

A LITERATURE REVIEW OF THE PRECAUTIONARY PRINCIPLE

The Precautionary Principle is a legal and moral requirement for private and public decision-makers to act when confronted with uncertainty and potential irreversible damage. At its most simple it is a tool for timely action when dealing with the harmful effects of human activities. However, there is wide debate surrounding what defines the Principle in practice as the following discussion will demonstrate. The Precautionary Principle is a vital part of many international treaties and declarations and is fast becoming an important fundamental principle of international law.¹ Its recent adoption as the core of the Cartagena Protocol on Biosafety would appear to be the most advanced expression of the principle so far in any international agreement.² The Protocol contains a strong version of the Precautionary Principle. It states in Article 10, paragraph 6 that 'lack of scientific certainty...shall not prevent [a] party from taking a decision, as appropriate,...' in relation to living modified organism and their potential risk to biodiversity. It establishes the Precautionary Principle as a principle of international environmental law and its strong treatment makes the dispute, that it is not a principle of customary international law, more difficult.³

In Australia⁴ the precautionary principle was adopted in February 1992 through the Intergovernmental Agreement on the Environment, (non-binding) whereby the Commonwealth, States, Territories, and Local Governments agreed to follow the Precautionary Principle as part of a commitment to ecologically sustainable

¹ De Sadeleer, N., 2002, *Environmental Principles, From Political Slogans to legal Rules*, Oxford University Press, Oxford, p. 97

² *ibid.*, p. 98

³ Cosby, A. and Burgiel, S., 2000, *The Cartagena Protocol on Biosafety: An analysis of result* (Online: <http://www.iisd.org/pdf/biosafety.pdf>) [accessed: 2007, February 22]

⁴ *ibid.*, p. 147

development. The parties agreed that:

Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

- (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
- (ii) an assessment of risk-weighted consequences of various options.⁵

Subsequently, in Australia, specific reference has been made to the precautionary principle in more than twenty statutes and policy documents⁶ as well as being at the forefront in Australian courts. The Precautionary Principle is a shift from traditional risk management, where risk assessment quantified the probabilities of cause and effect scenarios. The precautionary principle is a timely intervention undertaken before the effects are known and which seeks to avoid or diminish those effects.⁷

The Precautionary Principle, as a shift from traditional risk management, is undergoing the difficult process of breaking new ground and as such it is the subject of many interpretations, debates and some controversy. Ronnie Harding and Elizabeth Fisher point out that the Precautionary Principle is mainly concerned with ‘situations where scientific uncertainty is recognised in regard to the environmental outcomes of our activities’.⁸ There is a comprehensive body of knowledge relating to the principle consisting of official statements by authorities declaring operational

⁵ *ibid.*, pp. 147-148

⁶ ‘Of the Commonwealth’s legislation, the Environment Protection and Biodiversity Conservation Act 1999 provides the most detailed legislative exercise in its reference to the precautionary principle. Section 391 requires that the Minister take account of the precautionary principle in making decisions or granting permits. The New South Wales Parliament has been particularly active in promoting the principle. The Protection of the Environment Administration Act 1991 adopted the precautionary principle as an objective.....’ in *ibid.*, p. 148

⁷ Precautionary Principle Expert Group, World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), *The Precautionary Principle*, March, 2005 (Online: <http://unesdoc.unesco.org/images/0013/001395/139578e.pdf>) [assessed 2007, January, 24]

⁸ Harding, R. and Fisher, E. 1999, ‘Introducing the precautionary principle’ in *Perspectives on the Precautionary Principle*, eds. Harding, R. and Fisher, E., The Federation Press, Leichhardt, p. 2

frameworks, individual interpretations by experts studying the principle, and judicial statements as the result of litigation. The United Nations, *Rio Declaration on Environment and Development* is an official statement which expresses the definition in Principle 15 as:

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.⁹

At a conference in the United States a group of experts developed the interpretation in the *Wingspread Statement on the Precautionary Principle* which is as follows:

