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THE MANY FACETS OF PRECAUTIONARY LOGIC

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INTRODUCTION: THE MANY FACETS OF PRECAUTIONARY LOGIC

The collection of contributions to this issue of *Erasmus Law Review* illustrates the breadth of the academic writing on the theme of precaution. Only the article by Trouwborst can be considered to belong to the original domain of the legal discourse on the precautionary principle (PP) as a principle of international environmental law. The rest of the contributions clearly show that other disciplines have become involved as well.

This broadening of academic interest in precaution can be explained by the fact that the application of the PP is often highly contested. The European Union's claim that the PP is a received principle of international environmental law is problematic, at least in the sense that questions of when and how to apply it always give rise to considerable controversy. The PP can therefore be considered a 'contested concept'. It is true that the PP can be found in many international treaties, but it is equally true that all treaties use different words to state the meaning. In fact, many legal scholars deplore this lack of uniformity. The jurisdiction of courts thus far has not improved this state of affairs, as Marchant and Mossman have shown for the EU court.¹

Cases where the application of the PP is suggested are highly controversial in political, moral, and economic terms. The proof of success for legal concepts, principles, and rules is their routinisation. Their meaning becomes standardised and their application a matter of everyday habits. Regardless of the fact that it is carried out by professionals, habitual application is always unreflective. The precondition for this kind of unreflective application of legal concepts is their successful depoliticisation. Only then may concepts become part of our 'mental furniture' and thereby enter 'the world taken for granted', which is populated with routines and habits.

When controversy remains, depoliticisation and therefore routinisation is impossible. The contributions to this issue demonstrate that the PP certainly remains contested in its meaning, in its domains of applicability, and in its mode of application. This is partly the case in all

¹ G.E. Marchant and K.L. Mossman, *Arbitrary & Capricious* (Washington D.C.: The AEI Press 2004).

instances where we try to deal with risks. As Douglas and Wildavsky have stressed previously, risk and morality are strongly connected.² To name a certain risk is to state who is the victim and who is the perpetrator. This positioning depends on decisions about what can be considered damage and who is responsible for preventing it. We also need to decide who suffers the damage and whether they can be considered to be blameless victims deserving of protection and compensation. It is obvious that this kind of question is hard to answer and that the answers will always be contested.

Our societies are proud to be democracies governed by the rule of law. In such a context, political controversy should be – seen to be – resolved by arguments. This need for arguments in the public and political arena explains why precaution is discussed in many diverse disciplines. Much work in the legal domain centres on achieving consensus on the meaning and correct application of the PP. Trouwborst in particular has tried to deduce the ‘true core’ of the PP from an analysis of treaties and jurisprudence.³ In his present contribution, he continues his quest for conceptual clarification by exploring the relation between the PP and ‘the’ principle of prevention. His conclusion that adaptation of the PP renders the principle of prevention obsolete is provocative and will predictably inspire further discussion.

Given the fundamentally controversial nature of precaution, the successful standardisation of the PP is not likely to happen in the near future. However, two Dutch advisory bodies published reports in 2008 that can be seen as attempts to depoliticise the PP. This is especially true for Precaution with Reason by the Health Council of the Netherlands.⁴ The committee that prepared this report was chaired by Charles Vlek, whose personal contribution to this issue reflects a similar attempt. From a decision-theoretical perspective, Vlek offers an elaborate conceptualisation of the PP. In this elaboration, precaution loses its connection with environmental

² M. Douglas and A. Wildavsky, *Risk and culture: an essay on the selection of technological and environmental dangers* (Berkeley: University of California Press 1982). Also see M. Douglas, *Risk and blame: essays in cultural theory* (London: Routledge 2002).

³ A. Trouwborst, *Precautionary rights and duties of states* (Utrecht: Martinus Nijhoff Publishers 2006); A. Trouwborst, ‘The Precautionary Principle in General International Law: Combating the Babylonian Confusion’ (2007) 16 *Recie* 185. Also compare W. Douma, *The Precautionary Principle: its application in international, European and Dutch law* (Groningen: Rijksuniversiteit Groningen 2003).

⁴ Gezondheidsraad, *Voorzorg met rede* (The Hague: Gezondheidsraad 2008) [Health Council of the Netherlands, *Precaution with reason*]; see <<http://www.gr.nl>>. Also see Wetenschappelijke Raad voor het Regeringsbeleid, *Onzekere veiligheid: verantwoordelijkheden rond fysieke veiligheid* (Amsterdam: Amsterdam University Press 2008) [Scientific Council for Government Policy, *Uncertain security: responsibilities concerning physical safety*]; see <www.wrr.nl>.

protection, which according to Trouwborst remains the core of the PP as a principle of international law. In fact, the PP has scarcely any connection to specific material domains in Vlek's conceptualisation, notwithstanding the fact that the Health Council advised specifically on the application of the PP in the domain of public health. Vlek proposes a PP that is mainly of a procedural nature. To act in a precautionary way is to act in a carefully considered fashion that allows all relevant parties and interests to fully participate in the decision-making process. Vlek incorporates much of the criticism that is directed against the PP by stressing that the costs and benefits of all relevant policy options in the case at hand should be considered carefully.

The relevance of discourses concerning the PP for criminal law has become widely accepted since Jessica Stern pointed to the precautionary nature of the way the Bush administration responded to 9/11.⁵ The most elaborate attempt to show this relevance comes perhaps from Richard Ericson, whose *Crime in an Insecure World* inspired this issue on precautionary logic.⁶ Borgers and Van Sliedregt, both professors of criminal law, discuss the PP in this context.⁷ Following Sunstein's criticism of the PP in *Laws of Fear*, they focus especially on his idea of an 'anti-catastrophe principle'.⁸ After describing the counter terrorism measures that several EU countries introduced in their criminal law, they conclude that these 'are all centered around the notion of "prevention".' They agree that such measures may be criticised for being driven too strongly by fear and for introducing risks for the civil rights of citizens. However, they stress that such criticism easily overlooks the importance that citizens attach to safety and security. Their analysis of Sunstein's anti-catastrophe principle in this context results

⁵ J. Stern, 'Fearing evil' (2004) 71 *Social Research* at 1111. She developed her argument further with J.B. Wiener in 'Precaution against terrorism' in P.J. Bracken, I. Bremmer and D. Gordon (eds.), *Managing strategic surprise: lessons from risk management and risk assessment* (Cambridge: Cambridge University Press 2006); this publication is also available on the internet at The Social Science Research Network: <<http://ssrn.com/abstract=902373>>. In 2004 Pat O'Malley discussed the PP in his *Risk, Uncertainty and Government* (London: Glasshouse Press 2004) which mainly concerns criminological topics. Also compare Frank Furedi, who also contributes to this issue, *Invitation to terror: the expanding empire of the unknown* (London: Continuum 2007) and C.R. Sunstein, *Worst-case scenarios* (Cambridge, Massachusetts: Harvard University Press 2007).

⁶ R.V. Ericson, *Crime in an insecure world* (Cambridge: Polity 2007).

⁷ Borgers' inaugural lecture *De vlucht naar voren* (The Hague: Boom Juridische Uitgevers 2007) [*The flight forward*] is the first Dutch contribution to the criminal law discourse on the PP.

⁸ C.R. Sunstein, *Laws of fear: beyond the Precautionary Principle* (Cambridge: Cambridge University Press 2005). Also compare C.R. Sunstein, *Risk and reason: safety, law, and the environment* (Cambridge: Cambridge University Press 2002).

in a proposal that emphasises the need for a decision-making process in which the pros and cons of changes in the criminal code are considered carefully. In this sense, their contribution is similar to Vlek's. It would seem likely that Borgers and Van Sliedregt consider Vlek's proposal promising for application in this context.

As Ericson and O'Malley show, the PP is relevant for analysing developments in criminal law outside the attempts to counter terrorism.⁹ However, this domain remains the clearest example of the application of precautionary logic in the realm of criminal law. Developing his argument from *Invitation to Terror*, Frank Furedi analyses the 'precautionary culture and the rise of possibilistic risk assessment'. His contribution is highly critical in claiming that the application of a precautionary logic leads to an attitude towards the future that makes us fear that anything and everything may go wrong. Here his analysis runs parallel to a common theme in discussions about precaution, where uncertainty is stressed beyond the limits of scientifically valid predictions. In his sociological analysis, he links the precautionary logic to a loss of faith in the modern ideal of creating a better world through human intervention. In this sense, the precautionary logic, according to Furedi, signifies a loss of faith in the human capacity to do good.¹⁰ Whereas people in the 20th century embraced modern utopias, in the 21st century we seem to focus on post-modern dystopias. From this perspective, the threat of terrorism is even quite small compared to the climate crisis that global warming is thought to have in store for us.

Like Furedi, Hanekamp offers an explicitly critical analysis of precautionary logic. His analysis contains two important themes. The first is a search for the historical roots of precaution. In writing on the need for precaution with regard to environmental degradation, it is common to refer to Rachel Carson's *Silent Spring*.¹¹ Hanekamp shows, however, that two years before Carson published her criticism of the use of nuclear energy and pesticides, Herman Kahn wrote *On Thermonuclear War*, which for instance popularised the term 'megadeath'.¹² Kahn tried to develop ways of anticipating the Soviet nuclear threat. In this endeavor he 'believe[s] not only the impossible and the improbable, but also the implausible, the unlikely, and the unproven.' Such statements show that Rumsfeld's infamous statement on 'unknown unknowns' that we have to take into

⁹ Cf. n. 5 and 6.

¹⁰ Also see F. Furedi, *Culture of fear: risk-taking and the morality of low expectations* (London: Continuum 2002); note the subtitle.

¹¹ R. Carson, *Silent Spring* (London: Penguin Classics 2000) [original American publication: 1962].

¹² See for more information <http://en.wikipedia.org/wiki/On_Thermonuclear_War>. Kahn's book was published in 1960 by Princeton University Press. It is reprinted in 2007 by Transaction Publishers.

account when dealing with terrorist threats has a renowned pedigree. This kind of reasoning is a clear example of Furedi's 'possibilistic thinking'. In fact, Kahn goes beyond 'possibilism' by believing even the impossible.

Hanekamp's other theme is the relation between science and policy. He criticises authors who stress the limited value of scientific knowledge and plead for citizen participation. In his view, this kind of precautionary logic is strongly connected with utopian attempts to control the future. From this perspective, the attempts to create a sustainable future by foreseeing and forestalling all possible environmental threats are not different from Kahn's attempt to foresee and forestall all possible Soviet nuclear threats. By surpassing the scientific domain of theoretically validated and interpreted facts and entering the domain of the possible, the improbable, and the unknown, we contribute to the erosion of science. We do this by ignoring the 'tentative, exploratory, [and] questioning' character of science in our quest to find a certain and secure future that takes us beyond what we can reliably know.

Arnoldussen also offers a critical analysis of precautionary logic. His analysis is philosophical in nature. He identifies several 'absolute presuppositions' that can be found in all precautionary reasoning. These suppositions are absolute in that they are never questioned but always implicitly assumed to be self-evident truths. Like Furedi, Arnoldussen concludes that the suppositions of precaution stand in stark contrast to those of the Enlightenment. Along this historical line, he points to parallels between precaution and the religiously inspired philosophy of several church fathers from the Middle Ages. From this analysis, Arnoldussen draws the tentative conclusion that precautionary policies will tend to be of a moderate nature. Starting from the presupposition of the fragility of nature, humankind, and society, precaution will tend to warn us to be moderate and not to upset 'natural balances'. Arnoldussen postulates that precautionary policies therefore will be of a moderate nature as well.

All of the contributions offer an analysis of a different aspect of precaution. In conclusion, I want to offer some thoughts on what may be called the hermeneutic aspect of precaution. Whenever precaution is advocated, we tend to find remarks about the increased complexity and uncertainty of the reality we face in our time. For the most part, the claim is made that the nature of the world itself has changed: our social, economic, and political reality has become more complex and uncertain. Less often the claim is made that our attitude towards the world has changed. Because of this change of perspective, the world appears to be more complex and uncertain. And as our perspective determines our actions, the increased complexity and uncertainty we ascribe to the world actually is the result of a self-fulfilling prophecy.

The view that the nature of the world itself has changed seems hardly convincing. Think of the position Alexander the Great, Charlemagne,

or Philip II of Spain were in. Whenever they left their palaces they entered uncertain territory. This condition began as soon as they left their homes and became worse the further away that they moved. Even palaces themselves were not always safe for rulers. The question is whether we leave our homes with an optimistic sense of adventure or with a sense of dread. Do we venture out for the purpose of advancing the quality of our lives or for the purpose of guarding ourselves against threats that have remained hidden thus far?

The change in dominant cultural outlook pointed to by Furedi and Arnoldussen brings us to the second possibility. It is not so much that the world has changed but that we approach the world with a different attitude. It would be interesting to explore the role scientists and philosophers – or intellectuals in general – have played in this change. Peter Bernstein showed in *Against the Gods* how the idea of ‘risk’ gradually was picked up in political, economic, and legal practices.¹³ This changed those practices for good. In a similar way, it is important to write the remarkable history of uncertainty. Uncertainty has certainly become a true buzzword among scientists today.¹⁴ As a working title for such a history, I suggest *Against all Odds*.

The ‘post-modern’ turn in the appreciation of science will probably have a prominent place in this history. Proponents of precaution often criticise the arrogance of scientists and stress the limited value of scientific knowledge.¹⁵ And in a sense they are right; it is true that all received scientific knowledge is ‘valid through’ today. However, the more we seek security for a future that is further away from us, the more we encounter uncertainty. In this way, precautionary academic writing takes us away from what we can know with reasonable certainty. In encouraging us to ensure a sustainable world for our grandchildren – and for theirs – precautionary logic

¹³ P.L. Bernstein, *Against the Gods: the remarkable story of risk* (New York: Wiley 1996).

¹⁴ See for instance O’Malley, above n. 5; G. Bammer and M. Smithson, *Uncertainty and risk: multidisciplinary perspectives* (London: Earthscan 2008); O. Renn, *Risk governance: coping with uncertainty in a complex world* (London: Earthscan 2008); M. Power, *Organized uncertainty: designing a world of risk management* (Oxford: Oxford University Press 2007); J. O. Zinn (ed.), *Social theories of risk and uncertainty* (Oxford: Oxford University Press 2008); and R. Pieterman, *De voorzorgcultuur: streven naar veiligheid in een wereld vol risico en onzekerheid* (The Hague: Boom Juridische Uitgevers 2008). [The precautionary culture: striving for security in a world full of risk and uncertainty].

