

*The Precautionary Principle in Practice; Environmental Decision-making and Scientific Uncertainty*

Jacqueline Peel. Sydney: The Federation Press, 2005, 244 pp.

For a work directed towards “decision-makers and others with an interest in the application of precaution in the management of health and environmental threat: judges, regulators, lawyers, planners, scientists, academics and students” (p. x) this reviewer is a conglomerate of the latter three categories. I imagine the former will work their way through Jacqueline Peel’s exploration of the rather slippery concept of “scientific uncertainty”, and how it might be competently and consistently handled. They will almost certainly find useful indeed her combination of analysis of general principles and of several case studies—and her arrival at guidelines “on the question of how to apply the precautionary principle ‘in practice’.” (p. x) Equally probably, however, they won’t be reading a review in *AJEE* which is, therefore, addressed to my fellow conglomerate members.

This review first presents a brief outline of the structure and intentions of Peel’s book, together with a selection of some of the ideas she expresses. Second, there are briefly discussed some aspects I consider less than satisfactory. Finally I suggest the book’s degree of usefulness to the triad of possible readers listed above.

It was with some initial surprise that I noted Peel had not presented in full the precautionary principle (I’ll use TPP, for obvious reasons, in what follows). One of its several versions is presented in Deville & Harding (1997, p. 13):

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 the risk-weighted consequences of various options.

Harding and Deville take this version from The Intergovernmental Agreement on the Environment (IGAE) spelled out by Australian national, state and territory governments in 1992, at about the same time they developed the National Strategy for Ecologically Sustainable Development (NSESD). TPP was one of several Principles stated in the NSESD. All of this was towards, or around, the Rio Declaration emerging from the United Nations Conference on Environment and Development (UNCED) in the same year. Peel’s book, for all its many values, is not the place to start one’s reading about TPP, ESD and related material designated in ways to delight the acronymophilic, including the Declaration on Education for Sustainable Development which is of more direct interest to readers of *AJEE* and which emerged from the Rio+10 UN World Summit on Sustainable Development (WSSD) in 2002. Searches for the above acronyms in electronic and other databases will reveal better starting points about ESD and TPP. In addition, a reader might refer to: initial discussions and arguments about ESD and TPP in sources such as Beder (1993), Myers (2004) and Young (1993); a more hands-on approach to “TTP in practice” in Deville and Harding (1997); and for discussions on how some of the more intricate aspects of TPP understandings have been developed to several of the references given by Peel herself.

Doubtless Peel has avoided stating TPP in full—for the version above, and those preceding and following it, beg a wealth of questions—in order to concentrate her attention, and ours, on what TPP calls “lack of full scientific certainty”, and which Peel presents, in the main, as “scientific uncertainty”. However, her claim (p. x) to present and “explanation of the complex concept of scientific uncertainty” is, perhaps, better stated as an “exploration” of it.

The closing few sentences of her “Preface” are worth quoting in full:

A recurring theme of the discussion [in the book] is the need for a re-evaluation of decision-making *processes* concerned with the assessment of health and environmental threats to take adequate account of the impacts of scientific uncertainty. This is particularly so in those cases where determinations about potential harm are made within frameworks of decision-making that have traditionally emphasised the authority and pre-eminence of scientific knowledge. Ultimately, the book seeks to extend thinking about the precautionary principle, moving away from the conventional (legal) focus on issues of formulation and definition to a consideration of its role in health and environmental decision-making processes undertaken in circumstances of imperfect scientific knowledge.

The italics in the above are Peel’s and emphasise her attention towards discussing, and finally presenting guidelines about, the processes that might allow TPP to be applied, as indicated above, “competently and consistently”. However, her use of “imperfect” above is not helpful; after a first chapter discussing the “context” of precautionary decision-making—i.e. its development, institutionalisation, adoption and incorporation against a background of “Declining faith in science”—Peel spends a detailed and informative 25 pages of text and footnotes under the heading of “Understanding scientific uncertainty”. This rather raises the question of what she might mean by “imperfect”—given that it implies there can be “perfect”—scientific knowledge.

