm.¹⁴⁶ In this regard the precautionary principle is closely linked to the ecosystem approach.¹⁴⁷ As such, for an action to be truly precautionary it must, for example, take into account whether the chosen precautionary measure is in fact capable of:

- (1) guarding against time delayed and non-linear harm – e.g. will imposing monitoring requirements as a precautionary measure successfully enable detection of such harm and thus operate as an effective means of bridging the knowledge gap that is responsible for uncertainty;
- (2) taking into account the innumerable ecological connections than may be affected by a given impact; and
- (3) adequately protecting such ecological connections from an ultimate harm that may manifest as a product of a culmination of knock-on impacts being communicated through such connections.

On the above basis, we propose that what constitutes an effective precautionary measure will depend inter alia, on factors such as:

- (1) the specific characteristics and idiosyncrasies of the receiving ecosystem (e.g. on the basis that they determine the extent of the harm, whether it can be avoided or mitigated, and give an indicative understanding of whether the harm can be predicted);
- (2) the kind of harm that is to be prevented or abated (e.g. the gravity and nature of the harm as well as whether cumulative or synergistic effects are at play);
- (3) the extent of the uncertainty that the decision maker is faced with (i.e. as noted above, the following factors often dictate the extent to which the nature and likelihood of a given harm can be accurately determined and predicted: ecosystem complexity; whether highly variable, non-linear or chaotic

¹⁴⁶ Arie Trouwborst, above n 15, at 183.

¹⁴⁷ N.A. Robinson “Legal Procedures for Ecosystem Management: Environmental Law’s First Challenge of the New Millennium” (2000) 5 APJEL 203. Arie Trouwborst “The Precautionary Principle and the Ecosystem Approach in International Law: Differences, Similarities and Linkages” (2009) 18 RECIEL (1) 26.

ecosystem functions will be impacted; levels of existing knowledge about the receiving ecosystem and/or the component parts likely to be affected; how novel and technological the activity is and in turn how much is known about potential impacts; and, whether the activity will result in, or contribute to, cumulative or synergistic impacts, which are often difficult if not impossible to detect, or may only be detected over long periods of time); and

- (4) the relevant limitations of science and their ability to overcome, at least in the required timeframes, the uncertainty identified (e.g. if one must rely on modelling to determine ecological impacts then the limitations must be kept in mind).¹⁴⁸

¹⁴⁸ For example modelling, which is the primary means employed to predict ecosystem harm is extremely limited in its capacity to anticipate, account for and accurately predict all harmful outcomes. Such “Model uncertainty” or “model error” arises where there are “gaps in scientific theory” (e.g. the thesis that X impact will generate Y ecological effects), or “imprecision in the models used to bridge information gaps” (e.g. as to how a given activity will affect a given receiving ecosystem or part thereof). The result is that the subsequent model fails to accurately identify or specify, or sufficiently capture the relevant causal processes (e.g. between an activity and the subsequent impact induced ecological outcomes that culminate in harm), including the full extent and nature of the subsequent harm. Arguably, these difficulties “cripple” scientists' ability accurately to represent the modelled system. Furthermore, “...complex models can include only a finite number of variables and interactions”. As Schettler & Raffensperger go on to note, such models typically are unable to account for or incorporate all germane ecological variables because: “*The real world, however, is a confluence of biological, ecological, social, cultural, economic and political systems. No experimental model can fully account for each of these and their interrelationships. Ongoing research, monitoring and refining models may help to reduce uncertainty, but imprecision is inevitable.*” In particular, where there are multiple and interacting variables, there is a fundamental uncertainty in the relevant model, even before one takes into account the compounding complexity generated by spatial and temporal dynamics. Absent an ability to model complete systems and include all of their intricacies and idiosyncrasies, it is difficult - if not impossible - to anticipate anthropogenic impacts on the synergistic properties of ecosystems. See P.A. Larkin, “Concepts and Issues in Marine Ecosystem Management”, (1996) 6 *Reviews in Fish Biology and Fisheries* 139 at 150. Office of the Parliamentary Commissioner for the Environment Te Kaitiaki Taiao a Te Whare Pāremata “Illuminated or blinded by science? A discussion paper on the role of science in environmental policy and decision-making” (PCE, Wellington, July 2003) at 31. United Nations Conference on Environment and Development, Development, Report, Annex II, 12 August 1992, UN Doc A./Conf. 151/26 (Vol II-IV). D Gascuel “Towards the implementation of an intergrated ecosystem fleet-based management of European fisheries” (2012) 36