¹⁵ See for instance European Environmental Agency, *Late Lessons from Early Warnings: the precautionary principle 1896-2000* (Copenhagen: EEA 2001). The report can be downloaded at: <www.eea.eu.int>. Also compare C. Raffensperger and J. Tickner (eds.), *Protecting public health & the environment: implementing the precautionary principle* (Washington D.C.: Island Press 1999).

urges us to try to foresee and to forestall problems that could arise in the long term. Climate models typically have a time horizon of one or two centuries. Herman Kahn too wrote a book on the next two hundred years.¹⁶

The Dutch Scientific Council for Government Policy urges us in *Uncertain Security* to take uncertainty seriously.¹⁷ For the Council, this means that we need to look beyond what we know or can predict with reasonable certainty. It is difficult to see how this could lead to anything but speculation. However, if we refrain from attempting to control the future and settle for piecemeal engineering, taking uncertainty seriously can also be understood as a plea to accept that the validity of all knowledge is limited.¹⁸ Such acceptance should lead us to lower our aspirations in trying to create a 'sustainable' world.

All future generations will eventually and inevitably face their own 'present'. Perhaps the best we can do is to make sure that our children are well educated and have sufficient resources to effectively face the dangers they are sure to come up against. Many of these dangers are not known by us nor can they be known now. The realm of the known and the unknown unknowns is out there, and it will always remain beyond our present grasp. Accepting this is a cultural change that seems hardly possible, given the vested interest many institutions and scientists now have in the existence of an uncertain future. However, the precautionary turn that started in the 1960s and 1970s was also thought to be impossible, as it went against many of the dominant interests of that time.¹⁹ To answer Vlek's final question: I do feel that hope is a better counsellor than fear.

Roel Pieterman

¹⁶ H. Kahn, W. Brown and L. Martel, *The next 200 years: a scenario for America and the world* (New York: Morrow 1976).

¹⁷ Cf. n. 4.

¹⁸ See K. Popper, *The poverty of historicism* (London: ARK Paperbacks 1986).

¹⁹ Pieterman, above n. 14.

PREVENTION, PRECAUTION, LOGIC AND LAW

THE RELATIONSHIP BETWEEN THE PRECAUTIONARY PRINCIPLE AND THE PREVENTATIVE PRINCIPLE IN INTERNATIONAL LAW AND ASSOCIATED QUESTIONS

*Arie Trouwborst**

Abstract

The main purpose of this article is to promote clarification of the relationship between the precautionary principle and the prevent(at)ive principle in public international law. One of the questions addressed in this connection is whether the presence of uncertainty is a condition for the applicability of the precautionary principle. The article stresses and discusses the distinction between preventative and precautionary logic on the one hand and the corresponding legal principles on the other hand. It concludes, among other things, that in the international law of the environment the precautionary principle must be regarded as having absorbed the preventative principle or, alternatively, as being its most developed form. The widespread endorsement of the precautionary principle has thus made the continued existence of a separate preventative principle in international law superfluous.

1 Introduction

An advantage of writing on the precautionary principle is that one is never short of thought-provoking quotes to choose from in order to enliven a publication. An example is the following:

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The precautionary principle may well be the most innovative, pervasive, and significant new concept in environmental policy over the past quarter century. It may also be the most reckless, arbitrary, and ill-advised.¹

Few readers of this issue of *Erasmus Law Review* will be unaware of the many discussions that have taken and continue to take place on the pros and cons of the precautionary principle. Rather than taking sides, the focus of the present article, like the studies on which it builds, is on the *clarification* of the role and implications of the precautionary principle in contemporary international law, so as to, among other things, facilitate the discussions referred to. In particular, the main purpose of this contribution is to promote clarification of the relationship between the precautionary principle and what is termed the preventative principle in public international law. Dedicating a full article to this issue appears warranted, in light of the confusion that continues to surround it. A number of separate queries will need to be addressed in order to achieve the aforementioned purpose, including whether the presence of uncertainty is a condition for the applicability of the precautionary principle. Furthermore, to attain a better understanding of the relationship between the two principles involved, it is crucial to distinguish between preventative and precautionary *logic* on the one hand and the corresponding legal *principles* on the other, and to carefully distinguish, generally speaking, between theory and practice.

The relationship between the precautionary and the preventative principle and a few of the above-mentioned related issues have been addressed previously by the current author, albeit on a more modest scale, and the current contribution incorporates and builds on that prior research.² The article is structured as follows: Section 2 provides a benchmark by briefly sketching the basic attributes of the precautionary principle under international law; Section 3 discusses the characteristics of, and differences between, preventative logic and the preventative principle; Section 4 performs the same exercise with respect to precaution; Section 5 examines the differences between preventative and precautionary logic; Section 6 focuses on the relationship between the preventative and precautionary *principles*; and Section 7 contains concluding remarks. To lift the veil somewhat, the article concludes among other things that the widespread endorsement of the precautionary principle has made

¹ G.E. Marchant and K.L. Mossman, *Arbitrary and Capricious: The Precautionary Principle in the European Union Courts* (London: AEI Press 2004) at 1.

² See in particular A. Trouwborst, *Evolution and Status of the Precautionary Principle in International Law* (The Hague, London, New York: Kluwer Law International 2002) at 35; A. Trouwborst, *Precautionary Rights and Duties of States* (Leiden, Boston: Martinus Nijhoff Publishers 2006) at 91; A. Trouwborst, 'De Harde Kern van het Voorzorgsbeginsel' (2007) 34 *Tijdschrift voor Milieu en Recht* 198 at 203; A. Trouwborst, 'The Precautionary Principle in General International Law: Combating the Babylonian Confusion' (2007) 16 *Review of European Community and International Environmental Law* 185 at 191.

superfluous the continued existence of a separate preventative principle in international law.

2 Point of departure: the precautionary principle in a nutshell

A succinct description of the basic features of the precautionary principle is provided here to set the stage and to define the starting point for the analysis below.³

The rationale of the precautionary principle – or precautionary approach, as it is often referred to – is a dual one. That is to say, two scientific insights account for the adoption by States of the precautionary principle. Plainly stated, the first is the realisation that in many cases the environmental harm caused by human activities is graver than previously thought and can be difficult, if not impossible, to undo. Due to the vulnerability of the environment, anthropogenic impacts are often of a long-term and sometimes irreversible nature. The second insight making up the rationale of the precautionary principle concerns the uncertainty about, and limited predictability of, the gravity and probability of environmental impacts, which is due in a significant measure to the complexity and variability of natural systems and processes. In international law and policy, the precautionary principle is part of a recent trend from reactive and fragmented environmental policies towards more proactive and holistic approaches. Within this context, it is closely linked to the ecosystem approach.⁴ In addition, the application of the precautionary principle is widely regarded as essential for the achievement of sustainable development, which is commonly defined as development in a way and at a rate that suits the needs of present generations of human beings without

³ Selected introductions to the principle, all of which contain lists of further literature, are E. Hey, 'The Precautionary Concept in Environmental Policy and Law: Institutionalizing Caution' (1992) 4 *Georgetown International Environmental Law Review* 303; N. de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules* (Oxford: Oxford University Press 2002); P. Harremoës and others, *Late Lessons from Early Warnings: The Precautionary Principle 1896-2000* (London: Earthscan 2002); W.Th. Douma, *The Precautionary Principle: Its Application in International, European and Dutch Law* (Groningen: dissertation 2003); J. Peel, *The Precautionary Principle in Practice* (Annandale: The Federation Press 2005); Trouwborst (2006), above n. 2; and Trouwborst (2007b), above n. 2. Much of the remainder of this section is a summary of the last two sources mentioned.

⁴ On the relationship between the precautionary principle and the ecosystem approach, see A. Trouwborst, 'The Precautionary Principle and the Ecosystem Approach in International Law: Differences, Similarities and Linkages' (2009) 18 *Review of European Community and International Environmental Law* 26.

compromising the ability of future generations to meet theirs.⁵

The purpose of the precautionary principle is the adequate protection of the environment, both for its own sake and for the good of humankind. The classic statement in Principle 15 of the 1992 Rio Declaration, for instance, prescribes the principle's wide application by States '[i]n order to protect the environment.'⁶ Generally speaking, the precautionary principle calls for action at an early stage in response to threats of environmental harm, including in situations of scientific uncertainty. Applying the principle means giving the benefit of the doubt to the environment: *in dubio pro natura*.

The precautionary principle made its express entry on the intergovernmental stage a little over twenty years ago, at a regional conference for the protection of the North Sea.⁷ This was the beginning of a rapid development. Within five years it had been practically universally accepted as a central principle of international environmental law, an acceptance that was sealed in Rio de Janeiro at the 1992 UN Conference on Environment and Development (UNCED). Currently, the precautionary principle can be found in a great variety of intergovernmental declarations, resolutions, and action programmes and, moreover, in or under more than sixty multilateral treaties covering myriad environmental issues. The principle has also become a prominent tenet of European Union (EU) environmental law and policy. In response to these international developments, growing numbers of States are implementing the precautionary principle in domestic environmental laws and policies.

Already by the early 1990s, the application of the principle by States had become so widespread and consistent that the customary international law question came into play. An analysis carried out a decade later, testing the relevant conduct and statements of States against the generally accepted standards on the formation of customary or general international law, and taking account also of international jurisprudence and doctrine, prompted the conclusion that the core content of the precautionary principle had by then indeed attained the status of customary international law.⁸ As one judge put it in a recent case before the International Court of Justice (ICJ), 'the precautionary principle is not an abstraction or an academic component of desirable soft law, but a rule of law within general international law as it stands

⁵ See for example World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press 1987).

⁶ Declaration on Environment and Development, 14 June 1992, UN Doc. A/CONF.151/5/Rev.1.

⁷ Declaration of the Second International Conference on the Protection of the North Sea, 25 November 1987, para. XVI.

⁸ See Trouwborst (2002), above n. 2, at 33; see also Trouwborst (2006), above n. 2, at 8; and Trouwborst (2007b), above n. 2, at 187 and 194.

today.⁹ To illustrate the practical significance of this conclusion, it is worth noting that States have repeatedly invoked the principle as a norm of general international law in international judicial proceedings, including three times before the International Tribunal for the Law of the Sea (ITLOS) in Hamburg (Australia and New Zealand,¹⁰ Ireland,¹¹ and Malaysia¹²) and four times before the ICJ in The Hague (New Zealand,¹³ Hungary,¹⁴ Argentina,¹⁵ and Ecuador¹⁶). In the most recently instigated and currently pending case, Ecuador claims that by ‘aerially spraying toxic herbicides at, near, and over its border with Ecuador,’ Colombia has failed to act in a sufficiently precautionary manner.¹⁷ Examples of application of the precautionary principle as a norm of customary international law at the national level include judgments by the Supreme Courts of India¹⁸ and Canada¹⁹ concerning environmental pollution by, respectively, the leather industry and pesticides.

The analysis of the precautionary principle’s legal status just referred to was complemented more recently with another study aimed at determining as precisely as possible what it is that the precautionary principle requires as a matter of general international law.²⁰ A search was carried out for patterns and common denominators in the numerous germane sources, including treaties, declarations, decisions of international organisations, programmes of action, statements in judicial proceedings, and domestic legislation and jurisprudence. These were placed in context through a multidisciplinary investigation of the precautionary principle’s ecological and economic background, as well as an analysis of relevant international case law and literature. The main findings regarding the principle’s definition and implementation are summed up by way

⁹ *Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, Dissenting Opinion of Judge *ad hoc* Vinuesa, appended to the ICJ Order on Provisional Measures of 13 July 2006.

¹⁰ *Southern Bluefin Tuna (Requests for Provisional Measures) (New Zealand v. Japan; Australia v. Japan)*, 38 ILM (1999) 1624.

¹¹ *MOX Plant (Request for Provisional Measures) (Ireland v. UK)*, 41 ILM (2002) 405.

¹² *Land Reclamation (Request for Provisional Measures) (Malaysia v. Singapore)*, ITLOS Case No. 12, 8 October 2003.

¹³ *Nuclear Tests (New Zealand v. France)*, ICJ Reports (1995) 288.

¹⁴ *Gabcíkovo-Nagymaros (Hungary v. Slovakia)*, ICJ Reports (1997) 7.

¹⁵ *Pulp Mills*, above n. 9.

¹⁶ *Aerial Herbicide Spraying (Ecuador v. Colombia)*, proceedings instigated 31 March 2008.

¹⁷ *Id.*, Application by Ecuador (March 31, 2008), par. 37.

¹⁸ *Vellore Citizens’ Welfare Forum v. Union of India*, 5 SCC 647, AIR (SC) (1996) 2715.

¹⁹ *Spray-Tech v. Hudson*, 19 MPLR (3d) 1; see J. Abouchar, ‘Case Notes: Spray-Tech v. Hudson (Ville)’ (1999) 11 *Review of European Community and International Environmental Law* 104.

²⁰ Trouwborst (2006), above n. 2.

of concluding the present section.

'*In dubio pro natura*' and 'erring on the side of environmental protection' accurately reflect the gist of the precautionary principle in general international law. In particular, the following definition of a duty of States to take precautionary action is deemed representative of the current state of the law:

Wherever, on the basis of the best information available, there are reasonable grounds for concern that serious and/or irreversible harm to the environment may be caused, effective and proportional action to prevent and/or abate this harm must be taken, including in the face of scientific uncertainty regarding the cause, extent and/or probability of the potential harm.²¹

As indicated by the minimum thresholds of probability ('reasonable grounds for concern') and gravity ('serious and/or irreversible') of anticipated harm, not every chance of any adverse impact is supposed to trigger action.

As for implementation, the condition of effectiveness requires that a course of action is chosen that effectively safeguards the endangered part of the environment. The proportionality criterion demands that this course of action correspond to the size (probability and gravity) of the risk involved, so as to avoid adoption of excessively strict measures. The greater the aggregate risk, the more rigorous the precautionary action to match it, and vice versa. As a matter of general international law, there is, however, no requirement for precautionary measures to be cost-effective in the traditional, strictly economic sense. Various guidelines help establish what, in concrete instances, constitutes effective and proportional action. Such action should, among other things, be (1) timely; (2) tailored to the circumstances of the case; and (3) regularly reviewed and maintained as long as necessary to prevent the harm involved, but not longer. Several measures are typically associated with the implementation of the precautionary principle. These include research, environmental impact assessment (EIA), safety margins, allotment of the burden of proof to proponents of potentially harmful activities, and – the most obviously precautionary measure – the moratorium. All the same, any other measure may constitute an appropriate implementation of the principle provided that it complies with the prerequisites of effectiveness and proportionality.