First, attention is drawn to uncertainty “within” science, including the idea familiar to scientists, if not to politicians, the media and general public, that “full scientific certainty” does not mean “100 per cent proof or absolute guarantees of safety” (p. 36). She discusses the impact of variability of “system” functioning on the ability of scientists to attain the consistency/repeatability of results that might be equated with “scientific certainty”, and notes that such variability applies especially in many of the phenomena attending the issues of health and environment about which decision-makers might be called on to make determinations. Peel proceeds in her examination of uncertainty, this time “at the limits’ of science”—“at the limits’ of science”, that is, at and beyond its boundaries, by discussing epistemological uncertainties (such as “ignorance”—or “where ‘we don’t know what we don’t know.’” and “indeterminacy”—or “where ‘you can’t know what you need to know.’”); methodological uncertainties (such as methods which are insufficiently accurate or, perhaps, are yet to be developed); and sociological uncertainties (such as those existing because science is personned by people, with their tendencies to close ranks, however unintentionally or imperceptibly (and despite peer reviews and other processes meant make science “fully objective”) around or against ideas, groups and individuals. Peel discusses the difficulties that exist with demands for “proof” (i.e. that “uncertainty” must be replaced by “absolute certainty”), and with scientific “certainty” judged only as “reasonable scientific plausibility”—and calls for an approach that is “broader” and “critical”. By these terms she means that “full scientific certainty” needs to be assertively interrogated, pursuing enquiries about whether “indicative factors are present which point to the potential for uncertainty” (including critiquing: the design of scientific procedures; the degree of confidence that

scientists have about their understanding of the phenomena under investigation, and of the consequences if accepted understandings prove to be wrong). Peel also includes here the notion that uncertainty must be treated as “context-dependent”. In this she refers to situations in which one or more “sets” of understandings might possess similar degrees of high certainty, but be about health or environmental harms that are significantly differently valued by communities, and in which, therefore, the degrees of “certainty/uncertainty” in practice cannot be treated as “similar”. Further, highly valued phenomena (for example, ones in which significant, or irreversible, damage would be considered intolerable by a majority of citizens) need more “caution” than those less highly valued. Alternatively, information with high uncertainty might be given considerable credence if it pertains to situations that are “highly valued”. In her words (p. 54):

decision-makers will also need to take account of contextual, value-based factors extending beyond the realm of science in order to make comprehensive assessment of a health or environmental threat in circumstances of uncertainty.

and, later on pp. 54–55,

the real value of the precautionary principle, ... lies in highlighting the potential limitations of current scientific knowledge in a way that makes scientists, regulators and the broader community aware of the need to examine scientific information more critically ... [to] evaluate the nature and extent of uncertainties within the existing body of scientific knowledge and also to consider the potential for uncertainties arising beyond its current limits

Peel present four Australian case studies in two sections. The first discusses approaches to “Assessing threats of damage in conditions of uncertainty”—as an introduction to a detailed consideration of the application of TPP in fisheries management and in decisions about placement of mobile phone towers. The second is concerned with decision-making processes of a “precautionary” nature as they apply to risk assessment in relation to licensing the release of genetically modified organisms (GMOs) and to Environmental Impact Statements (EIAs) produced towards gaining for approval for development proposals.

In “Assessing threat”, Peel first considers the problem of relying on judgements that demand the scientifically acceptable demonstration of a “threshold” of damage to “trigger application of TPP. She refers (p. 74) to situations in which “scientific information demonstrating the existence of a threat is lacking” and later outlines the use of “non-scientific” information in precautionary approaches to fisheries management. Second, she discusses (p. 74) situations in which “expert risk assessment may embody value judgements about the harms and uncertainties of significance at odds with the spectrum of values found in the community at large”, using deliberations about mobile phone tower siting as her example. She proposes (p. 75) a strong need for “[e]nhanced transparency in the decision-making process [to] ... guard against the possibility of arbitrariness ... [and to ensure] that values entering the decision-making process are disclosed and opened up to a broader scrutiny” - and suggests consulting official statements about managing a phenomenon, or public consultation to reveal the values attached to it by legislators and the community respectively.