Regarding the gravity of harm (i.e. factor two listed directly above), commentators note that determining severity of an impact can be a subjective, value-laden exercise. However, in response to the call for objective criteria, commentators have come up with the following, mostly objective, indicia which assist decision makers with the task of characterising harm as high, moderate or low.¹⁴⁹

- (1) “spatial scale of harm”; whereby the extent of a given harms geographical spread operates as an indication of severity (for example, local, regional, national or global);¹⁵⁰
- (2) “temporal scale of harm”; whereby persistence of harm over time (namely, whether effects are immediate, short term, mid-term, long-term, intergenerational or irreversible) also operates as an indicator of severity;
- (3) the potential magnitude of an ecological impact on “genetic, species, or ecosystem abundance or diversity and processes such as atmospheric, water and nutrient cycles” and their subsequent impact on human health, wellbeing, enjoyment and economic interests;
- (4) the perceived value of threatened environment (i.e. that which will be subject

Marine Policy 1022 at 1022 to 1032. g Wang, “Ecosystem Management and its Application to Large Marine Ecosystems: Science, Law, and Politics” (2004) 35 *Ocean Dev & Int'l L* 41 at 42-43.

Douglas Clyde Wilson *The Paradoxes of Transparency: Science and the Ecosystem Approach to Fisheries Management in Europe* (Amsterdam University Press, Amsterdam, 2009) at 40. Adriana Fabra and Vignia Gascon “The Convention on the Conservation of Antarctic marine Living Resources (CCAMLR) and the Ecosystem Approach” (2008) 23 *The International Journal of Marine and Coastal Law* 567 at 577. Malcolm MacGarvin, above n 94, at 77. Ted Schettler and Carolyn Raffensperger, above n 23, at 69 and 74. P.A. Larkin, “Concepts and Issues in Marine Ecosystem Management”, (1996) 6 *Reviews in Fish Biology and Fisheries* 139 at 151. International Risk Governance Council, above n 145, at 10 and 11.

¹⁴⁹ Adrian Deville and Rodney Harding above n 78, at 25. Daniel Bodansky above n 15, at 387. Per Sandin above n 15, at 891 to 892. Andreas Klinke and Ortwin Renn “Prometheus Unbound: Challenges of Risk evaluation, risk classification and risk management” (Working Paper No 153, Akademie für Technikfolgenabschätzung in Baden-Württemberg, Stuttgart, 1999) <http://elib.uni-stuttgart.de/opus/volltexte/2004/1712/pdf/ab153.pdf>. Arie Trouwborst, above n 15, at 57. Graeme Parkes “Precautionary fisheries management; the CCMLR approach” (2000) 24 *Marine Policy* 83 at 84.

¹⁵⁰ Arie Trouwborst, above n 15, at 56 to 57

to harm), whereby impacts on highly valued environments (for example, pristine environments, those valued for conservation, or critical human activities and so on) are more readily viewed severe in nature;

- (5) the connectivity of a receiving ecosystem (for example, via complex interactions, multiple feedbacks and other linkages), which indicates a propensity for pervasive effects (note that this may also go to the spatial scale of harm); and
- (6) reversibility of the potential harm (i.e. whether it is permanent in nature), for example will it result in species loss, an ecosystem shift, or the release of persistent harmful substances.