Where an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.¹⁰

These two interpretations are a source of controversy for toxicologist Bernard Goldstein, who complains that the different wordings mean the Precautionary Principle 'lack[s] clarity in definition and consistency in use'¹¹. However, in support of its many versions Nicolas de Sadeleer believes that '[A]ny attempt to define a legal principle by overly precise wording would definitively restrict its meaning, thereby rendering it useless'.¹² For de Sadeleer, the Precautionary Principle texts need to remain flexible and adaptable, amenable to a complex and context specific world. The culmination of many debates and interpretations surrounding the Precautionary Principle has lead to a definitive working definition of the Precautionary Principle,

⁹ United Nations Environment Program, *Rio Declaration on Environment and Development* (Online: <http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=78&ArticleID=1163>) [assessed 2006, December, 22]

¹⁰ Wingspread Statement on the Precautionary Principle (Online: www.gdrc.org/u-gov/precautiona-3.html) [accessed 2006, December 21]

¹¹ Goldstein, Bernard D, 2005, 'The Precautionary Principle: Is It a Threat to Toxicological Science?' in *International Journal of Toxicology*, Vol 25 pp. 3-7, p. 3

¹² De Sadeleer, N., op. cit., p. 174

formulated by the World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), as follows:

[w]hen human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm.¹³

In the COMEST definition the strong wording of the phrase ‘actions shall be taken’ is an imperative to act implying the urgency of the current environmental situation. This imperative contrast with those weaker definitions sketched above which simply call for an ‘approach to be widely applied’ or ‘measures should be taken’.

Definitions of the Precautionary Principle have evolved through environmental law and policy to address the need for better environmental management, by public and private institutions, in the face of increasing scientific uncertainty.¹⁴ The Precautionary Principle became increasingly necessary as a strategy for assessing and managing risks within the context of this scientific uncertainty¹⁵. Hence, the Precautionary Principle applies to specific environmental problems that are of a complex nature, especially as to their causal relationships, and which exhibit unquantifiable scientific uncertainty limiting the application of traditional risk assessment.¹⁶

The need for better environmental management first became popularised in the mid-1960s with the publication of ‘*Silent Spring*’ by Rachel Carson¹⁷ and the subsequent awareness of the extent of the environmental degradation caused by human activities. Carson’s work synthesised the growing body of evidence that indicated that the increase in the rate of cancer was linked to the increase in cancer-causing chemicals.¹⁸

¹³ COMEST, op. cit., p. 14

¹⁴ Harding, R. and Fisher, E., op. cit.

¹⁵ COMEST, op. cit., p. 8

¹⁶ *ibid.*, p. 25

¹⁷ Carson, R., with an introduction by Al Gore, 1994 *Silent Spring*, Houghton Mifflin, Boston

However, exposure can be both uncontrolled and multiple or a summation of effects, with the chemicals themselves acting on each other, one as an initiator or promoter weakening the system. According to de Sadeleer this presented a unique challenge to science to anticipate and prevent harm from risks where causation is uncertain. These risks, unlike traditional risks, are generally an accumulation of ecological impacts, the result of human activities, which are pervasive and complex but with a vital difference; they are burdened with uncertainty.¹⁹

Uncertainty is a factor surrounding much of contemporary existence and this has necessitated the development of new ways of thinking and acting.²⁰ As such the Precautionary Principle has been developed as an important tool in acting to prevent harm to both the environment and human health when faced with scientific uncertainty.²¹ Research into the Principle by judges, policy makers and regulators were published in 2006 in *Implementing the Precautionary Principle, Perspectives and Prospects* edited by Elizabeth Fisher, Judith Jones and Rene von Schomberg. The editors express the view that whilst the literature is extensive, ‘the challenges involved in its actual and potential application have tended to be underestimated’. They argue for far more intensive empirical studies into how the principle is implemented. The authors subsequently deal with the issues involved in implementing the principle and acknowledge the significant institutional adjustments needed.²²

In contrast with the need for greater enquiry into implementation de Sadeleer in *Environmental Principles, From Political Slogans to Legal Rules* argues that the ‘precautionary principle has its greatest impact prior to decision-making, since its logic relates to the formulation of decisions rather than their implementation’.²³ From this perspective the decision maker, acting from a duty of care, is required to formulate standards, which place the burden to demonstrate safety of an activity on the proposer of that activity. Therefore the proposer must, once the standard is set,

¹⁸ Ibid., p. 221

¹⁹ De Sadeleer, N., op. cit., p. 152

²⁰ Lyon, D., 1999, *Postmodernity*, (2nd Ed), Open University Press, Buckingham, UK

²¹ Harding, R. and Fisher, E., op. cit.