Her attention to precaution and decision-making turns around the fact that legal, EIA and risk-assessment approaches have often relied on “science-based” information alone, and that such information may be sparse, inaccurate or assume certain cause-effect relationships even when these are not well-established for the system under review. In the case of GMO risk-assessment she concludes (p. 182) that there is a need

to develop decision-making structures for integrating views beyond those of scientists and other “experts”. In discussing precaution and EIAs, Peel (pp. 210–211) points to the potential dangers of (1) allowing a development to proceed with proviso for an “adaptive management” strategy, that is, monitoring of effects and altering procedures if harm becomes obvious, given that by that time remediation and reversibility may be almost impossible or cost-prohibitive, and (2) assuming that “caution” is a natural part of professionally informed “prudence”, that it is “commonsense”, warning that this may merely reaffirm decisions without critically examining uncertainties. She concludes (p. 212):

In the development context, a crucial aspect of a precautionary process is the critical examination of expert assessments of environmental impact, appraising their utility in predicting long-term risks, any gaps in scientific knowledge that they reveal, the limitations of models used for forecasting effects and the capacity for identified uncertainties to be resolved or reduced to “acceptable” levels.

In her concluding chapter Peel sets out recommendations for “precaution as a process”, as different from merely a principle somehow adhered to in the absence of clear guidelines. Not surprisingly, given what has been presented, she asks (p. 222–225) that precautionary decision-making processes be characterised by:

- “critical examination of science and uncertainty”;
- “transparency in assessing threats of damage”; and
- “incorporating a range of views”.

What was surprising, to this reviewer at least, was Peel’s concluding sentences (p. 229):

The ... balancing of all relevant factors in the decision-making process will not result in health and environmental concerns being elevated to a privileged place. However, it will give them the “benefit of the doubt” so that the decision-making exercise as a whole will be better placed to anticipate threats of future damage to human health or the environment.

After 230+ pages of detailed material, including several hundred footnotes—many of which contain amounts and kinds of information of some considerable significance to her arguments or examples—followed by several pages of references, it seemed that giving the health of humans and environments “the benefit of the doubt” was an ending on the “lame” side. However, I was wrong. The same expression appears in Deville and Harding (1997, p. 12), in a Multinational Monitor interview with Carolyn Raffensperger (2004, p. 26) one of the authors of the 1998 Wingspread Statement on the Precautionary Principle (see reference below) and in searches for “precautionary principle” electronic and otherwise. In the unlikely event that I might affect the text and sentiment of TPP I would rather see a statement of “equal rights”, than “benefit of the doubt” with all the off-handedness that this expression implies in everyday use. Why can’t human and environmental health be accorded the same right to “continued integrity” that I’m sure a “developer” expects when a “development” proposal is approved. Might there not be some litigation if the local council, without adequate warning or compensation, drove a roadway through the shopping mall, residential site or other “development”? Although it’s obviously not Peel’s major intent, and the task she chose for a single work was large enough, I would have been encouraged had she, at least in that forest of footnotes if not in-text, also alluded to the problematic nature of the term “development”. Garrett Hardin, of “Tragedy of the Commons” fame (Hardin, 1968)—in a reference I’ll find again one day!—has suggested we should replace the term “development” with “alteration”.

Such a wording might be part of establishing a generally precautionary mindset itself!

A further puzzle in Peel's closing sentences is her statement (p. 228) that:  
rather than producing paralysis in the regulatory system, a precautionary process trusts to decision-making procedures to produce the "fairest" consideration of all relevant factors where different interests compete.

The puzzle is not in the strong sentiment of support for the proper use of TPP. That, after all, is her "mission" – one she amplifies in an early section (p. 100) in which she rightly maintains that TPP "does not dictate an 'anti-scientific' approach to assessing threats", rather that it "requires a more critical and realistic approach to the role that scientific information plays in health and environmental decision-making". It is in her use of the term "paralysing", without the quotation marks employed in many instances throughout the book when a term is "contestable", open to disagreement and so on. In a footnote - #54, p. 214 – Peel records the unqualified use of the term in a court judgement. Its sentiment is part of the opposition to TPP emerging from several commentators (see references below) who see TPP as an excuse for delay by those who want to hinder "progress". As such, the use of the term here, particularly in the concluding sentences of a work which does not accept that TPP is necessarily or by intent "paralysing", requires qualification, or at least quotation marks.