3 Preventative logic and the preventative principle

Preventative *logic*, which may be captured in the common-sense adagio that prevention is better than cure, has been a pervasive feature of environmental law and policy for quite some time, and has formed the foundation of many

²¹ *Id.*, at 159.

international and national legal and policy instruments aimed at environmental protection. As a basis for everyday decisions in many walks of life, however, preventative logic is obviously not limited to environmental matters.

The preventative *principle*, however, is a predominantly environmental concept.²² An understanding of this principle – synonyms of which include ‘preventative principle’, ‘prevention principle’, ‘principle of prevent(at)ive action’, and ‘prevent(at)ive approach’ – can be obtained partly by describing what it is *not*. Specifically, the preventative principle should be told apart from the duty of States to avoid transboundary environmental harm.²³ The latter constitutes a traditional and fundamental tenet of international environmental law and was enshrined in the 1972 Stockholm Declaration as the obligation of States ‘to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction’.²⁴ It was reiterated in the Rio Declaration²⁵ and is almost universally believed to form part of customary international law.²⁶ Because in many situations this duty

²² Generally, see inter alia de Sadeleer, above n. 3; and P. Sands, *Principles of International Environmental Law* (Cambridge: Cambridge University Press 2003, 2nd ed.) at 246.

²³ On the distinction between the duty not to cause transboundary damage and the preventative principle, see Sands, *id.* at 246; G. Handl, ‘Environmental Security and Global Change: The Challenge to International Law’ in W. Lang and others (eds.), *Environmental Protection and International Law* (London, Dordrecht, Boston: Graham & Trotman 1991) 59 at 75; L. Guruswamy and B. Hendricks, *International Environmental Law* (St. Paul: West Publishing Co. 1997) at 29; L. Paradell-Trius, ‘Principles of International Environmental Law: An Overview’ (2000) 9 *Review of European Community and International Environmental Law* 93 at 97; F. Orrego Vicuña, *The Changing International Law of High Seas Fisheries* (Cambridge: Cambridge University Press 1999) at 153; J. Juste Ruiz, *Derecho Internacional del Medio Ambiente* (Madrid: McGraw-Hill 1999) at 71; A.C.H. Kiss and D. Shelton, *International Environmental Law* (New York: Transnational Publishers 2000, 2nd ed.) at 263; and F. Mucklow, ‘The Integration of Environmental Principles into the World Bank’ (2000) 9 *Review of European Community and International Environmental Law* 100 at 107.

²⁴ Declaration of the UN Conference on the Human Environment, 16 June 1972, UN Doc. A/CONF/48/14/Rev.1, Principle 21.

²⁵ Rio Declaration, above n. 6, Principle 2.

²⁶ See for example P. Birnie and A. Boyle, *International Law and the Environment* (Oxford: Oxford University Press 2002, 2nd ed.) at 109; Sands, above n. 22, at 241; R. Lefeber, *Transboundary Environmental Interference and the Origin of State Responsibility* (London, Dordrecht, Boston: Graham & Trotman 1996) at 19; Guruswamy and Hendricks, above n. 23, at 29; Kiss and Shelton, above n. 23, at 42; Paradell-Trius, above n. 23, at 97. According to the ICJ in its 1996 Advisory Opinion on the *Legality of the Threat or Use of Nuclear Weapons*, the duty not to

calls for the adoption of preventative measures, some have in fact, for present purposes unhelpfully, referred to it as the 'preventive principle'.²⁷

Although both the duty to avoid transboundary harm and the preventative principle as it is generally understood mandate the adoption of preventative measures, the fundamental distinction between them lies in their respective objectives. Whereas the former derives from respect for the principle of state sovereignty, the latter – like the precautionary principle – seeks to protect the environment as an end in itself.²⁸ Accordingly, the scope of the preventative principle – again like the precautionary principle – is not confined to transboundary damage.²⁹ Its conceptual core: namely, preventative *logic*, can be traced back at least some eighty years and can, as stated above, be viewed as being at the basis of many environmental agreements and of concrete measures aimed at, for instance, the minimisation of pollution.³⁰ However, as a *principle* it has not been codified nearly as frequently as the duty to avoid transboundary harm, and the scant codifications in question are largely confined to European instruments.³¹ Consequently, not all writers necessarily recognise the existence per se of the preventative principle as understood here,³² and of those who do, very few claim that it has attained the status of customary international law.³³ Indeed, a number of authors do attribute customary status to the duty to avoid transboundary harm but not to the preventative principle.³⁴ In 1991,

cause transboundary harm 'is now part of the corpus of international law relating to the environment.' ICJ Reports (1996) at 241.

²⁷ D. Freestone and Z. Makuch, 'The New International Environmental Law of Fisheries: The 1995 UN Straddling Stocks Convention' (1996) 7 *Yearbook of International Environmental Law* 3 at 13; D. Freestone, 'International Fisheries Law Since Rio: The Continued Rise of the Precautionary Principle' in A. Boyle and D. Freestone (eds.) *International Law and Sustainable Development* (Oxford: Oxford University Press 1999) 135 at 139.

²⁸ Sands, above n. 24, at 246; Orrego Vicuña, above n. 23, at 153; Kiss and Shelton, above n. 23, at 264.

²⁹ Sands, *id.*

³⁰ Kiss and Shelton, above n. 23, at 263.

³¹ See for example below n. 63.

³² For example Lefeber, above n. 26, discusses the obligation of prevention and abatement of transboundary harm (at 19) and the precautionary principle (at 33 and 91), but not the preventative principle. The same goes for Birnie and Boyle, above n. 26, dealing with the duty to avoid transboundary harm (at 109) and the precautionary principle (at 115), but not with a separate preventative principle.

³³ Sands, above n. 22, at 249 appears to allude to the possibility, but does not state it in so many words, that the principle has customary law status.

³⁴ Writers expressly denying the latter principle the capacity of international custom include Handl, above n. 23, at 75; and Guruswamy and Hendricks, above n. 23, at 29. Others, such as Paradell-Trius, above n. 23, at 97, while affirming that the duty

one author, while observing that the ‘self-evident truth that an ounce of prevention is better than a pound of cure, has for some time now been reflected in the international law related to the environment,’ acknowledged that ‘unto this day the notion has persisted that customary international law does not yet include such an obligation’.³⁵ Interestingly, the 2005 arbitral award in the *Iron Rhine* case appears to come close to according customary status to the preventative principle when stating that:

Environmental law and the law on development stand not as alternatives but as mutually reinforcing, integral concepts, which require that where development may cause significant harm to the environment there is a duty to prevent, or at least mitigate, such harm (see paragraph 222). This duty, in the opinion of the Tribunal, has now become a principle of general international law.³⁶

Nevertheless, the 222nd recital of the award referred to here makes clear that what is meant is, after all, the traditional duty to prevent *transboundary* harm.

It would seem that to date the preventative principle still does not provide a broad customary obligation to prevent environmental harm in areas beyond *and* within national jurisdiction. The *precautionary* principle, however, does exactly that.

4 Precautionary logic and the precautionary principle

In parallel to the considerations in the previous section, precautionary *logic* – which roughly corresponds to erring on the safe side – is an habitual feature of human life that is evidently not confined to environmental affairs.³⁷ Notably, the application of precautionary logic to security issues, including dealing with terrorism, has been receiving increased attention in recent years.³⁸ Such logic had been apparent in the security policy of the George W. Bush administration since 11 September 2001. As then Vice President Dick Cheney instructed the

to avoid transboundary harm is a customary principle, choose not to comment on the legal status of the preventative principle.

³⁵ Handl, above n. 23, at 75.

³⁶ *Iron Rhine Arbitration (Belgium v. Netherlands)*, 24 May 2005, Permanent Court of Arbitration Award Series (2005), <www.pca-cpa.org>, para. 59.

³⁷ See for example R. Pieterman, *De Voorzorgcultuur: streven naar veiligheid in een wereld vol risico en onzekerheid* (The Hague: Boom Juridische Uitgevers 2008).

³⁸ See for example C. Aradau and R. van Munster, ‘Governing Terrorism Through Risk: Taking Precautionas, (un)Knowing the Future’ (2007) 13 *European Journal of International Relations* 89; A. Goldsmith, ‘The Governance of Terror: Precautionary Logic and Counterterrorist Law Reform After September 11’ (2008) 30 *Law and Policy* 141; M. de Goede, ‘The Politics of Preemption and the War on Terror in Europe’ (2008) 14 *European Journal of International Relations* 161.

CIA in November 2001: ‘Even if there’s only a one percent chance of the unimaginable becoming true, act as though it’s a certainty’.³⁹ Similarly, before actually carrying it out, President Bush repeatedly reserved the option of an anticipatory military strike against the Iraq of Saddam Hussein in the absence of conclusive evidence of weapons of mass destruction, in classic precautionary wording such as this:

Understanding the threats of our time, knowing the designs and deceptions of the Iraqi regime, we have every reason to assume the worst, and we have an urgent duty to prevent the worst from occurring. ... There is no easy or risk-free course of action. Some have argued we should wait – and that is an option. In my view, it is the riskiest of all options – because the longer we wait, the stronger and bolder Saddam Hussein will become. ... [W]e cannot wait for the final proof – the smoking gun – that could come in the form of a mushroom cloud.⁴⁰

All the same, the US and other states are *not* in the habit of expressly invoking the precautionary *principle* in these matters. The latter has, from the outset, been a distinctly *environmental* principle and the limits of its scope in contemporary general international law reflect this. In respect of human health protection, the situation is slightly less clear-cut than in the security area.⁴¹ Health is encompassed within the scope of the customary precautionary principle only partly and indirectly: namely, to the extent that human health benefits from *environmental* protection. Typical health issues like food safety fall outside this scope. The Rio Declaration, in which States endorsed the principle in order to ‘protect the *environment*’ through measures preventing ‘*environmental* degradation’, is highly representative in this respect.⁴² Legal instruments expressly linking the precautionary principle to human health as well as the environment exist, but are so few and far between that they must be regarded the exceptions confirming the general rule just set out.⁴³ Moreover, the provisions in question in these instruments focus on shielding human health from negative effects of *environmental* pollution: put differently, also in those provisions the precautionary principle has little to do with, for instance, the possible health hazards of vitamin additives.

In contending that the precautionary principle covers not only the

³⁹ See R. Suskind, *The One Percent Doctrine* (New York: Simon and Schuster 2006).

⁴⁰ Televised speech broadcast 7 October 2002, transcript available at <<http://www.cnn.com>>.

⁴¹ For a slightly more elaborate discussion than the one below, see Trouwborst (2007b), above n. 2, at 189.

⁴² Rio Declaration, above n. 7, Principle 15 (emphasis added).

⁴³ See for example Protocol to the Convention on Biological Diversity on Biosafety, 29 January 2000, Art. 1, 10(6) and 11(8); Convention on Persistent Organic Pollutants, 22 May 2001, Art. 1.

environment but also human, animal, and plant health in their own right, the EU has been fighting a lonely battle in the global arena.⁴⁴ Significantly, an EU proposal to explicitly include human health within the ambit of the principle ran aground at the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg, and there is little to suggest that things have changed since then. Some of the largest international controversies involving the precautionary principle, to be sure, have precisely concerned distinctive health issues: for instance, the trans-Atlantic beef hormones dispute in the World Trade Organization (WTO) in the mid-1990s. Whilst reasoning that the precautionary principle ‘finds reflection’ in some of the provisions of the SPS Agreement,⁴⁵ the WTO Appellate Body settling the dispute was unwilling to accord the precautionary principle much legal significance outside the environmental domain, while more generously reserving the possibility of the principle having attained the status of ‘customary international *environmental law*’.⁴⁶ This approach was copied by the WTO Panel in the more recent *Biotech* case.⁴⁷ Besides, academic critics of the precautionary principle seldom target its application to nature conservation or to environmental pollution, while wholeheartedly condemning its application in Europe to health issues proper like antibiotics in animal feed, BSE, and pharmaceuticals.⁴⁸

Once more, the key to understanding this state of affairs is the distinction between precautionary *logic* and the precautionary *principle*. In conformity with the priorities of States and their citizens, precautionary logic has formed part of health law and policy for a long time.⁴⁹ No *principle* was

⁴⁴ See, e.g., the European Commission Communication of 2 February 2000 on the Precautionary Principle, COM (2000) 1, at 8, or a random selection from the germane jurisprudence of the EU Court of Justice.

⁴⁵ WTO Agreement on the Application of Sanitary and Phytosanitary Measures, 15 April 1994, Preamble and Art. 3.3 and 5.7.

⁴⁶ *EC Measures Concerning Meat and Meat Products*, WTO AB 16 January 1998, WT/DS26/AB/R, WT/DS48/AB/R, para. 123 (emphasis in original). The Appellate Body also submitted that ‘the precautionary principle, *at least outside the field of international environmental law*, still awaits authoritative formulation’ (*id.*, emphasis added).

⁴⁷ *EC Measures Affecting the Approval and Marketing of Biotech Products*, WTO 29 September 2006, WT/DS291/R, WT/DS292/R, WT/DS291/R. After reproducing the paras. from *Beef Hormones* just cited, the Panel observes in para. 7.88 of its report that provisions applying the precautionary principle ‘have been incorporated into numerous international conventions and declarations, although, for the most part, they are *environmental* conventions and declarations. Also, the principle has been referred to and applied by States at the domestic level, again mostly in domestic *environmental law*’ (footnotes omitted; emphasis added).

⁴⁸ See for example Marchant and Mossman, above n. 1.