Finally, critical to aiding the selection of the appropriate and effective response is the need to impose measures that are biased towards environmental protection. This approach is considered essential because it counters the bias against finding causal relationships (i.e. between an activity and resulting harm) that is inherent in the scientific process and statistical analysis.¹⁵¹

¹⁵¹ Explaining how this statistical bias operates in the environmental science context, Kriebel et al makes the following observations:¹⁵¹ “By convention, Type I...errors are guarded against by setting that error rate low, usually at 5%. In other words, the finding must be so strong that there is less than a 5% probability that this result would have been seen by chance alone in a world in which no such phenomenon actually exists. In this case the result is called statistically significant...The Type II error, failing to detect something that actually does exist, is, by convention, often set at 20%...Twenty percent of the time, a real phenomenon will be missed because the data were not strong enough to convincingly demonstrate its existence”. This statistical bias is one instance of a “value-laden judgement” being embedded in the scientific method used in ecosystem risk identification. As Shettler and Raffensperger note: “Establishing type I and type II error rates is a choice that reflects certain biases and is largely done by [scientific] convention, often without considering the consequences...” Because of this skewed approach, type II errors are frequently “...the inevitable result of a consistent bias towards avoiding type I errors...”, and, in practice, operate as “...a de facto bias in favour of industrial freedom of action”, and in turn, against environmental protection. This approach, therefore, leads to a comparatively detrimental outcome for environmental protection initiatives and objectives. See Kriebel et al “The precautionary principle in environmental science” in Marco Martuzzi & Joel Tickner (eds), above n 23, at 153-154. Ted Schettler and Carolyn Raffensperger, above n **Error! Bookmark not defined.**, at 71. Kristen Schrader-Frechette “Methodological risks for four classes of scientific uncertainty” in J Lemons *Scientific Uncertainty and Environmental Problem Solving* (Blackwell,

5 *Other Factors*

Other factors that guide the exercise of ascertaining the appropriate response include the obligation to secure intergenerational equity, the harm minimisation principle discussed at pages 12 to 14 (i.e. the need to operate from a starting point that all harm must be minimised as much as possible rather than seeking to identify levels of tolerable insult and consenting all activities deemed to not exceed such levels), and the need to safeguard ecological space.

6 *Working Example: Adaptive Management*

In the consenting context in New Zealand, particularly in the marine space, decision-makers and the courts have often asserted that allowing an activity for which consent is sought to occur under an adaptive management approach amounts to a precautionary response (i.e. proper application of the precautionary principle).¹⁵² In addition, the EEZ Act closely pairs the precautionary principle and adaptive management in s 61(3) which as noted above provides:¹⁵³

If favouring caution and environmental protection means that an activity is likely to be refused, the EPA must first consider whether taking an adaptive management approach would allow the activity to be undertaken.

In other words, s 61(3) states that if, in light of the uncertainty and harm associated with an activity for which consent is sought (i.e. which has triggered application of the precautionary principle), decision-makers think the appropriate precautionary response is to refuse the activity, then the EPA must first consider whether taking an adaptive

Oxford, 1996) 12 as cited in Timothy O’Riordan “The Precautionary Principle and Civic Science” in Tim O’Riordan, James Cameron and Andrew Jordan (eds), above n 35, at 102. Arie Trouwborst, above n 15, at 194. Ted Schettler and Carolyn Raffensperger, above n 23, at 71. David Gee and Andrew Stirling “Late lessons from early warnings: improving science and governance under uncertainty and ignorance in Marco Martuzzi & Joel Tickner (eds), above n 23, at 511. M’Gonigle and others, above n 17, at 102. Jamie Benidickson, above n 73, at 237-238.

¹⁵² See for example *Kuku Mara Partnership (Beatrix Bay) v Marlborough District Council (No 2)* EnvC W 39/2004 at [35(g)], [221], [229] and [717], which when read together demonstrate the Court considers requiring adaptive management equals proper application of the precautionary principle. *Golden Bay Marine Farmers v Tasman District Council (No 2)* W19/2003 at Chapter 5.

¹⁵³ EEZ Act, s 61.

management approach would allow the activity to occur.

Given the above, it is worthwhile examining the adaptive management measure and considering the application of the “effectiveness” and other criteria above, in order to see whether and/or how employing adaptive management in response to the Act’s precautionary triggers being met amounts to proper application of the precautionary principle.