²² ibid.

²³ De Sadeleer, N., op.cit., pp. 201-202

demonstrate the safety of the activity, the burden of proof no longer rests with the regulator or decision maker as to whether to restrict or ban the activity. The result being the absence of scientific certainty can no longer be an excuse for delaying action, accordingly those who create the standards, are no longer required to defend their actions on the basis of scientific certainty. De Sadeleer declares this a new paradigm. He argues that where 'previously the polluter benefited from scientific doubt; henceforth doubt will work to the benefit of the environment'.²⁴

The recent European Union acceptance of the Registration, Evaluation and Authorisation of Chemicals (REACH)²⁵ to assess new and existing chemicals, shifts the burden of proof to the proponent or manufacturer to prove, in this case, that certain chemicals are safe. There is uneasiness when the proponent is in control of the science assessing the safety of the chemical. However, as James Cameron points out, the Precautionary Principle 'does have legal effect'²⁶ and as such the proponent is liable to litigation if false data is produced. Rene von Schomberg makes the observation that there is another benefit in shifting the onus to the proponent, the decision-maker is no longer able to 'use or abuse a persistent dissent among scientists as a reason (or excuse), for not taking action at all'.²⁷

Timely action, or interventions, in the face of scientific uncertainty is identified by many authors as a vital component of the precautionary principle. The case studies of Harremoes et al²⁸ as 'late lessons from early warnings', look at the human suffering and financial costs of delayed action. Warning signs, such as the potential irreversibility of actions, the novelty of new chemicals and harm to wildlife as indicators of potential danger to the human population, are all identified by the

²⁴ De Sadeleer, N., op. cit., p. 203

²⁵ European Commission, Enterprise and Industry Directorate General, Environment Directorate General, REACH (Online: http://ec.europa.eu/environment/chemicals/reach/reach_in_brief04_09_15.pdf) [accessed 24.1.2007]

²⁶ Cameron, J., 1994, 'The Status of the Precautionary Principle in International Law' in *Interpreting the Precautionary Principle*, eds. O'Riordan, T. and Cameron, J., Earthscan Publications Ltd., London p. 16

²⁷ Von Schomberg, R., 'The precautionary principle and its normative challenges', 2006, in *Implementing the Precautionary Principle, Perspectives and Prospects*, eds., Fisher, E., Jones, J., von Schomberg, R., Edward Elgar Publishing Limited, Cheltenham, UK, Northampton, MA, USA, p. 35

²⁸ Harremoes, P., Gee, D., MacGarvin, M., Stirling, A., Keys, J., Wynne, B., Vaz, S.G., eds., 2002, *The Precautionary Principle in the 20th Century, Late Lessons from Early Warnings*, Earthscan Publications Ltd, London, Sterling, VA

authors as triggers for early action.²⁹ Authors Richter and Laster, in their article ‘The Precautionary Principle’,³⁰ concur with Harremoes et. al., that these delays are the result of not ‘recognizing risks from past exposures and acting on the findings’.³¹ The case studies in Harremoes et. al. are all ‘false negatives’, human activities thought to be harmless (e.g. asbestos) when in fact history proved them to be extremely harmful. Carolyn Raffensperger and Peter deFur argue that in science the false negative is emphasised because certainty is necessary before acting to prevent harm – the Precautionary principle reverses the preferred error to the false positive – taking action before outcome is known, regardless of whether the outcome could result in no harm. This should in fact generate more scientific research and prevent the possibility of irreversible damage.³²