⁴⁹ As noted by the WTO Appellate Body in *Beef Hormones*, above n. 46, para. 124: ‘responsible, representative governments commonly act from perspectives of prudence and precaution where risks of irreversible, e.g. life-terminating, damage to

needed to ensure this. Things are different in the environmental field, where precaution has, at least until recently, been lacking enormously. With respect to the environment, the need for, and added value of, an express legal principle to force a change for the better was substantial. In any case, even in the EC Treaty the precautionary principle is absent from provisions dealing with human health and consumer protection,⁵⁰ and can be found only in the environment section.⁵¹ The precautionary principle was simply never meant to deal with the alleged health hazards of high voltage cables and comparable risks with infinitesimal probabilities. The present application of an explicit precautionary *principle*, primarily by and within the EU, in an area, human health, where precaution has long been the rule as it is, has led to unease and agitation on the part of trade partners and to perceptible confusion on the part of EU institutions themselves. One way or the other, in general international law as it stands the scope of the precautionary principle is restricted to environmental protection. Ignoring this means entering murky waters – and plenty of work for courts.⁵²

5 Preventative logic and precautionary logic

In theory, a comparatively unambiguous dividing line may be drawn between preventative logic and precautionary logic, using uncertainty as the defining criterion. If the environmental effects of a particular activity are known, measures to avoid them may be termed preventative. If such effects are uncertain, the same measures may also be labelled precautionary.⁵³ As knowledge of an issue (e.g. ozone layer depletion or climate change)

human health are concerned'. Of course, it has been argued in individual cases that the application of precautionary logic to human health protection has not gone quite far enough. See for example P. van Zwanenberg and E. Millstone, "'Mad Cow Disease" 1980s-2000: How Reassurance Undermined Precaution' in Harremoes and others, above n. 3, at 157.

⁵⁰ Treaty Establishing the European Community, 25 March 1957, 298 UNTS 11, Art. 152-153.

⁵¹ *Id.*, Art. 174(2) (introduced by the Treaty on European Union amendments, 7 February 1992, 31 ILM (1992) 247.

⁵² The EU Court of Justice (e.g. *Pfizer Animal Health v. Council*, 30 June 1999, T-13/99) and several WTO panels bear witness to this, as do the Australian judges who in a decade had to decide more than 25 cases on the precautionary principle in relation to mobile phone towers. On the latter, see J. Peel, 'When (Scientific) Rationality Rules: (Mis)Application of the Precautionary Principle in Australian Mobile Phone Tower Cases' (2007) 19 *Journal of Environmental Law* 103.

⁵³ See for example J. Cameron and J. Abouchar, 'The Status of the Precautionary Principle in International Law' in D. Freestone and E. Hey (eds.), *The Precautionary Principle and International Law* (The Hague: Kluwer Law International 1996) 29 at 45; De Sadeleer, above n. 22, at 222.

advances, related measures automatically become less precautionary and more preventative.⁵⁴ Ultimately, once all uncertainty has been removed, 'precaution is no longer the right word'.⁵⁵ Under strictly preventative logic, the taking of preventative action is conditional upon the existence of 'certainty' regarding the threats involved. Conversely, precautionary logic means acting as soon as alarm bells are ringing, even if 'certainty' is not yet available.⁵⁶ In time, precautionary logic thus typically calls for measures at an earlier stage than does purely preventative logic. Precautionary logic goes further than preventative logic, and clearly presupposes the latter. Whichever way, in principle, where there is certainty, preventative logic suffices and vice versa.⁵⁷

Matters become slightly more complex when one adheres to the relatively common position that preventative logic covers the prevention of known risks of harm. Risk is generally construed as a function of the probability of occurrence of a certain hazard in a given period and the expected gravity of resultant harm should it occur.⁵⁸ On the aforementioned view of the matter, minimisation of quantifiable risks could still be seen as preventative. It would thus be the presence or absence of scientifically established and well-understood causal relationships that defines the distinction between preventative and precautionary logic. After all, without proof and understanding of such relationships, risks cannot validly be calculated.⁵⁹ As De Sadeleer explains:

Prevention is based on certainties: it rests on cumulative experience concerning the degree of risk posed by an activity (Russian roulette, for example, involves a

⁵⁴ J. Cameron, 'The Status of the Precautionary Principle in International Law' in T. O'Riordan and J. Cameron (eds.), *Interpreting the Precautionary Principle* (London: Cameron & May 1994) 263 at 275; W. Gullett, 'Environmental Protection and the Precautionary Principle: A Response to Scientific Uncertainty in Environmental Management' (1997) 14 *Environmental and Planning Law Journal* 52 at 60.

⁵⁵ N. Haigh, 'The Introduction of the Precautionary Principle into the UK' in T. O'Riordan and J. Cameron (eds.), *Interpreting the Precautionary Principle* (London: Cameron & May 1994) 229 at 241.

⁵⁶ Freestone and Makuch, above n. 27, at 13; D.M. Dzidzornu, 'Four Principles in Marine Environment Protection: A Comparative Analysis' (1998) 29 *Ocean Development and International Law* 91 at 100; Freestone, above n. 27, at 139; also Juste Ruiz, above n. 23, at 78.

⁵⁷ M. Kaiser, 'Fish-Farming and the Precautionary Principle: Context and Values in Environmental Science for Policy' (1997) 2 *Foundations of Science* 307 at 312; N. Haigh, above n. 55, at 241.

⁵⁸ For a discussion and further sources, see Trouwborst (2006), above n. 2, at 26.

⁵⁹ See for example Lefeber, above n. 26 at 91; J. Cameron, W. Wade-Gery and J. Abouchar, 'Precautionary Principle and Future Generations' in E. Agius and others (eds.), *Future Generations and International Law* (London: Earthscan 1998) 93 at 101.

predictable one-in-six chance of death). Therefore, prevention presupposes science, technical control, and the notion of an objective assessment of risks in order to reduce the probability of their occurrence. Preventive measures are thus intended to avert risks for which the cause-and-effect relationship is already known. ... Precaution, in contrast, comes into play when the probability of a suspected risk cannot be irrefutably demonstrated. The distinction between the two ... is thus the degree of uncertainty surrounding the probability of risk. The lower the margin of uncertainty, the greater the justification for intervention as a means of prevention rather than in the name of precaution. By contrast, precaution is used when scientific research has not yet reached a stage that allows the veil of uncertainty to be lifted.⁶⁰

From a practical perspective, however, a rigid segregation of the two concepts is hardly operable. One may consider, for instance, the 'apparently unsteady distinction' between risk and uncertainty.⁶¹ Notwithstanding terminology such as 'known risks' and the like, uncertainty is obviously inherent in the very notion of risk. Also quantifiable risks, where the likelihood and nature of an anticipated impact are relatively 'established', still embody a degree of uncertainty.⁶² Furthermore, any given calculation, however correctly executed, may be overlooking or misinterpreting environmental relationships and effects that may not yet exist or are wrongly understood. In this sense, action taken to combat *risks* can be named precautionary as much as preventative.⁶³ The precautionary *extent* of any such action, for instance addressing contamination of a river as a result of an industrial accident, depends on the relative importance of the uncertainties in question:

If both the probability of accidental pollution and the magnitude of the consequences of that pollution are known, the standards would be relatively unprecautionary, precisely because the level of uncertainty involved is relatively low. High risks do not necessarily entail high levels of uncertainty. However, if the probability and magnitude are relatively unknown, because, for instance, it is not known what cause and effect relationships are involved, or exactly what the nature of the involved causal relationships is, then the standards would be precautionary because of the relative uncertainties involved.⁶⁴

It may thus be argued that in the end all *risk* reduction measures are precautionary to some degree, although some more than others.⁶⁵

⁶⁰ De Sadeleer, above n. 22, at 74-75.

⁶¹ Cameron, Wade-Gery and Abouchar, above n. 59, at 101.

⁶² By definition, probability is not the same as certainty.

⁶³ Cameron, Wade-Gery and Abouchar, above n. 59, at 101.

⁶⁴ *Id.*

⁶⁵ H. Hohmann, *Precautionary Legal Duties and Principles of Modern International Environmental Law* (Dordrecht: Kluwer Law International 1994) at 334.

6 The preventative principle and the precautionary principle

At the outset of this section it is worthwhile to recall that the preventative principle and the precautionary principle have identical purposes: namely, the adequate protection of the environment. Still, they have regularly been treated as separate principles, including in the EC Treaty and a number of other (predominantly European) international legal and policy instruments that name both principles alongside each other.⁶⁶ But how are they different and, more importantly, how do they relate to each other?

Following the elegant and, theoretically speaking, apparently sound distinction between preventative and precautionary logic as described in the previous section, commentators have frequently distinguished the preventative principle and the precautionary *principle* along the same lines.⁶⁷ In this regard, the preventative principle – like the duty to avoid transboundary harm – is often understood to comprise the avoidance of known harm as well as known risks of harm.⁶⁸ Yet, this distinction has not translated accurately into inter-governmental practice. As will be clear by now, preventative and precautionary *logic* do not neatly overlap with, respectively, the preventative and precautionary *principles*. Likewise, the difference between preventative logic and precautionary logic does not exactly match the difference between the preventative principle and the precautionary principle. And even if it did, it would obviously still be difficult for States to decide when to rely on the preventative and when on the precautionary principle, considering the practical difficulty of distinguishing between preventative and precautionary action discussed above.⁶⁹ As Haigh put it: ‘Since there is likely to be uncertainty when

⁶⁶ EC Treaty, above n. 50, Art. 174(2); Convention on the Protection of the Meuse and Convention on the Protection of the Scheldt, 26 April 1994, 34 ILM 1995 at 851, Art. 3(2) of both; Pan-European Biological and Landscape Diversity Strategy, 25 October 1995, <www.nature.coe.int>, Section 2.4, paras. 2 and 3; Protocol (to 1960 Treaty Between the Netherlands and Germany on Cooperation in the Ems River Mouth) on Cooperation in the Area of Water and Nature Protection in the Ems River Mouth, 22 August 1996, Art. 1(2); Trilateral Wadden Sea Plan, 22 October 1997, para. 8; Convention on the Protection of the Rhine, 12 April 1999, Art. 4; Protocol (to 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes) on Water and Health, 17 June 1999, ECOSOC Doc. MP.WAT-AC.1-1999-1, Art. 5. For example, the latter provision refers separately to the precautionary principle [para. (a)], the duty to avoid transboundary harm [para. (c)] and the preventative principle [para. (e)].

⁶⁷ For example De Sadeleer, above n. 3, *id.*

⁶⁸ Lefeber, above n. 26, at 29; Freestone and Makuch, above n. 27 at 13; Cameron and Abouchar, above n. 53, at 45; Cameron, Wade-Gery and Abouchar, above n. 59, at 101; Freestone, above n. 27, at 139.

⁶⁹ Ch.W. Backes and others, *Milieurecht* (Deventer: Kluwer 2006, 6th ed.) at 36; Ch.W. Backes and others, ‘Onderzoeksrapport: Het Voorzorgbeginsel in het

uncertainty disappears there will also be uncertainty about whether to talk of the principle of precaution rather than of prevention'.⁷⁰

Not surprisingly, in national and international discourse, States have not always distinguished sharply between the preventative and precautionary principles.⁷¹ A 1988 UK policy document, for example, speaks of 'a preventive, precautionary approach'.⁷² The 1991 Bamako Convention, apart from mentioning 'the precautionary principle', makes reference to 'the preventive, precautionary approach',⁷³ whereas the parties to the 1992 EEA Agreement dedicated themselves to preserving the environment on the basis of 'the principle that precautionary and preventive action should be taken'.⁷⁴ Likewise, the 1992 Central American Hazardous Wastes Agreement refers to 'el enfoque preventivo y precautorio'.⁷⁵ A similar lack of distinction can be encountered, *inter alia*, in various provisions of Agenda 21⁷⁶ and the 1996 Protocol to the London Convention on marine dumping.⁷⁷ Prevention and precaution seem to be presented in these instruments as two sides of the same coin, with a blurred dividing line between them at best.⁷⁸

However, a question – the answer to which is evidently crucial for present purposes – is whether uncertainty is actually a precondition for the applicability of the precautionary principle. This is tightly related to the question of whether the precautionary principle warrants action *because* of uncertainty or *in spite* of uncertainty.

The answer is that the practice of States and common sense alike clearly favour the latter option. Certainly, as described earlier, the role of

Natuurbeschermsrecht' in Ch.W. Backes and others (eds.), *Het Voorzorgbeginsel in het Natuurbeschermsrecht* (Deventer: Kluwer 1997) 49 at 56; Hohmann, above n. 65, at 334.

⁷⁰ Haigh, above n. 55, at 241.

⁷¹ K.R. Gray, 'International Environmental Impact Assessment' (2000) 11 *Colorado Journal of International Environmental Law and Policy* 83 at 99.

⁷² Department of the Environment, *Protecting Your Environment: A Guide* (July 1988), cited in Haigh, above n. 56, at 247.

⁷³ Convention on the Ban of Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, 29 January 1991, 30 ILM 1991 at 775; both references in Art. 3(f).

⁷⁴ Agreement on the European Economic Area, 20 May 1992, OJ 1994 L1 at 3, preamble, 6th para.

⁷⁵ Regional Agreement on the Transboundary Movement of Hazardous Wastes, 11 December 1992, <www.basel.int>, Art. 3(3).

⁷⁶ Agenda 21, 14 June 1992, UN Doc. A/CONF.151/26/Rev.1, paras. 17.5, 17.21, 17.22, 19.60.

⁷⁷ Protocol (to 1972 Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matter), 7 November 1996, (1996) 7 *Yearbook of International Environmental Law* at 644, preamble, 2nd para.

⁷⁸ Backes and others, above n. 69 at 56; also Cameron, Wade-Gery and Abouchar, above n. 59, at 101.

uncertainty in environmental affairs forms an important part of the rationale of the precautionary principle.⁷⁹ Even so, as the word ‘including’ in the definition presented above indicates, it is *not* correct to say that the presence of uncertainty is a requirement for application of the principle.⁸⁰ On the contrary, the criterion of proportionality requires that the strictness of precautionary measures correspond to the likelihood and expected gravity of harm. Thus, when there is certainty – assuming such a thing exists – that harm will occur if preventative measures are not taken, then this is all the more reason to take action. If the thresholds of harm and likelihood are crossed, effective and proportional must be taken, whether there is uncertainty or not. Strictly speaking, the last part of the definition just referred to, running from ‘including’ through ‘harm’, can be left out without changing the content of the principle. It is a clarification, not a condition. The right question is therefore not how much uncertainty *must* there be for the precautionary principle to apply, but how much uncertainty *may* there be. The latter question may be answered by reference to the minimum threshold of likelihood: ‘reasonable grounds for concern’. It is thus possible to imagine cases where there is too much uncertainty for the principle to apply. Conversely, there can never be too much *certainty* of harmfulness for the principle to be applicable.