Some further points of criticism are:

1. There are minor inconsistencies in the use of "op cit" in the footnotes. Sometimes the title of the work previously referred to is indicated (p. 32, note 36); mostly it is not which is unfortunate because the skeletal reference usually supplied makes finding the work designated "op cit" more difficult than it need be. In general, the footnoting system used is wonderfully elegant. However, footnoting is "a pain" in this, and in many other works. It's not clear in this set of footnotes, when a footnote arises in-text, whether it is merely indicating a source being referenced (the details of which might be pursued while reading the text, or later), or whether the footnote contains information of substance, and many of the ones used do (which are best consulted as an addition, though interruption, to reading the text). It is also a matter of some irritation, for example at footnote number 79 (p. 163), that there is an example of "op cit", but no indication of where the original citation occurred, to which the reader must return to find details. For most cases of "op cit", in which the original citation is within the foregoing set of footnotes, this is irritating enough; in the case of number 79 the original citation is at the back of the book under "References"!
2. Some unhelpful language or implied meanings occur. In the following examples the underling is my own for the purposes of emphasis; the order in which the examples are presented is the order in which they appear in the book, not one of implied importance.
  - (p. 10) "Planning authorities and judges encounter calls for precautionary action" - while others "find themselves called upon to employ precautionary notions" and others still "come across the principle", almost as though some professionals "stumble" into TPP while others proceed with proper attention to detail.
  - (p. 10) "Even scientists and risk assessors are not immune from [its] influence" does carry two unfortunate implications. One is that TPP is some kind of disease

(rather than a desirability); a further is that scientists (and risk assessors) are, almost by nature, incautious.

- (p. 10) “the precautionary principle is also experiencing rapid growth”, when what is probably meant, albeit that TPP is undergoing continuing exploration and refinement, is that it “its use, incorporation into legal documents and so on” is growing.
- (p. 22) “the public ... have an increasingly high-level understanding of science and technological issues” is highly contestable in the entertainment-oriented media-influenced environments of “the public”. Being aware that science and technological issues exist—which is probably the case for “the public”—is clearly not the same as possessing “high-level understanding”. Peel’s optimistic (I maintain) assessment of the relationship between “scientific knowledge” and “general community understandings” is repeated on p. 139.
- in note 48, p. 32 “His Royal Majesty Prince Charles” might be a “correct” way to refer to Prince Charles (although I would think it somewhat pre-emptive of Elizabeth’s demise and should be HRH) but in a scholarly work it is unnecessarily Gilbert and Sullivanish; the accompanying reference to his concerns about nano-technology are patronising, especially when he was calling for “caution”! Such a call has been echoed by Phoenix and Treder (2003) and, probably, many others.
- given the interconnectedness of natural entities Peel’s use (p. 81) of the singular (“the wider ecosystem” and “the marine environment”) is less than accurate; it is pluralised, however, on p. 85.
- on p. 85, “the reviewing tribunal was placed in the position of having to consider for itself how it would apply the precautionary principle on the facts” might more fluently be presented as “on the basis of information available”, both to deal with the solitary “on” and to be cautious about the use of the term “facts”, surely problematic in a work about uncertainty.
- on p. 152 Peel states:  
As the social and economic benefits of proposals are generally more certain and readily quantifiable than any environmental impacts, they tend to loom large in a decision-maker’s mind, shadowing claims of adverse environmental effects which cannot be accurately estimated due to uncertainty.

Hopefully decision-makers will interrogate the claims made for social and economic benefits in the same ways and to the same extents that Peel recommends for scientific uncertainty, in which case their “certainty” and “ready quantifiability” might very probably be found to be more wanting than this statement suggests.

- on p. 181 Peel writes:  
Nevertheless, it is becoming clear that the challenges of “democratising” risk assessment processes in this way [*i.e. the receiving of public comment and its proper integration with those of more scientific and regulatory players*] are not only critical to ensuring a “precautionary” assessment of the intractable uncertainties surrounding some novel technologies, but also to instilling public confidence in the technology itself and its regulation. (italics added)

It seems to me that the “critical” element in the above is not “the challenges” themselves, but “meeting the challenges”.