The Precautionary Principle is dependent on scientific methods to inform precautionary policy. Kriebel et. al. acknowledge that in environmental sciences observational studies are the rule because often experiments are unfeasible or unethical; hence they explore other types of evidence such as the accumulation of plausible conclusions from various independent lines of study.³³ They suggest some of these study lines into environmental causes of cancer may be provided by ‘the geographic distributions of cancers; time trends in cancer frequency; ...and experimental knowledge of chemical pathways of cancer induction’, whilst any one line may prove inadequate, ‘[i]t is the preponderance of evidence that finally prevails’.³⁴ Breitholtz et. al. however, call for more decisive rules which ‘stipulate that when relevant ecotoxicological information, i.e., sufficient test data, is lacking, this automatically calls for precautionary actions’.³⁵

²⁹ Harremoes, P. et al., op. cit.

³⁰ Richter, E.D. and Laster, R., 2005 The Precautionary Principle, *Epidemiology and the Ethics of Delay* in *Human and Ecological Risk Assessment* Vol 11, pp. 17-27, p. 17

³¹ Richter and Laster, op. cit. p. 17

³² Raffensperger, C. and deFur P.L., 1999, ‘Implementing the Precautionary Principle: Rigorous Science and Solid Ethics’ in *Human and Ecological Risk Assessment*, Vol 5, No 5, pp. 933-941, p. 937

³³ Kriebel, D., Tickner, J., Epstein, P., Lemons, J., Levins, R., Loechler, E.L, Quinn, M., Rudel, R., Schettler, T. and Stoto, M. 2001, ‘The Precautionary Principle in Environmental Science’ in *Environmental Health Perspectives*, Vol 109, No 9, pp. 871-876

³⁴ *ibid.* p. 874

³⁵ Breitholtz, M., Ruden, C, Hansson S.O., Bengtsson, Bengt-Erik, 2006, ‘Ten challenges for improved ecotoxicological testing in environmental risk assessment’ in *Ecotoxicology and Environmental Safety* Vol 63, pp. 324-335 p. 332

Uncertainty, according to COMEST, is more than statistical error. It also has qualitative dimensions which have yet to be addressed.³⁶ Jacqueline Peel indicates some of these qualitative uncertainties in her book *The precautionary principle in practice*, as including the influence of social factors on the production of scientific knowledge and the community's uncertainties in respect to both science and public decision making.³⁷ She also raises uncertainty within the legal convention of proof as in need of clarification. Peel proposes the need for a shift from the legal assumption that science can provide certainty, to a more 'civil' standard of proof, where the evidence is of 'sufficient quality or quantity to convince the court that the chance of a particular hazard occurring is 'more probable than not''.³⁸ However, Justice Stein, did use a common sense approach based on the Precautionary Principle in *Leatch v National Parks and Wildlife Service (NSW)* when he upheld an appeal against granting of a licence to 'take and kill' endangered fauna.³⁹

This apparent move away from scientific certainty has caused critics to view the Precautionary Principle as unscientific. However, as stated in the Introduction to the COMEST paper '[T]he Precautionary Principle is not unscientific; it acknowledges uncertainty in scientific practice'.⁴⁰ As Sharon Beder writes, in the situation of chemical use in the environment, 'scientists are usually unable to tell policy makers exactly where and how far a pollutant will spread, how it will interact with other pollutants, and how it will affect the health of people and the functioning of ecosystems'.⁴¹ This view is supported by Harremoes et. al. who state that '[N]o matter how sophisticated knowledge is, it will always be subject to some degree of ignorance'.⁴² Kriebel et. al. concur that the 'cumulative and interactive effects of multiple insults on an organism or ecosystem are very difficult to study',⁴³ and they

³⁶ COMEST, op. cit. p. 27

³⁷ Peel, J, 2005, *The Precautionary Principle in Practice: Environmental Decision Making and Scientific Uncertainty*, The Federation Press, Leichhardt

³⁸ *ibid.*, p. 141

³⁹ Stein, Hon. Justice P.L. 'Are Decision Makers too cautious with the Precautionary Principle' in (Online: http://www.lawlink.nsw.gov.au/lawlink/supreme_court/ll_sc.nsf/pages/SCO_speech_stein_141099) [2007, January 20]