Principle 15 of the Rio Declaration, and the many other provisions of international and national instruments that are either similarly phrased or directly refer to Principle 15, postulate that where environmental harm is threatened, ‘lack of full scientific certainty shall not be used as a reason for postponing’ preventative measures.⁸¹ That is, action to ward off potential hazards may not be impeded by uncertainty. Where the use of scientific uncertainty as an excuse for postponing measures to prevent environmental degradation is forbidden, the suitability of such measures *an sich* must be considered a given.⁸² Put yet another way, the trigger for any measures that may be required by the precautionary principle is obviously the concern that damage may be caused, and not the scientific uncertainty itself. Hence, according to these provisions, the precautionary principle demands action *in spite* of uncertainty, not because of it.

Other instruments state this premise more explicitly. For instance, in the 1992 Baltic Sea Convention the precautionary principle has been specified to require preventative action when there is reason to assume that emissions of substances or energy into the marine environment may be harmful, ‘*even when* there is no conclusive evidence of a causal relationship between inputs and

⁷⁹ See above Section 2.

⁸⁰ See text accompanying n. 21.

⁸¹ For a selection of such provisions and a discussion of Principle 15’s significance, see Trouwborst (2006), above n. 2, at 32.

⁸² Also A. Soria Jiménez, ‘Ecological Catastrophes in Light of the Rio Agreements’ (1996) 39 *German Yearbook of International Law* 388 at 407.

their alleged effects'.⁸³ This is a clear case of action despite uncertainty. Likewise, the 2002 ASEAN Haze Pollution Agreement stipulates that 'where there are threats of serious or irreversible damage from transboundary haze pollution, *even without full scientific certainty*, precautionary measures shall be taken by Parties concerned'.⁸⁴ The 1992 OSPAR Convention,⁸⁵ the 1996 London Protocol,⁸⁶ the 1997 Trilateral Wadden Sea Plan,⁸⁷ the European Commission's 2000 Communication on the principle,⁸⁸ and several inter-governmental declarations on the protection of the oceans contain like formulations.⁸⁹ Instances of such formulations at the national level include a 1984 judgment of the German Federal Administrative Court,⁹⁰ the 1996 report of the US President's Council on Sustainable Development,⁹¹ a Belgian federal act of 1999 on the protection of the marine environment,⁹² and several UK policy instruments.⁹³ The environmental law of Mozambique is particularly categorical, stating that the precautionary principle calls for the avoidance of significant or irreversible adverse environmental impacts '*independently* of the

⁸³ Convention on the Protection of the Marine Environment of the Baltic Sea Area, 9 April 1992, 3 *Yearbook of International Environmental Law* (1992) 1, Art. 3(2) (emphasis added).

⁸⁴ ASEAN (Association of South East Asian Nations) Agreement on Transboundary Haze Pollution, 10 June 2002, <www.aseansec.org>, Art. 3(3) (emphasis added).

⁸⁵ Convention for the Protection of the Marine Environment of the North-East Atlantic, 22 September 1992, 8 *International Journal of Marine and Coastal Law* (1993) 50, Art. 2(2)(a).

⁸⁶ Above n. 77, Art. 3(1).

⁸⁷ Above n. 66, para. 8.

⁸⁸ Above n. 44, at 13.

⁸⁹ Second North Sea Declaration, above n. 7, para. XVI(1); Declaration of the Third International Conference on the Protection of the North Sea, 8 March 1990, preamble; Declaration of the Nordic Council International Conference on Pollution of the Seas, 18 October 1989; Ministerial Declaration of the Sixth Trilateral Governmental Conference on the Protection of the North Sea, 13 November 1991, para. 3.

⁹⁰ *Bundesverwaltungsgericht*, 14 February 1984, 69 *BverGE* (1985) at 43; see N. de Sadeleer, 'The Enforcement of the Precautionary Principle by German, French and Belgian Courts' (2000) 9 *Review of European Community and International Environmental Law* 144 at 145.

⁹¹ President's Council on Sustainable Development, *Sustainable America: A New Consensus for Prosperity, Opportunity and a Healthy Environment*, February 1996.

⁹² *Wet ter Bescherming van het Mariene Milieu in de Zeegebieden onder de Rechtsbevoegdheid van België*, Act of 20 January 1999, *MB* 12 March 1999, Art. 4(3).

⁹³ White Paper 'This Common Inheritance' (1990); Guidelines for Environmental Risk Assessment and Management, 2000.

existence of scientific certainty about the occurrence of such impacts'.⁹⁴ The 2004 International Law Association (ILA) Berlin Rules on Water Resources⁹⁵ as well as many individual scholars take a comparable approach.⁹⁶

On all these occasions, the precautionary principle apparently embodies the assumption that preventative and abatement action is *always* appropriate where there is a sufficiently qualified threat of environmental harm. The principle accompanies this by the explicit elucidation that this is so *even when* scientific proof in relation to this threat and its potential effects is lacking. The definition of the precautionary principle in the 1990 Bergen Declaration points in the same direction:

In order to achieve sustainable development, policies must be based on the precautionary principle. Environmental measures must anticipate, prevent and attack the causes of environmental degradation. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.⁹⁷

The full-stop at the end of the second sentence says it all. Environmental degradation must be prevented. That scientific uncertainty may not hamper this prevention is a separate addition. Yet another variation on the same theme is provided by formulations in the vein of the 2002 ILA New Delhi Declaration on Sustainable Development, which specifies that the precautionary principle commits States 'to avoid human activity which may cause significant harm to human health, natural resources or ecosystems, *including* in the face of

⁹⁴ Lei no. 20/97, 1997, reproduced at <faolex.fao.org/docs/texts/moz15370.doc>, Art. 4(3); author's translation of the original Portuguese text, which speaks of 'evitar a ocorrência de impactos ambientais negativos significativos ou irreversíveis, *independentemente* da existência de certeza científica sobre a ocorrência de tais impactos' (emphasis added).

⁹⁵ 21 August 2004, Art. 23(2).

⁹⁶ E.g., J. Ebbesson, *Compatibility of International and National Environmental Law* (London, The Hague, Boston: Kluwer Law International 1996) at 119; P.H. Martin, "'If You Don't Know How to Fix it, Please Stop Breaking it!": The Precautionary Principle and Climate Change' (1997) 2 *Foundations of Science* 263 at 276; J. Lemons and others, 'The Precautionary Principle: Scientific Uncertainty and Type I and Type II Errors' (1997) 2 *Foundations of Science* 207 at 210; Dzidzornu, above n. 57 at 98; Freestone, above n. 27 at 137; H.C. Borgers, 'In Dubio Pro Natura: Het Functionele Perspectief van het Voorzorgsbeginsel' (1999) 48 *Ars Aequi* 431 at 435; F.X. Perrez, *Cooperative Sovereignty: From Independence to Interdependence in the Structure of International Environmental Law* (The Hague, London, Boston: Kluwer Law International 2000) at 289; M. Tallacchini, 'A Legal Framework from Ecology' (2000) 9 *Biodiversity and Conservation* 1085 at 1096.

⁹⁷ Ministerial Declaration on Sustainable Development in the ECE Region, 16 May 1990, UN Doc. A/CONF.151/PC10, Annex I, para. 7.

scientific uncertainty’.⁹⁸

Now that *preventative* action proper is evidently viewed as within the bounds of the precautionary principle just as much as *precautionary* action proper, where does this leave the preventative principle? Just as precautionary logic presupposes preventative logic – in the sense that not only uncertain hazards but of course also ‘certain’ hazards are to be dealt with – so the precautionary principle may perhaps be considered as presupposing, as it were, the preventative principle. That is, the latter might be deemed ‘a necessary corollary to the former’.⁹⁹ It seems to do more justice to the pertinent practice of States, however, to view the precautionary principle as an expanded version of the preventative principle,¹⁰⁰ as effectively comprising the latter, or – probably most accurately – as the ‘most developed form’ of prevention.¹⁰¹

Indeed, States do not focus on demarcating the respective scopes of application of the preventative and precautionary principles and, for that matter, rarely cite the preventative principle at all, as mentioned above.¹⁰² Instead, they tend to rely on the precautionary principle as the flag that covers the entire cargo of preventative measures, whether taken under scientific uncertainty or not. For example, a 1989 Decision by the UN Environment Programme (UNEP) Governing Council Decision urged the international community to adopt the precautionary principle as *the* basis (not just one of the bases) of its policy on marine pollution.¹⁰³ Correspondingly, the 1995 Fourth North Sea Declaration states:

The Ministers AGREE that the objective is to ensure a sustainable, sound and healthy North Sea ecosystem. The guiding principle for achieving this objective is the *precautionary* principle. *This implies the prevention of the pollution of the North Sea* by continuously reducing discharges, emissions and losses of hazardous substances, thereby moving towards the target of their cessation within one generation (25 years) with the ultimate aim of concentrations in the environment

⁹⁸ Declaration of Principles of International Law Relating to Sustainable Development, 2 April 2002, para. 4.1 (emphasis added).

⁹⁹ Soria Jiménez, above n. 82, at 407.

¹⁰⁰ For example Soria Jiménez, *id.*; Martin, above n. 97, at 263; M. Matthee and D. Vermersch, ‘Are the Precautionary Principle and the International Trade of Genetically Modified Organisms Reconcilable?’ (2000) 12 *Journal of Agricultural and Environmental Ethics* 59 at 61; E. Louka, *International Environmental Law: Fairness, Effectiveness and World Order* (Cambridge: Cambridge University Press 2006) at 50.

¹⁰¹ A.C.H. Kiss, ‘The Rights and Interests of Future Generations and the Precautionary Principle’ in D. Freestone and E. Hey (eds.), *The Precautionary Principle and International Law* (The Hague: Kluwer Law International 1996) 19 at 27; similarly, Kiss and Shelton, above n. 24, at 265.

¹⁰² See above Section 3.

¹⁰³ UNEP Governing Council Decision 15/27 on the Precautionary Approach to Marine Pollution, Including Waste-dumping at Sea, 25 May 1989, 44 UNGAOR (1989), Supp. 25, 152, para. 1.

near background values for naturally occurring substances and close to zero concentrations for man-made synthetic substances.¹⁰⁴

In fact, scores of legal instruments prescribe the application of the precautionary principle while *not* separately mentioning the preventative principle – which can impossibly be interpreted to mean that uncertain dangers are to be prevented while ‘certain’ dangers may be allowed to materialise. The Rio Declaration, for instance, does not incorporate the preventative principle as an autonomous principle, feeding the supposition that it is indeed inherent or encompassed in Principle 15.¹⁰⁵ By way of an illustrative sample,¹⁰⁶ the same goes for the OSPAR Convention,¹⁰⁷ the 1993 EU Fifth Action Programme on the Environment,¹⁰⁸ the 2001 Albatross Agreement,¹⁰⁹ and the 2001 Stockholm POPs Convention.¹¹⁰

In addition to these multilateral instruments apparently using the precautionary principle as *pars pro toto* for all preventative action – whether taken under uncertainty or not – various examples can be drawn from the domestic arena. One such instance is provided by the measures imposed after a fire in a chemical depot in Drachten, the Netherlands.¹¹¹ Although the impacts of some of the released substances were unknown, those of several others certainly were. Still, instead of appealing to the precautionary *and* preventative principles to justify a prohibition on the use of grass growing in the surrounding area as cow feed, the competent Dutch minister referred solely to the former.¹¹² In Germany it is not unusual either to conceive of precaution as actually comprising prevention.¹¹³ As a final example, a judicial decision by the Indian Supreme Court also treats the concept of prevention as part and parcel of the precautionary principle, in a manner very similar to the approach of the aforementioned Bergen Declaration.¹¹⁴

¹⁰⁴ Declaration of the Fourth Ministerial Conference on the Protection of the North Sea, 9 June 1995, <www.dep.nl/md/html/conf/declaration/esbjerg.html>, para. 17 (emphasis added).

¹⁰⁵ Soria Jiménez, above n. 83, at 392 and 407.

¹⁰⁶ More examples can be found in Trouwborst (2002), above n. 2, at 41.

¹⁰⁷ Above n. 85.

¹⁰⁸ Fifth Action Programme on the Environment of the European Community, 1 February 1993, OJ 1993 C138, Chapter 2.

¹⁰⁹ Agreement on the Conservation of Albatrosses and Petrels, 2 February 2001, <www.acap.aq>.

¹¹⁰ Convention on Persistent Organic Pollutants, 23 May 2001.

¹¹¹ See C. Lambers, ‘Het Voorzorgsbeginsel: Vluchten Kan Niet Meer’ (2000) 27 *Tijdschrift voor Milieu en Recht* 176.

¹¹² *Id.*

¹¹³ De Sadeleer, above n. 90, at 144.

¹¹⁴ *Vellore Citizens*, above n. 18.

In summary, the plain answer to the questions posed at the outset of this section is that where the precautionary principle is endorsed, the substance of the preventative principle is as well.

7 Conclusion

Rather than summarising all findings, this article ends with some selected remarks with a practical focus.

Firstly, to all intents and purposes, in the international law of the environment the precautionary principle must be regarded as having absorbed the preventative principle – or, alternatively, as being its most developed form. One way or the other, the result is the same. With the legal consolidation of the precautionary principle, there is no longer any reason to maintain a separate preventative principle aimed at the prevention of ‘certain’ harm – a principle that has never led an impressive autonomous existence in international law in any case. As described above, many modern environmental treaties exhibit this new status quo by mentioning, of the two, solely the precautionary principle, whereas it is evidently not the parties’ intention to combat uncertain threats while leaving ‘certain’ threats alone. Nevertheless, especially in the EU and its member States, the historically grown attachment to a theoretical distinction between prevention and precaution is presently still influential. This is unlikely to change drastically as long as the provision of the EC Treaty, in which the two principles are cited separately, survives in its current form.¹¹⁵ When the occasion presents itself, however, it would probably serve the interest of clarity to fall in with general international law by adopting the precautionary principle as the sufficient and sole basis for the prevention of ‘certain’ and uncertain environmental harm alike, and bidding the preventative principle farewell.

Secondly, it seems fitting to emphasise the importance of the distinction between precautionary logic and the precautionary principle at this point. Whereas from various perspectives it is interesting and worthwhile to study the role of precautionary *logic* in fields outside the environmental domain, the above analysis warrants the conclusion that it would be inappropriate and unnecessarily confusing to refer in these areas to the precautionary *principle*.

Having started with a thought-provoking quote, this article ends with a modern classic that is not only suitable in light of the above but also poetic:

¹¹⁵ EC Treaty, above n. 50, Art. 174(2).