While a universal definition of adaptive management does not exist, the definition cited by the Environment Court in *Clifford Bay Marine Farms Limited* is representative:¹⁵⁴

Adaptive Management: An experimental approach to management, or "structural learning by doing". It is based on developing dynamic models that attempt to make predictions or hypotheses about the impacts of alternative management policies. Management learning then proceeds by systematic testing of these models, rather than by random trial and error. Adaptive management is most useful when large complex ecological systems are being managed and management decisions cannot wait for [mal research results.

In practice, adaptive management entails allowing an activity that has uncertain ecological effects to start on a smaller scale than is ultimately sought under an application for consent subject to:¹⁵⁵

- (1) the collection of baseline information about the receiving ecosystem upon which subsequent adaptive monitoring is based (e.g. information about the

¹⁵⁴ *Clifford Bay Marine Farms Limited v Marlborough District Council* EnvC C 131/2003 at [151].

Golden Bay Marine Farmers v Tasman District Council NZEnvC Wellington W 19/03, 27 March 2003 at [78] to [79]. See also Anne-Marie Smit “Adaptive monitoring: an overview” (DOC Science Internal Series 138, October 2003). Benidickson et al above n 73, at A-2. R.E. Grumbine “What is Ecosystem Management?” (1994) 8:1 *Conservation Biology* 27 at 31.

¹⁵⁵ Board of Inquiry’s decision in *New Zealand King Salmon Requests for Plan Changes and Applications for Resource Consent* Blenheim, 22 February 2013 at [181]–[182]. *Crest Energy Kaipara Ltd v Northland Regional Council* [2011] NZEnvC 26 at [8]. *Golden Bay Marine Farmers* above n 154. Derek Nolan & Claire Kirman “The Coastal Environment” in Derek Nolan (ed) *Environmental and Resource Management Law* (4th ed, Lexis Nexis, Wellington, 2011) at 384 to 386. Grumbine above n 154. Benidickson et al above n 73, at A-2.

health and population of species that are believed to indicate an ecosystems health or natural state prior to the proposed activity taking place);

- (2) scientific monitoring of the smaller scale version of the proposed activity's impact on the receiving environment overtime in order to detect, for example: (a) changes or deviations from the baseline ecological starting point; and (b) if relevant, levels of specified chemicals or substances introduced or generated in the receiving environment as a result of the activity;
- (3) thresholds (in terms of deviation from an identified ecological indicator baseline), at which remedial action is triggered, which are set on the basis that taking action at this point allows sufficient time to react before the impact becomes overly damaging or irreversible harm; and
- (4) the activity being allowed to expand in timed stages, typically over the course of several years, towards the full activity for which consent was sought, provided that the relevant thresholds are not triggered; and
- (5) if triggered, a prescribed management response is initiated, which may entail reassessment of the activity, implementation of prescribed mitigation measures or the requirement that the activity be ceased.

As Iorns & Severinsen note, adaptive management is a response to uncertainty and, importantly, careful consideration needs to be given to whether, in a given case, it is an appropriate response to the given uncertainty that the decision-maker is confronted with. In this response they aptly note:¹⁵⁶

...the express provision of adaptive management under the Act should not be seen as a silver bullet to address precaution. As the Parliamentary Commissioner for the Environment noted in her submission on the EEZ Bill, adaptive management and precaution "can work together and are largely interdependent", but the former is "not always appropriate". The Act simply requires the EPA to consider whether adaptive management conditions might allow consent to be granted if it would otherwise be refused, and does not provide guidance on when this might be the case. This should not be

¹⁵⁶ Iorns Magallanes and Severinsen, above n 59, at 231 (footnotes omitted).

confused with the idea that a "learning as you go" approach is sufficient to manage all risks that are worth considering, even if there is some evidence that potential effects are reversible.