⁴⁰ COMEST, op. cit., p. 15

⁴¹ Beder, S., 2006, *Environmental Principles and Policies, An interdisciplinary approach*, UNSW Press, Sydney, p. 56

⁴² Harremoes et. al., op. cit., p. 187

⁴³ Kriebel et. al., op. cit., p. 874

refer to the recent problem with endocrine disruption as an example. As the following conference summary shows:

So shocking was this revelation [about the widespread observation of endocrine disruption in wildlife] that no scientist could have expressed the idea using only the data from his or her discipline alone without losing the respect of his or her peers.⁴⁴

De Sadeleer agrees: he argues that ‘[t]his type of complexity is the rule, rather than the exception, in ecosystems’, therefore in approaching such complexity scientists ‘put forward hypotheses rather than assertions’.⁴⁵ Kriebel et. al. conclude, that as scientists provide policy makers with information ‘limited by their tools and their imaginations and to a degree socially determined’ they therefore have an obligation to carry out science that protects both human health and the environment.⁴⁶ As the Precautionary Principle is a “standard that is to be observed, not because it will advance or secure an economic, political or social situation deemed desirable, but because it is a requirement of justice or fairness or some other dimension of morality”,⁴⁷ it is the tool to support both scientists and decision-makers in carrying out their obligations to both humans and the environment.

The Precautionary Principle does not operate within a vacuum; it is a practical tool and has been implemented into Australia’s management of the sea and biodiversity. Biodiversity provides important services for human health and wellbeing. However biodiversity presently faces serious threats.⁴⁸ In fisheries there is ‘uncertainty regarding stock status and the level of risk posed by fishing’.⁴⁹ The Australian Fisheries Management Authority (AFMA)’s application of the Precautionary Principle is required by Commonwealth fisheries legislation, under the Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act) which also applies

⁴⁴ Kriebel et. al., op. cit., p. 874

⁴⁵ De Sadeleer, N., op. cit., p. 153

⁴⁶ Kriebel et. al., op. cit., p. 875

⁴⁷ Dworkin, R. quoted in Marr, S., 2003, *The Precautionary Principle in the Law of the Sea, Modern Decision Making in International Law*, Martinus Nijhoff Publishers, The Hague, London, New York, p. 12

⁴⁸ Cooney, R. 2005, ‘From Promise to Practicalities: The Precautionary Principle in Biodiversity Conservation and Sustainable Use’ in *Biodiversity and the Precautionary Principle, Risk and Uncertainty in Conservation and Sustainable Use*, eds., Cooney, R. and Dickson, B., Earthscan, London, Sterling VA

⁴⁹ *ibid.*, p. 4

the Precautionary Principle in the protection of biodiversity. The literature would indicate, after brief assessment, that decision making under the Principle is being applied inadequately to both fisheries and biodiversity.

Warwick Gullett in examining the Intergovernmental Agreement on the Environment (IGAE) formulation of the Precautionary Principle as applied to Australian fisheries found 'it did not give a strong mandate for the use of precaution' as it 'utilizes preventive rather than precautionary phraseology'⁵⁰. It would appear that the Australian policy makers are still operating on the basis that science can provide quantitative probability for risk assessment, therefore failing to adequately implement the Precautionary Principle necessary to deal with scientific uncertainty generated when dealing with fisheries and biodiversity.

Andrew MacIntosh also found the EPBC Act is failing to protect biodiversity because it fails to halt habitat destruction, the greatest threat to biodiversity, as it focuses on 'significant impacts' rather than the cumulative impacts of relatively small actions.⁵¹ The Precautionary Principle is taken into account by the Minister 'in deciding whether actions require approval and in determining whether or not to approve an action' only when that action is significant.⁵² The result of which is that only three areas were registered as 'critical habitat' between 2001 and 2003 and they consisted of remote islands and rocky outcrops to protect albatross species.⁵³

In assessing environmental risks the Precautionary Principle has its competing methods. These include among others, modelling, cost/benefit analysis and risk assessment. The first of these, modelling, is limited when dealing with uncertainty in complex and non-linear⁵⁴ environmental scenarios. As van der Sluijs observes, models are unable to account for the value-laden nature of the assumptions made or