As we know,
There are known knowns.
There are things we know we know.
We also know
There are known unknowns.
That is to say
We know there are some things
We do not know.
But there are also unknown unknowns,
The ones we don't know
We don't know.¹¹⁶

¹¹⁶ D. Rumsfeld, US Department of Defence news briefing, 12 February 2002, <dod.gov>.

A PRECAUTIONARY-PRINCIPLED APPROACH TOWARDS UNCERTAIN RISKS: REVIEW AND DECISION-THEORETIC ELABORATION

*Charles Vlek**

Abstract

Precautionary judgment, decision, and action are needed in situations involving serious uncertain risk. Examples are mountain climbing, nanotechnology, global warming, and international terrorism. The history of the Precautionary Principle (PP) shows that its proponents and opponents have different appraisals of probabilistic risk analysis. However, modern 'risk governance' and precautionary safety management seem to be converging into a balance of useful substance and feasible procedure. In this paper, the PP is unfolded as a three-way principle for risk assessment, decision-making, and risk control. For an integrative circumscription of the PP, ten key issues are identified. These are discussed one by one, whereby 'rational' precautionary decision-making is particularly illustrated via the concrete example of a railway bomb alarm. It is argued that a substantive-analytical framework is indispensable, that a decision-

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theoretic perspective may offer useful guidance, that the PP is a rational (survival) rather than a normative (ideological) principle, that the need to avoid false negatives versus false positives may well differ among distinct policy domains, and that precautionary ‘pessimism’ should stimulate towards improved, multi-sided control of uncertain risks. Concluding questions are answered and research suggestions are formulated.

1 Introduction and overview

The ongoing international debate about the Precautionary Principle (PP) continues to plague policy-makers, entrepreneurs, and scientists around the world. The crucial question is not ‘What does the PP practically involve?’, but rather ‘How could uncertain risks be adequately assessed and managed?’ This paper is meant to provide a review and decision-theoretic clarification of the PP, as a basis for a practical approach towards uncertain-risk situations. An attempt is made to balance a sociological and legal inclination – it seems – towards careful procedures, against an economic and psychological quest for meaningful substance.

1.1 Emergence of the Precautionary Principle

In the 1970s and 1980s, the PP emerged as a management perspective for dealing with serious uncertain risks for the natural environment and for public health. Original domains of precautionary action were the marine environment and the use of hazardous chemicals.¹ A precautionary approach had already been adopted in the US Federal Water Pollution Control Act of 1972, and during the 1970s for an international moratorium on commercial whaling.² Other areas of application were atmospheric pollution, global warming, and climate change.³ Biosafety and the safety of food and

¹ *London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972, and 1996 Protocol Thereto* (London: International Maritime Organisation 1972/2003), <<http://www.imo.org>>; M. Karlsson, ‘The pre-cautionary principle, Swedish chemicals policy and sustainable development’ (2006) 9 *Journal of Risk Research* 337.

² D. Bodansky, ‘Scientific uncertainty and the precautionary principle’ (1991) 33 *Environment* 4 at 4 and 43.

³ UNEP, United Nations Environment Program, *The Montreal Protocol on Substances that Deplete the Ozone Layer* (1987) available at <<http://www.unep.org/ozone>>; UNFCCC, United Nations Framework Convention on Climate Change, *Kyoto Protocol* (1997) available at <<http://unfccc.int>> or <<http://unep.org/climatechange/>>.

foodstuffs were explicitly brought under the PP somewhat later,⁴ while nanotechnology is currently gaining precautionary attention.⁵

More recently, the PP has also been appreciated in connection with threats from international terrorism; the USA's 'pre-emptive strike' against Iraq in March 2003 was presented officially as a precautionary strategy under the uncertain risk of 'weapons of mass destruction'.⁶ Since the terrorist attacks of 11 September 2001, on the New York WTC towers and the Pentagon building in Washington D.C., precautionary anti-terrorism policies have also been developed in several European countries, notably Spain, Great Britain, Denmark, and The Netherlands.⁷

Since its official adoption as Principle 15 of the Rio Declaration,⁸ the PP has been spreading as part of national and international policy-making, especially in EU countries.⁹ However, the UK House of Commons,¹⁰ apparently discontented with the European Commission's circumscription of the PP, has expressed scepticism about the 'ill-defined and practically unsatisfactory' PP and has recommended that the government not use the term.¹¹ The UN/WHO Codex Alimentarius Commission also decided not to

⁴ United Nations, *Carthage Protocol on Biosafety to the Convention on Biological Diversity* (Montreal, 29 January 2000) available at <www.cbd.int/biosafety/protocol/shtml>; WTO, *Agreement on the Application of Sanitary and Phytosanitary Measures* (SPS Agreement) (Geneva: World Trade Organization 1994) available at <<http://www.wto.org>>.

⁵ R. Haum and others, *Nanotechnology and regulation within the framework of the precautionary principle* (Berlin: Institut für Ökologische Wirtschaftsforschung 2004) available at <<http://www.ioew.de>> (accessed December 2004)

⁶ R. Jervis, 'Reports, politics, and intelligence failures: The case of Iraq' (2006) 29 *The Journal of Strategic Studies* 3; J. Stern and J.B. Wiener, 'Precaution against terrorism' (2006) 9 *Journal of Risk Research* 393.

⁷ M. J. Borgers, *De vlucht naar voren* [The flight forward] - Inaugural address, Free University of Amsterdam (The Hague: Boom Juridische Uitgevers 2007), discusses relevant changes in Dutch criminal law.

⁸ UNCED, United Nations Conference on Environment and Development 1992 (see Table 2 below).

⁹ EC, European Commission, *Communication from the Commission on the precautionary principle*. COM (2000) 1 [Summary-2007 at <http://europa.eu/scadplus/glossary/precautionary_principle_nl.htm>]; EC, European Commission, *The White Paper on Strategy for a Future Chemicals Policy* COM (2001) 88 Final; République Française, *Charte de l'Environnement* (2005) Loi constitutionnelle n° 2005-205 du 1er mars 2005 Paris.

¹⁰ UK House of Commons Select Committee on Science and Technology, *Science and Technology: Fourth Report* (London, Her Majesty's Stationary Office 2006), ch. 4: 'The Precautionary Principle' available at <www.publications.parliament.uk/pa/cm/200506/cmselect/cmsctech/1030/103007>.

¹¹ EC (2000), above n. 9.

adopt the PP explicitly in its *Working Principles for Risk Analysis*.¹²

1.2 Scientific debate and controversy

Nevertheless, almost in concert with the international reception of the PP as a policy principle, a lively and sometimes fierce scientific debate has arisen concerning its actual meaning and practical application. As an early skeptic, Bodansky raised several questions that are still haunting proponents today.¹³ Active promoters of the PP are Grandjean,¹⁴ Hansen,¹⁵ Latour,¹⁶ Martuzzi,¹⁷ O’Riordan,¹⁸ Sandin,¹⁹ and Weiss.²⁰ Vigorous critics are Bergkamp,²¹ Entine,²² Hanekamp,²³ IEM,²⁴ Majone,²⁵ Marchant,²⁶ Peterson,²⁷ and

¹² Codex Alimentarius Commission, *Working Principles for Risk Analysis for Application in the Framework of the Codex Alimentarius* (2007) available at <<http://www.fao.org/docrep/006/y4800e/y4800e0o/htm>> (Accessed 29 October 2007).

¹³ Bodansky, above n. 2.

¹⁴ P. Grandjean and others, ‘Implications of the precautionary principle in research and policy making’ (2004) 45 *American Journal of Industrial Medicine* 382.

¹⁵ S.F. Hansen, L. Carlsen and J.A. Tickner, ‘Chemicals regulation and precaution: does REACH really incorporate the precautionary principle?’ (2007) 10 *Environmental Science and Policy* 395.

¹⁶ B. Latour, ‘Du principe de précaution au principe du bon gouvernement: vers de nouvelles règles de la méthode expérimentale’ (2000) available at <<http://www.bruno-latour.fr/poparticles/poparticle/p088.html>>.

¹⁷ M. Martuzzi, ‘The precautionary principle: in action for public health’ (2007) 64 *Occupational and Environmental Medicine* 569.

¹⁸ T. O’Riordan, ‘The precautionary principle in environmental management’ in R.U. Ayres and U.E. Simonis (eds.), *Industrial Metabolism: Restructuring for Sustainable Development* (Tokyo: The United Nations University 1994).

¹⁹ P. Sandin and others, ‘Five charges against the precautionary principle’ (2002) 5 *Journal of Risk Research* 287.

²⁰ Ch. Weiss, ‘Scientific uncertainty and science-based precaution’ (2003) 3 *International Environmental Agreements: Politics, Law and Economics* 137.

²¹ L. Bergkamp, ‘Understanding the precautionary principle’ in *Environmental Liability* (Brussels: Hunton & Williams 2002) 10, 1: Part 1, 18-30; 10, 2: Part II, 67-82.

²² J. Entine, *Let them eat precaution* (Washington D.C.: American Enterprise Institute, AEI Press 2006).

²³ J.C. Hanekamp, ‘Precaution and cholera: a response to Tickner and Gouvea-Vigeant’ (2006) 26 *Risk Analysis* 1013.

²⁴ IEM, *Economic note: Precaution with the precautionary principle* (Bruxelles: Institut Économique Molinari 2005) available at: <www.institutmolinari.org>.

²⁵ G. Majone, ‘What price safety? The precautionary principle and its policy implications’ (2002) 40 *Journal of Common Market Studies* 89.

²⁶ G.E. Marchant, ‘The precautionary principle: an unprincipled approach to biotechnology regulation’ (2001) 45 *Journal of Risk Research* 143.

Sunstein.²⁸

The controversiality of the PP is focused on its ‘vague’ definition (‘What should we apply?’), its inherent pessimism aimed at avoiding false negatives (i.e. neglect of real danger), its dependence on plausibility reasoning, the lack of comparative risk evaluation, its openness as regards legal obligations, and its implied shift in the burden of proof. Other key issues (see Table 3 below) have been criticised to a lesser extent, although in practice they may prove problematic as well.

1.3 Being cautious from principle to practice

The PP involves a principal attitude of provisional caution or circumspection towards serious uncertain risks, under pessimistic assumptions about possible negative outcomes.²⁹ For practical application, the PP may be unfolded as:

- a. an *assessment* principle focused on evidentiary rules and plausibility judgment;
- b. a *decision* principle focused on the evaluation of alternative courses of action;
- c. a *control* principle focused on the practical realisation of precautionary safety.

Thus, clear answers are given to the ‘why, what, and how?’ question: Why be cautious? What must be done? How should this be done? Then follows the ‘Who?’ question, about the role of authorities and other parties responsible for uncertain-risk assessment and management.

1.4 Organisation of the paper

We first consider the types of uncertain risk for which the PP seems most properly invoked, and we look briefly into the basic criticisms and developments of probabilistic risk analysis. Several PP definitions are presented in Section 3, where ten key issues are identified and an integrative

²⁷ M. Peterson, ‘The precautionary principle should not be used as a basis for decision-making’ (2007) 8 *EMBO Reports*, *European Molecular Biology Organization* 305.

²⁸ C.S. Sunstein, ‘Beyond the precautionary principle’ (2003) 151 *University of Pennsylvania Law Review* 1003.

²⁹ G. Immordino, ‘Looking for a guide to protect the environment: the development of the precautionary principle’ (2003) 17 *Journal of Economic Surveys* 629; Ph. Kourilsky and G. Viney, *Le Principe de Précaution. Rapport au Premier Ministre* (15 Octobre 1999) (Paris: La Documentation Française/Éditions Odile Jacob 2000). Also available at <<http://lesrapports.ladocumentationfrancaise.fr/BRP/004000402/0000.pdf>>; Ch. Weiss, ‘Can there be science-based precaution? Institute of Physics Publishing’ (2006) 1 *Environmental Research Letters* 1.

circumscription is proposed. In Section 4, five substantive issues are discussed from a largely decision-theoretic perspective. Critical points of understanding are illustrated via the concrete example of a railway bomb alarm. Section 5 deals with five largely procedural PP issues. In Section 6, concluding answers are given to various general questions about precautionary risk management, and research suggestions are formulated.

2 Uncertain risks and the development of risk analysis

The enormous technological development and economic expansion in the industrial countries since World War II have gradually caused new risks to arise with respect to public health and safety, and to environmental security. Well-known risk sources are synthetic chemicals, nuclear power, large-scale fossil-fuel combustion, genetically modified organisms (GMOs), avian influenza, and nanotechnology. The risks involved may be called 'environmental', but in most cases public health seems equally at stake. At the heart of the 'new risk' issues are uncertainties about problem boundaries, the sources of risk, dose-effect relationships, risk-reduction options and their costs, and the seriousness of possible consequences. The simple fact that different stakeholders are involved underlies the socio-political controversy of such problems.

In view of various dimensions of risk,³⁰ we may summarily conclude that problematic 'new risks' are characterised by complexity, spatial and temporal extent, potential catastrophality, improbability, diverse uncertainties, plurality of perspectives, and learning-with-time.³¹ Such

³⁰ See U. Beck, 'The terrorist threat: world risk society revisited' (2002) 19 *Theory, Culture and Society* 39; see also D. Matten, 'The impact of the risk society thesis on environmental politics and management in a globalizing economy – principles, proficiency, perspectives' (2004) 7 *Journal of Risk Research* 377; A. Klinke and O. Renn, 'A new approach to risk evaluation and management: risk-based, precaution-based, and discourse-based strategies' (2002) 22 *Risk Analysis* 1071; T. Page, 'A generic view of toxic chemicals and similar risks' (1978) 7 *Ecological Law Quarterly* 207; RIVM (National Institute for Public Health and Environmental Protection), *Zorgen voor Morgen; Nationale Milieuverkenning 1990-2005* (Concern for Tomorrow; National Environmental Outlook 1990-2005) (Bilthoven, Alphen a/d Rijn: Samson Tjeenk Willink 1988); P. Slovic, B. Fischhoff and S. Lichtenstein, 'Facts and fears: understanding perceived risk' in R.C. Schwing and E. Albers Jr. (eds.), *Societal risk assessment: how safe is safe enough?* (New York: Plenum 1980); Ch. Vlek and G.B. Keren, 'Behavioral decision theory and environmental risk management: assessment and resolution of four 'survival' dilemmas' (1992) 80 *Acta Psychologica* 249.