As they go on to note, whether adaptive management is likely to be effective in a precautionary sense hinges entirely on its capacity to bridge the uncertainty that triggered the need to exercise caution in the first instance (i.e. reduce such uncertainty to acceptable levels). In this respect they comment:

A sensible interpretation of s 61(2) and one consistent with *King Salmon* is that it requires a response proportionate to the uncertainty, in terms of the potential magnitude, scope and occurrence of an effect. In some cases, proportionality may demand only that an activity proceed on a reduced scale, intensity or timeframe, but this would not be sufficient if this trial version would have the potential for large or irreversible effects, or effects that may not become noticeable for a period of time. In light of this it is intriguing that the EPA in the *Trans-Tasman Resources* decision rejected the adaptive management approach proposed by the applicant but also noted that staged development may have been appropriate had it been pursued by the applicant, despite significant uncertainties involving potentially serious impacts.

The above makes absolute sense. In fact it can be said that adaptive management has very limited capacity as it relies entirely on science, and in fact, possesses all the hallmarks of the traditional approach. In this regard adaptive management:¹⁵⁷

- (1) relies on science to measure the 'baseline' conditions of the receiving ecosystem (i.e. typically by measuring the presence and condition of indicator species), and over time, monitors impact of the activity by measuring deviations from the baseline ecological state (i.e. the pre-activity ecological status quo), a technique which has a limited ability to detect and prove the full

¹⁵⁷ *Oceans and the Law of the Sea: Report of the Secretary General*, above n 33. Randall Peterman and Michael M'Gonigle "Statistical Power Analysis and the Precautionary Principle (1992) 24, No 5 Marine Pollution Bulletin 231. M'Gonigle above n 17.

array of ecological impacts an activity renders on the receiving ecosystem;¹⁵⁸

- (2) sets impact thresholds (i.e. levels of insult that science believes the receiving ecosystem can tolerate) and thus, runs contrary to the minimal harm principle;
- (3) relies on statistical analysis to prove or disprove the null hypothesis, and in doing so becomes subject to the bias that operates against environmental protection mentioned above;¹⁵⁹ and
- (4) allows the activity to proceed, be it in a staged manner over several years, unless there is scientific proof that it is causing harm.

Based on the above, a strong argument can be made that, in essence, adaptive management is a staged version of the traditional approach. The key benefits that it offers over a simple approval is that it eliminates some scientific uncertainty as it affords the proponent of an activity more time to gathering information regarding ecological impacts, and allows them to use monitoring of real effects rather than scientific modelling alone.

¹⁵⁸ Ibid.

¹⁵⁹ See page 58 and footnote 151.

VI Conclusion and Summary

The precautionary principle in s.61 of the EEZ Act appears short and simple and – being relatively young - without any history or baggage to encumber its interpretation and application. However, despite the Act being only a few years old, and there having been few chances to apply it, we hope we have shown that there is indeed a number of important matters to take into account in its application. The principle itself has a lengthy history at international law, and it has been applied by New Zealand courts for many years under different laws and policies. There is thus plenty of material for useful comparison with different formulations of it.

One of the most important factors to take into account is the subject matter that it is being applied to. Application in the marine environment has been widely recognised as requiring a stronger precautionary approach than other settings. This is primarily due to the fact that less is known about the marine environment itself, with more reliance for predictions of future effects on scientific modelling that is necessarily incomplete. They may represent the best scientific knowledge available today, but that itself is incomplete. Thus legal formulations of the principle requiring stronger environmental protection have been chosen for the marine environment worldwide, and including in the EEZ Act.

The key elements to work through in applying section 61 to any given set of facts have been detailed in this submission. In summary they include:

- (1) The threshold of threat of harm – whether significant adverse effects might result;
- (2) the level of risk and the certainty about that risk or level of harm that might result: some evidence is needed of a risk, mere speculation is not enough, but an amount of evidence significantly lower than the level of a legal burden of proof; these levels will likely be lower – ie more cautious - for the kinds of activities being considered in the marine environment.
- (3) that at the appropriate levels of harm and risk (ie appropriate for the situation and activities in question), action must be taken to address the risk and to favour caution;