⁵⁰ Gullett, W., 2005, 'The threshold test of the precautionary principle in Australian courts and tribunals: lessons for judicial review' in *The Precautionary Principle and Public Policy*, eds. Von Schomberg, R, Fisher, E., and Jones, J., Edward Elgar Publishing,

⁵¹ MacIntosh, A., 2004, 'Why the Environment Protection and Biodiversity Conservation Act's referral, assessment and approval process is failing to achieve its environmental objective' in *Environmental and Planning Law Journal*, Vol. 21, No. 4 pp. 288-311, p. 307

⁵² *ibid.*, p. 306

⁵³ *ibid.*, p. 303

⁵⁴ COMEST, *op. cit.*, p. 25

the uncertainties in their outcomes.⁵⁵ Kriebel et. al. identify the numerous errors in variables, the choice of models for interpreting and analysing data and biases which compound scientific uncertainty when dealing with complex biological systems,⁵⁶ as further limitations to modelling. However, the Precautionary Principle is designed to deal with uncertainties and as Jeroen van der Sluijs and Wim Turkenburg observe the Precautionary Principle drives the need to develop models further to integrate social and ecological systems.⁵⁷

Secondly, the use of cost/benefits analysis has its limitations because it focuses on economic aspects at the expense of equity, morality and public approval.⁵⁸ As Kinzig et. al. observe, it is inequitable when the benefits gained by a few individuals through damaging the environment are borne by the costs to present and future generations.⁵⁹ Therefore, the Precautionary Principle is a more equitable tool because it takes into account, the moral and ethical imperative, to consider both present and future generations.

Finally in relation to risk assessment the Precautionary Principle is implemented when risk goes beyond the normative assumptions of harm.⁶⁰ Risk assessment is limited to making causal connections between actions and their harmful effects, when the probabilities are quantifiable and the effects predictable. Or as von Schomberg explains, the probability of risk can be quantified and the level of protection against a harmful outcome can be defined. These traditional risks, according to de Sadeleer, do not come under the Precautionary Principle because the ‘causation between an event and damage is demonstrated by irrefutable scientific proof’.⁶¹ The Precautionary Principle on the other hand applies to all risks for which the cause-and-effect relationship is scientifically uncertain but where there is a ‘reasonable scientific

⁵⁵ Van der Sluijs, J.P., 2002, ‘A way out of the credibility crisis of models used in integrated environmental assessment’ in *Futures*, Vol. 34, Issue 2, pp. 133-146, p. 4

⁵⁶ Kriebel et. Al. op. cit., p. 873

⁵⁷ Van der Sluijs, J. and Turkenburg, W., ‘Climate change and the precautionary principle’ in Fisher et al., op cit. p. 262

⁵⁸ COMEST, op. cit., p. 31

⁵⁹ Kinzig et. al. op. cit., p. 297

⁶⁰ COMEST., op. cit., p. 29

⁶¹ De Sadeleer, N. op. cit., p. 158

plausibility; that this relationship exists'.⁶² Therefore, the Precautionary Principle goes beyond traditional risk assessment; it has the ability to deal with the uncertainty posed by the inherent unpredictability of social and environmental complexity.

Society faces huge environmental problems at the same time when a deeper knowledge of nature reveals elusive, unknowable, synergistic and inter-dependent factors. The realities of diminishing fish stocks, endangered species, biodiversity loss and habitat destruction pose threats whose outcomes cannot be quantified or predicted by science and risk management. What is needed is what de Sadeleer describes as a 'paradigm shift'⁶³ in thinking and acting. As the Precautionary Principle is designed both as a pre-emptive and cautious approach, which is also a guiding rule in how to act when faced with unknown risks, it is vital that it is further developed and implemented as a decision-making tool for both public and private decision making.

⁶² De Sadeleer, N., op. cit., p. 160

⁶³ De Sadeleer, N. op. cit., De Sadeleer cites the 1990s Directive 90/220/EEC (on the deliberate release of GMOs) as a law anticipating an uncertain risk, and as such representing a revolution in thinking, with a paradigm shift from both a scientific and legal viewpoint. p. 112

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