- the term “incomplete” appears on p. 223 in the expression “where the data is incomplete”—which raises the question of what “complete” data is (in a similar way that the term “imperfect” raised questions earlier in this review). Probably the data here need to be described as “insufficient to attaining scientific certainty”.
- on p. 225 the matter of “undue influence” is discussed thus:  
Insisting upon transparency in the process by which these decisions are reached provides some safeguard against the possibility that the values of the decision-maker will have an undue influence upon the decision-making process, rather than values which have greater measure of community support.

There are several issues with this sentence which, I suggest, would better be presented as:

Insisting upon transparency in the process by which these decisions are reached provides some safeguard against the possibility that the values of decision-makers will be able to influence decision-making processes to any extent that is unduly (or unwarrantedly) greater than those that have greater measure of community support.

- I am uncomfortable (on p. 226) with “value judgements about the ‘acceptability’ of uncertainties in light of the potential benefits of GM agriculture”, and suggest that the insertion of “claimed” before “potential” might represent a properly precautionary approach!
3. p. 118 contains figures for emissions of radiofrequency radiation near mobile phone towers, which are then expressed as percentages of two standards for exposure limits. The percentages given are incorrect: “less than 0.01 percent” in one case, which should have been “0.05% - 0.7%”; “less than 0.002 percent” in the second, when calculations suggest the number is more like “0.02% - 0.3%”. These exposures are, of course, still very low on the basis of the standards given, but not as low as the author indicates.
  4. electronic addresses for sources are provided at seven points in the footnotes. Of the two I tried to access on 310806
    - #64, p. 215 [www.epa.nsw.gov.au/mao/odourcontrol.htm](http://www.epa.nsw.gov.au/mao/odourcontrol.htm) and
    - #10, p. 184 [http://www.sdi.qld.gov.au/dsdweb/v3/guis/templates/content/gui\\_cue\\_cntnhtml.cfm?id=168](http://www.sdi.qld.gov.au/dsdweb/v3/guis/templates/content/gui_cue_cntnhtml.cfm?id=168))  
the first “worked” (there must be a proper IT term for that!) but the second document was only found by a search on the appropriate home page, which revealed that the URL was in error in that the number “168” at the end should be “8568”. All save one of the URLs supplied lack “date of access” which may be the convention adopted in the footnoting style used in this book. A check of one other work (I was running out of time!!) with a similar footnoting approach revealed the same absence of “date of access”. However, despite this disappointing “agreement”, disappointing because that information I believe to be important, they had solved the “op cit” irritation mentioned above by using “see note xx above”.
  5. There are minor typos on pp. 56, 94, 100, 113, 148 and 198, an occasional feral ampersand appears for no obvious reason and, although “legal types” might be “at home” with acronyms such as “FCR”, “QPELR” and “LGERA” (all on p. 164) because

they are probably to law-oriented journals or other documents, such brevity is unfriendly to the conglomerate this review is directed towards.

So, too, is the use of the term “amicus briefs” (p. 73) without some explanation of it either in-text or in the footnote referred to at that point. At least “interlocutory injunction” is in the footnotes (#10, p. 160) and the less-legalese “interim injunction” is used in-text (p. 139).

Finally, despite the detailed discomforts set out above, which are of varying degrees of importance and sometimes matters of editorial “style” rather than authorial accuracy or helpfulness to the reader, Peel’s book is one that I am sure will challenge and inform enormously “scientists, academics and students”. The latter I take to be tertiary, although the lonely few secondary teachers presenting integrating approaches to learning (such as “Legal Studies” and “Natural Resource Management”, and so on) amidst the senior school silos will find rewarding professional reading, material to extract for their students’ use—and something to whet the appetites of the constructively argumentative.

The experience of a close reading of “The Precautionary Principle in Practice”, which is where the Earth and we need it to be, was certainly an informative one for me—and suggested more sources to pursue than I have years to do so. If you’re another rock in my conglomerate I recommend you try it!

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