³¹ Klinke and Renn's distinction among simple, complex, uncertain and (sociopolitically) ambiguous risk problems indicates some important aspects of the

general characteristics may be supplemented with more specific features like the more or less gradual development of risk (as in atmospheric pollution), the relative modesty of expected benefits (as in food supplements?), either social ('diffuse') or individual ('point') sources of risk, and the costs of reversing or compensating for eventual harm or damage.

Table 1 gives a condensed categorisation of different types of uncertain-risk situations, showing one specific example per cell. The 'short-term, local criminal' problem of a railway bomb alarm is decision-analysed in Section 4.4.4.

Table 1 Condensed categorisation of uncertain-risk situations.

Focus of risk ↓		Natural	Human-caused		
			Criminal action ¹⁾	Point source	Diffuse sources
Short-term	Local	Avalanche	Railway bomb-alarm	LPG/LNG BLEVE ²⁾	Electr. power blackout
	Extensive	Heavy storm	Football hooliganism	Oil tanker crash	BSE crisis (1996-)
Long-term	Local	Volcanic eruption	WTC attack '9/11'	Nuclear waste	Urban air pollution
	Extensive	Sequake tsunami	Genocide (WW-II, Ruanda, Darfur)	Bhopal MIC ³⁾ Gas release (1984)	GMO-technology

¹⁾ Here, the point versus diffuse sources distinction is not made explicit.

²⁾ BLEVE = Boiling Liquid Expanding Vapour Explosion.

³⁾ MIC= methylisocyanate.

2.1 Criticisms of probabilistic risk assessment and management

Already in the early days of probabilistic risk analysis (PRA), uncertainty about probabilities and about possible consequences was a major source of doubt with regard to PRA's potential as a basis for responsible risk

'new risks'. Klinke and Renn, above n. 30. However, it would seem that ambiguity often flows from uncertainty, which itself flows from complexity, and there are other important aspects as well.

assessment and management; see, for instance, Lewis'³² critique of the reactor-safety study Wash-1400.³³ In view of the many time-honoured criticisms (see references below), we may generally conclude that: (a) a formal concept of risk and the notion of model rationality properly apply only to reasonably well-defined risk problems; (b) probabilistic risk analysis has always had to grapple with assessment uncertainties; (c) the social dynamics of safety management (in design, decision, and control) are hard to model predictively a priori; and (d) often different scientific and social perspectives on risk assessment and management may be equally valid.

On the one hand, in response to these criticisms since the 'formal-quantitative' 1970s, practical risk assessment and management have come a long way to gaining a grip on, and certainly acquiring more understanding of, the kind of uncertain-risk problems for which the PP is being advanced.³⁴ On the other hand, the PP debate has gradually become more sensitive to issues like credibility of evidence, cost-benefit balancing, and risk-risk trade-offs.³⁵ Such a rapprochement between risk-analytic and precautionary-principled thinking meets with Majone's (2002) critique that uncertainty about possible harm or damage is a continuous and not a dichotomous variable.³⁶

³² See H.W. Lewis and others, *Risk assessment review group report to the the U.S. Nuclear Regulatory Commission*, Report no. NUREG/CR-0400 (Washington D.C., September 1978).

³³ Wash-1400, *Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants* (Washington D.C.: U.S. Nuclear Regulatory Commission 1975).

³⁴ IRGC, *White Paper on Risk Governance. Towards an Integrative Approach* (Geneva: International Risk Governance Council 2005) available at <www.irgc.org>; H. Otway and M. Peltu (eds.), *Regulating industrial risks. Science, hazards and public protection* (London: Butterworths 1985); Presidential-Congressional Commission, 1997; Royal Society, *Risk: Analysis, Perception and Management. Report of a Royal Society Study Group* (London: The Royal Society 1992); P.C. Stern and H.V. Fineberg (eds.), *Understanding risk; informing decisions in a democratic society* (Washington D.C.: National Academy Press 1996); G.M. Gray, 'The precautionary principle in practice: comparing US-EPA and WHO pesticide risk assessments' *Risk in Perspective* (2004) 12 *Newsletter of the Harvard Center for Risk Analysis*, available at <www.hcra.edu>.

³⁵ Cf. J.D. Graham, 'Decision-analytic refinements of the precautionary principle' (2001) 4 *Journal of Risk Research* 127; J. Scott and E. Vos, 'The juridification of uncertainty: observations on the ambivalence of the Precautionary Principle within the EU and the WTO' in C. Joerges and R. Dehousse (eds.), *Good Governance in Europe's Integrated Market* (Oxford: Oxford University Press 2002) at 253; Stern and Wiener, above n. 6; E. Stokes, 'The EC courts' contribution to refining the parameters of precaution' (2008) 11 *Journal of Risk Research* 491.

³⁶ Majone, above n. 25, at 104.

3 Definitions of the Precautionary Principle

As a principle – ‘a comprehensive and fundamental law or doctrine, or a rule or code of conduct’ – the PP has been formulated in various ways.³⁷ From the many definitions proposed, Table 2 gives four illustrative examples.

Table 2 Specimen definitions of the Precautionary Principle.

	Strong	Weak
Narrow	Wingspread (1998): ‘ <i>When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. ... the proponent of an activity ... should bear the burden of proof</i> ’. ³⁸	UNCED (1992), Rio-Declaration, Principle 15: ‘ <i>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</i> ’. ³⁹
Broad	Unesco-COMEST (2005): ‘ <i>When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. ... Morally unacceptable harm is The judgment of plausibility should be grounded in scientific analysis. ... Actions should be ... proportional to the seriousness of the potential harm, with consideration of their positive and negative consequences. ... The choice of action should be the result of a participatory process</i> ’. ⁴⁰	Graham’s (2001) extension of UNCED (1992): ‘ <i>Prior to enacting precautionary measures, decision makers should consider any potential benefits of unintended exposures, any potential risks of precautionary actions, and the promise of targeted investments in scientific research as a precautionary strategy. ... other refinements ... include formal measurement of citizen preferences about societal risk aversion and temporal preferences, concerns raised by Page⁴¹ more than 20 years ago</i> ’. ⁴²

³⁷ Following <www.merriam-webster.com/dictionary>. See also A. Trouwborst, ‘The precautionary principle in general international law: combating the Babylonian confusion’ (2007) 16 *Review of European Community and International Environmental Law* 185.

³⁸ ‘Wingspread Statement on the Precautionary Principle’ (1998) 586 *Rachel’s Environment and Health Weekly*.

³⁹ UNCED, above n. 8. Rio-Declaration, Principle 15.

⁴⁰ Unesco-COMEST, World Commission on the Ethics of Scientific Knowledge and Technology, *The Precautionary Principle* (Paris: United Nations Educational, Scientific and Cultural Organization 2005).

⁴¹ T. Page, ‘A generic view of toxic chemicals and similar risks’ (1978) 7 *Ecological Law Quarterly* 207.

⁴² Graham’s extension of UNCED, above n. 8; Graham, above n. 35.

Strong, ‘obligatory’ versions of the PP such as UN General Assembly,⁴³ Wingspread⁴⁴ and Unesco-COMEST,⁴⁵ may be distinguished from weak, ‘optional’ versions such as UNCED,⁴⁶ EC,⁴⁷ and Graham.⁴⁸ There is also a significant variation in the scope of precaution. Somewhat compact but open statements are those made by UNCED⁴⁹ and Resnik.⁵⁰ In contrast, comprehensive formulations have been proposed by Graham,⁵¹ Unesco-COMEST,⁵² Kourilsky and Viney,⁵³ and Martuzzi.⁵⁴ Wide-scope versions of the PP are explicit about such things as risk comparisons, cost-benefit analysis, and participatory decision-making. All versions of the PP provoke questions about substantive and procedural methodology: How could this ‘principle’ be clearly elaborated and practically applied?

After reviewing the many different proposals, one may conclude that, for a comprehensive circumscription of the PP, ten key issues are important, as listed in Table 3.

Table 3 Ten key issues for a precautionary-principled approach to uncertain risks.

-
1. General inclination and motivation (‘Why precaution?’)
 2. Nature and seriousness of potential harm (e.g. ‘Worst case?’)
 3. Plausibility of possible harm or damage
 4. Precautionary decision-making: balancing over- vs under-protection
 5. Precautionary safety actions (‘What could we do, provisionally?’)
 6. Optional versus obligatory precaution
 7. Who carries the burden of proof of risk or safety?
 8. Further research and policy development
 9. Multiparty communication and deliberation
 10. Distribution of responsibilities (‘Who should do what, and when?’)
-

⁴³ United Nations General Assembly, *World Charter for Nature* UN GA/RES/37/7 (New York, 28 October, 1982).

⁴⁴ Wingspread, above n. 39.

⁴⁵ Unesco-COMEST, above n. 40.

⁴⁶ UNCED, above n. 8.

⁴⁷ EC (2000), (2001), above n. 9.

⁴⁸ Graham, above n. 35.

⁴⁹ UNCED, above n. 8.

⁵⁰ D.B. Resnik, ‘Is the precautionary principle unscientific?’ (2003) 34 *Studies in the History and Philosophy of Biological and Biomedical Sciences* 329.

⁵¹ Graham, above n. 35.

⁵² Unesco-COMEST, above n. 41.

⁵³ Ph. Kourilsky and G. Viney, above n. 29.

⁵⁴ Martuzzi, above n. 17.

The ten issues form the basis of a precautionary approach comprising both substantive and procedural elements. Key issues 1-5 are explained in Section 4; issues 6-10 are discussed in Section 5.

3.1 An integrative circumscription of the Precautionary Principle

In view of the definitions represented in Table 2 and the key issues listed in Table 3, a general circumscription of the PP may be given as in Box 1.⁵⁵

Box 1 Integrative circumscription of the Precautionary Principle

The Precautionary Principle applies when people (one or more persons, a group, organisation, society) are confronted with a situation of serious uncertain risk or threat.

It involves:

- an analysis and evaluation of credible worst-case scenarios;
- the making of epistemic judgments on the basis of incomplete evidence;
- the inclination to take a cautious or ‘pessimistic’ decision about a provisional course of action;
- a careful evaluation of expected costs, risks, and benefits of the target activity and its feasible alternatives;
- and the timely selection and implementation of ‘reasonable’ precautionary (i.e. early-safety) measures.

Whereby:

- the proponent of the relevant activity has a special responsibility in demonstrating the likelihood of safety;
- further research is undertaken to reduce uncertainties;
- risk management decisions can be revised when new information becomes available, and
- the entire process of assessment, decision, and control is the subject of open communication and an information exchange among relevant stakeholders;
- supervision and coordination is undertaken by an appropriate independent authority.

The upper five items in Box 1 cover ‘assessment, decision, and control’, and they largely indicate what the PP substantively involves. These

⁵⁵ The items in Box 1 do, of course, reflect but are not fully parallel to the issues in Table 2.

five apply to small-scale individual situations, such as undertaking a mountain cycling trip on a rainy day, as well as to large-scale collective situations, such as the international spread of avian influenza.⁵⁶ The lower five items in Box 1 are largely procedural; in principle, they may also apply to small-scale activities, but typically they apply to societal risk situations in which responsible risk managers must eventually make decisions that can be well understood by all parties concerned.

The precautionary heart of the principle is its ‘pessimistic’ or unusually protective inclination towards foregoing an activity or imposing strict(er) safety measures upon it, both of which are induced by the great uncertainty about possible disastrous consequences. The difference between weak and strong precaution (cf. Table 2) lies mainly in the greater emphasis on risk avoidance, ‘proving’ safety and the obligation to take safety measures, that characterises strong precaution.⁵⁷

In comparison to probabilistic risk analysis, Box 1 contains three distinctive elements: (i) the uncertain inclination of ‘pessimism’, (ii) the proponent’s larger burden of demonstrating the likelihood of safety, and (iii) a tendency to delay risk-taking until sufficient new information becomes available. A fourth distinctive element – multiparty deliberation – might be added, but this has already been recommended for quite some time, since the development of risk analysis (cf. Section 2).

4 A precautionary-principled approach to uncertain-risk problems

In this section, the practical meaning and application of the PP is elaborated in terms of substantive key issues 1-5 in Table 3, whose labels will reappear as subheadings below. This labelling also offers the opportunity of a systematic response to major criticisms of the PP, as summarised in Section 1.

4.1 General inclination and motivation

A basic proposition inherent to the PP is that more caution is justified when there is greater uncertainty about possible negative consequences and/or

⁵⁶ In principle, the substantive meaning of precaution (upper five items in Box 1) also applies to animal behaviour: for example, in the case of a hungry fox warily foregoing the tempting bait in a trap.

⁵⁷ M. Basili and M. Franzini, ‘Understanding the risk of an avian flu epidemic: rational waiting or precautionary failure?’ (2006) 26 *Risk Analysis* 617; P. Gardiner, ‘A core precautionary principle’ (2006) 14 *The Journal of Political Philosophy* 33; J. Hughes, ‘How not to criticize the precautionary principle’ (2006) 31 *Journal of Medicine and Philosophy* 447.

about the seriousness of those consequences. Another proposition is that any risk problem always implies at least two choice alternatives: go/do not go, accept/reject, or permit/restrict. Also, there are at least two ‘states of nature’: there is a serious threat or there is not. This elicits two possible basic decision errors: (1) a false positive, when you take costly precautions while there actually is no threat, and (2) a false negative, when you neglect real danger. The gravity of these two errors is relative to the corresponding benefits of deciding ‘correctly’: being costly cautious when there is a threat, and being profitably careless when there is none.

A further point is that a precautionary decision often is provisional; a revised choice can be made when new information becomes available. When one knows more about the possible consequences of a target course of action, about their manageability by further safety measures, and/or about feasible alternatives, then the initial cautious decision may be revised, and the original goal(s) may be achieved in a safer way. Thus there are in fact not two but three basic decision options: do, do not do, or defer (see Section 4.4.4).

The fundamental problem, not of the PP but of uncertain-risk situations, is the great uncertainty about the possibility of serious harm. This may lead one to call it a normative principle, but only if one does not accept the rationality of temporarily shrinking back from a course of action that *might* lead into disaster.⁵⁸

4.2 Nature and seriousness of potential harm

What is a ‘serious threat’ that could initially trigger and later justify precaution? It must be something that could thoroughly disrupt a person’s, life, harming its positive development, bringing about long-term trauma, and causing very high costs of recovery, reversal, or compensation. Or, at the societal level, a serious threat might cause severe social disruption, environmental damage, and political shock, which would take many years, numerous debates, and considerable funds to overcome. In view of these considerations, the notion of serious harm may be assessed in terms of the criteria assembled in Box 2; these link up with basic results from risk-perception research.