- (4) that such action must also favour environmental protection
- (5) the more uncertain the threat is, the more cautious we must be in our action taken:
- (i) *at the strong end of the response spectrum*, where the potential harm may be high and/or the lack of knowledge about their nature and potential to manifest is also high, a decision-maker should decline a decision; and
 - (ii) *at the mid point of the response spectrum*, again, on the basis of moderate harm and uncertainty and even high harm and moderate uncertainty, conditions could be imposed that require certain effects to be avoided (and if they cannot be avoided then the activity is not allowed);
 - (iii) *at the low end of the response spectrum*, where the potential harm is low to medium and the associated uncertainty is low but still persistent, conditions to avoid and/or mitigate (if avoidance is not possible), and measures capable of overcoming lower levels of uncertainty, such as adaptive management, may be appropriate.
- (6) that adaptive management may be able to be used, as per s.61(3); it may enable real data to be gathered (as opposed to relying on models) but cannot be conflated with precaution under s.61(2);
- (7) harm minimisation: that all harm must be minimised as much as possible rather than seeking to identify levels of tolerable insult.

APPENDIX 1 – PRECAUTIONARY PRINCIPLE ELEMENTS TABLE 1¹⁶⁰

Strong precautionary principle formulations				
Formulations	Threat Dimension	Certainty Dimension	Command Dimension	Action Dimension
<i>EEZ Act, s 61(2): If [when] making a decision under this Act...</i>	[significant adverse effects]	“information available is uncertain or inadequate”	“the EPA must”	“favour caution and environmental protection”
<i>NZCPS, principle 3</i>	“Effects on the coastal environment [that] are potentially significantly adverse.”	“effects [that] are uncertain, unknown, or little understood ”	“[required to] ¹⁶¹ adopt”	“a precautionary approach towards proposed activities”
<i>London Protocol, Article 3(1): In implementing this protocol...</i>	“when there is reason to believe that wastes or other matter introduced into the marine environment are likely to cause harm even when there is no conclusive evidence to prove a causal relation between inputs and their effects.”		“contracting parties [(i.e. their decision-makers)] shall apply”	“a precautionary approach to environmental protection... whereby appropriate preventative measures are taken”
Moderate to weak precautionary principle formulations				
<i>Fisheries Act 1996: Where there are...</i>	“in relation to the utilisation of fisheries resources”	“when information is uncertain, unreliable, or inadequate”	“should be cautious ...[and]... “should not be used as a reason for postponing or failing to take”	“any measure to achieve the purpose of this Act”
<i>HSNO, section 7:</i>	“adverse effects”	“scientific and technical uncertainty about those effects.”	“shall take into account the need for caution”	“caution in managing adverse effects”
<i>Rio Declaration, Principle 15: Where there are:</i>	“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”

¹⁶⁰ Dale Scott, LLM Thesis VUW, above n 21.

¹⁶¹ “Required” inserted on the basis of the Supreme Court’s interpretation of Principle 3. See *Sustain Our Sounds Inc v the New Zealand King Salmon Company Ltd* [2014] NZSC 40; (2014).

APPENDIX 2: PRECAUTIONARY PRINCIPLE ELEMENTS - TABLE 2 ¹⁶²

THRESHOLD		<i>Protection</i>			
		<i>Weaker</i>	→	→	<i>Stronger</i>
SIZE OF RISK		‘Likely’	‘Reasonable ground concern’	for	‘Threat’ ‘May be a risk of’
DAMAGE		Serious, irreversible	‘unacceptable’		“Harm”
TO WHAT		To the environment only			To humans & environment
AMOUNT OF EVIDENCE OF CAUSAL LINK		No conclusive proof (some evidence required ?)			Where no scientific evidence of proof
ACTION		May take measures	Shall not postpone measures		Must take preventative measures
		If cost effective and within capabilities	Must use Best Available Technology		Without weighing up costs or capabilities
BURDEN OF PROOF		No extra burden before activity	Burden to get more information, eg EIAs, CBAs		Reverse burden of proof before allowing activity

¹⁶² From Iorns, “The Precautionary Principle in the New Zealand Fisheries Act”, above n 141.