⁵⁸ See Bergkamp, above n. 21; Peterson, above n. 27; WRR, Wetenschappelijke Raad voor het Regeringsbeleid (Scientific Council for Government Policy), *Naar nieuwe wegen in het milieubeleid* [Towards new ways in environmental policy-making] WRR-rapport no. 67 (Den Haag: SDU Uitgevers 2003).

Box 2 Criteria for assessing the seriousness of possible harm

- Degree of harm or fatality for human, animal, and/or plant life;
- Degree of material, economic damage;
- Extent of social damage (number of people involved);
- Extent of environmental damage (animals/plants, ecosystems involved);
- Timing, duration, and/or persistence of harm;
- Costs of restoring, reversing, or recovering from the damage;
- Causation of significant social inequities in quality of life;
- Causation of significant intergenerational inequities.

Psychologically, a focus on possible worst cases or potential catastrophality is more obvious the greater the uncertainty about its actual, often very unlikely, occurrence.⁵⁹ This ‘probability neglect’ may be enhanced by the emotions surrounding images of disaster.⁶⁰ Godard’s⁶¹ warning about radical ‘catastrophism’ lines up with Starr’s,⁶² who ascribes present-day ‘hypothetical fears’ (e.g. of global warming, irradiated foods, and GMOs) as arising from a primitive instinct to suspect the unknown, which leads to the PP – seen by Starr – as a barrier to an adaptive future.⁶³ Thus, under great uncertainty, worst-case analysis may be inevitable, but ‘worst-case thinking’ may be a tricky affair, which should be guarded from improper influences and considerations, such as special interests, exaggerated fears, and unreasonable assumptions. In cases of catastrophic potential, however, there is a high burden of proving their impossibility.⁶⁴

⁵⁹ Slovic, Fischhoff and Lichtenstein, above n. 30; Ch. Vlek and P.J. Stallen, ‘Judging risks and benefits in the small and in the large’ (1981) 28 *Organizational Behavior and Human Performance* 235.

⁶⁰ C.S. Sunstein, ‘Terrorism and probability neglect’ (2003a) 26 *Journal of Risk and Uncertainty* 121.

⁶¹ O. Godard, ‘The precautionary principle and catastrophism on tenterhooks: lessons from constitutional reform in France’ in E. Fisher, J. Jones and R. von Schomberg (eds.), *The Precautionary Principle and Public Policy Decision Making* (London: Edward Elgar 2006) at 63.

⁶² Ch. Starr, ‘Hypothetical fears and quantitative risk analysis (2001) 21 *Risk Analysis* 803.

⁶³ Starr, above n. 63, and others, e.g., R. Pieterman, ‘Culture in the risk society. An essay on the rise of a precautionary culture’ (2001) 22 *Zeitschrift für Rechtssoziologie* 145.

⁶⁴ ‘Serious harm’ may not only pertain to false-negative consequences (neglecting real danger), since false-positive decisions (taking needless precautions) may also

4.3 Plausibility of possible harm or damage

Uncertainty is the taproot of precaution. If one worries about a serious uncertain threat, a key judgment about the plausibility of possible grave harm or damage is needed for a take-risk versus enhance-safety decision. Here, the PP may function as an *assessment principle*.

Uncertainty is a multifactorial concept. In a reasonably complex decision problem there may be uncertainty about one's assessment of the status quo, one's options and their feasibility, the likelihood of conditioning events, relevant cause-effect relationships, the nature of possible consequences and their valuation, and – after a choice to defer the decision – the utility of new information to be collected before reconsidering the decision. A great deal of the uncertainty-justifying precaution is due to the time lag between cause and effect; when the latter manifests it may be too late to reduce or eliminate its cause.⁶⁵

4.3.1 Different kinds of uncertainty

Focused uncertainty about serious risks may have various sources. Following EC:

Scientific uncertainty results usually from five characteristics of the scientific method: the variable chosen, the measurements made, the samples drawn, the models used and the causal relationship employed. Scientific uncertainty may also arise from a controversy on existing data or lack of some relevant data. Uncertainty may relate to qualitative or quantitative elements of the analysis.⁶⁶

Internationally, several other taxonomies have been proposed.⁶⁷ From these

have rather bad consequences to which several of the above-listed criteria may apply.

⁶⁵ F. Ewald, 'The return of Descartes's malicious demon: An outline of a philosophy of precaution' in T. Baker and J. Simon (eds.), *Embracing Risk: The Changing Culture of Insurance and Responsibility* (Chicago: University of Chicago Press 2002) at 273; E.D. Richter and R. Laster, 'The precautionary principle, epidemiology and the ethics of delay' (2005) 11 *Human and Ecological Risk Assessment* 17.

⁶⁶ EC (2000), above n. 9, at 14.

⁶⁷ J. Lemons, K. Shrader-Frechette and C. Cranor, 'The precautionary principle: scientific uncertainty and Type I and Type II errors' (1997) 2 *Foundations of Science* 207; M.E. Paté-Cornell, 'Uncertainties in risk analysis: six levels of treatment' (1996) 54 *Reliability Engineering and Systems Safety* 95; M. Regan, M. Colyvan and M.A. Burgman, 'A taxonomy and treatment of uncertainty for ecology and conservation biology' (2002) 12 *Ecological Applications* 618; C. Tannert, H.-D. Elvers and B. Jandrig, 'The ethics of uncertainty' (2007) 8 *EMBO Reports*,

we may identify four basic questions about uncertainties and their possible reduction:

1. How adequate are the concepts, model, method, variables, and sample and data analysis used?
2. How complex and/or variable (and thus: how unpredictable) is the process, object, or system we wish to understand?
3. What and how much could in principle be known about the subject matter of interest?
4. What values and/or weights should be attached to possible decision consequences and/or options?

Question 1 may get higher-quality answers via *better* research. Question 2 is about inherent limited predictability which, in principle, no further research could improve. Question 3 in fact demands *more* innovative and pioneering research. Question 4 may reveal personal or organisational value diversity. The latter may be approached via social-deliberative procedures for judgment and decision-making, under the presumption that this may yield sufficient understanding and/or consensus for relevant decisions (see further Section 5).

4.3.2 Judging the plausibility of serious harm

To prevent unfounded presuppositions, assumptions, and imaginings from playing a significant role in precautionary policies, epistemic criteria are needed to judge the plausibility of possible serious effects, in the shorter and the longer term, of target activities or developments.

More than 40 years ago, Hill considered a set of criteria for inferring a causal relationship from an observed association between phenomena A (e.g. an environmental condition) and B (e.g. a health condition),⁶⁸ as summarised in the left column of Table 4.⁶⁹ The right column lists six criteria for judging the plausibility of a hypothesis (e.g. about a serious threat) as proposed by Resnik.⁷⁰

European Molecular Biology Organization 892; M.B.A. van Asselt, *Perspectives on Uncertainty and Risk* (Dordrecht: Kluwer 2000).

⁶⁸ A.B. Hill, 'The environment and disease: association or causation?' *Proceedings of the Royal Society of Medicine, Section of Occupational Medicine*, Meeting of January 14, 1965 (London: Royal Society of Medicine 1965) at 295.

⁶⁹ Hill nicely quotes the famous detective Sherlock Holmes as having said: 'When you have eliminated the impossible, whatever remains, *however improbable*, must be the truth.' (Hill's italics); Hill, above n. 69, at 298.

⁷⁰ Resnik, above n. 51.

Table 4 Hill's and Resnik's criteria for judging plausibility of causality

Hill's criteria for causality judgment	Resnik's epistemic criteria for plausibility
<ol style="list-style-type: none"> 1. *Strength of association 2. *Consistency of association 3. Specificity of association 4. Temporality of association 5. *Biological gradient of association (dose-response curve) 6. *Plausibility of association (after elimination of the impossible) 7. Coherence of causal interpretation with known facts 8. Experimental test of causality 9. Analogy of association with other, known cause-effect relationships 	<ol style="list-style-type: none"> 1. Coherence (consistency of background knowledge and theories) 2. Explanatory power 3. Analogy (to similar, well-understood mechanisms and processes) 4. Precedence (similar to previously observed events) 5. Precision (the hypothesis should be reasonably precise) 6. Simplicity (the hypothesis should be parsimonious)

Note: *Asterisked Hill-criteria are most often used by practitioners, following Weed.⁷¹

These and similar sets of criteria hold the message that, under major uncertainty, the plausibility of a hypothesis about a causal relationship – or of finding an alternative course of action, or of discovering hitherto unknown possible consequences, for that matter – always is a tentative, fumble-and-grope affair. It is a scientist's 'best bet', whereby one may eventually turn out to be right or wrong, since nature ultimately determines the actual outcome.⁷²

4.3.3 Evidence scales and standards of proof

The extent to which a given phenomenon (often a cause-effect relationship) occurs may be expressed as a greater or lesser probability or plausibility. We should remember that probability is a mathematical concept ranging from 0: impossibility, to 1: necessity of occurrence. Probability measures should

⁷¹ D.L. Weed, 'Precaution, prevention, and public health ethics' (2004) 29 *Journal of Medicine and Philosophy* 313.

⁷² Extreme uncertainty, of course, comes close to total ignorance, whereby the English proverb may apply: 'Where nought's to be got, kings lose their scot.'

fulfil a limited set of measurement axioms: for example, that the probabilities of an exhaustive set of mutually exclusive events should amount to 1.

In contrast, or rather, in supplement to, the notion of plausibility reflects a combination of possibility ('cannot be excluded') and a vague but a priori low likelihood ('worth looking into'). Traditionally, scientists don't like 'plausibility reasoning',⁷³ and it has been argued that the controversial PP derives from the limitations of scientific knowledge.⁷⁴

Scales covering various degrees of evidence and their implication for decision-making have been assembled by IARC,⁷⁵ Weiss⁷⁶ and Wiedemann, Mertens, and others.⁷⁷ After a careful comparison of legal, scientific, and Bayesian-statistical levels of uncertainty, Weiss proposes the ten-point 'subjective scale of scientific certainty' as summarised in Table 5;⁷⁸ the final column indicates the corresponding evidentiary qualifications of the Intergovernmental Panel on Climate Change (IPCC) in its Fourth Assessment Report.⁷⁹

⁷³ J.S. Gray, 'Statistics and the precautionary principle' (1990) 21 *Marine Pollution Bulletin* 174; M. Iaccarino, 'A cost/benefit analysis. About the Precautionary Principle' (2000) 1 *EMBO Reports, European Molecular Biology Organization* 454; Peterson, above n. 27; E. Soule, 'The precautionary principle and the regulation of U.S. food and drug safety' (2004) 29 *Journal of Medicine and Philosophy* 333.

⁷⁴ J. Van der Sluijs, 'Uncertainty and precaution in environmental management: Insights from the UPEM conference' (2007) 22 *Environmental Modelling and Software* 590.

⁷⁵ IARC, International Agency for Research on Cancer. *IARC monographs on the evaluation of carcinogenic risks to humans, Preamble* (Lyon: World Health Organization-IARC 2006) available at: <<http://monographs.iarc.fr/eng/preamble/currentpreamble.pdf>>.

⁷⁶ Ch. Weiss, 'Expressing scientific uncertainty' (2003) 2 *Law, Probability and Risk* 25; Ch. Weiss, above n. 29.

⁷⁷ P.M. Wiedemann and others, *Risikopotenziale elektromagnetischer Felder: Bewertungsansätze und Vorsorgeoptionen*, Endbericht für das Bayerische Staatsministerium für Landesentwicklung und Umweltfragen. (Jülich: Forschungszentrum Jülich, Programmgruppe Mensch, Umwelt, Technik 2001).

⁷⁸ Weiss (2003), above n. 77, Tables 2 and 3.

⁷⁹ IPCC, '*IPCC Fourth Assessment Report: Climate Change 2007*' (Synthesis Report and Working Group I-III Summaries and Reports). Geneva (CH): Intergovernmental Panel on Climate Change, <www.ipcc.ch>.

Table 5 Adapted (un)certainty scale as proposed by Weiss,⁸⁰ with IPCC-2007 column⁸¹ added

Level	Legal standard of proof	Scientific qualification	Bayesian Probability	IPCC-scale of likelihood 2007
10.	Beyond any doubt	Experimentally broadly validated theory	100%	(None)
9.	Beyond a reasonable doubt	Rigorously proven	> 99%	Virtually certain
8.	Clear and convincing evidence	Substantially proven, reasonably certain	> 95%	Extremely likely
			> 90%	Very likely
7.	Clear showing	Very probable	80-90%	Likely
6.	Substantial and credible evidence	Probable, not fully Proven	67-80%	
5.	Preponderance of the evidence	More likely than not to be true	50-67%	> 50%: more likely than not; 33-67%: about as likely as not
4.	Clear indication	Attractive but unproven	33-50%	
3.	Probable cause, reasonable grounds for belief	Plausible hypothesis	10-33%	Unlikely
2.	Reasonable, articulable grounds for suspicion	Possible, worth investigating	5-10%	Very unlikely
			1-5%	Extremely unlikely
1.	No reasonable grounds for suspicion	Unlikely, but not excludable	< 1%	Exceptionally unlikely
0.	Impossible	Against known laws of science	0%	(None)

⁸⁰ Weiss, above n. 77.

⁸¹ IPCC (2007), above n. 80.

From a Bayesian decision-theoretic point of view, a given level of certainty/uncertainty or probability in Table 5 could be used in a formal policy ‘gamble’. One might, for example, invest more or less public money in developing a mitigation and/or adaptation strategy for climate change, the more or less certain one is about the human causes of and solutions to problems of climate change.

4.3.4 ‘Sufficient evidence’ for diagnostic judgments

How much evidence is needed, or how much uncertainty may remain before one embarks upon a precautionary strategy? Here, it should be realised that empirical scientific conclusions (e.g. about a chemical being carcinogenic, or an animal population being at risk) may, perhaps improbably, be wrong in two ways: they may be falsely positive or falsely negative. Thus, the implicit value question for the scientist is: What is worse? Stating that a risk is present when it actually is not (a false positive or Type I error), or declaring that there is no risk when there actually is one (false negative or Type II error)? The basic proposition here is that in a diagnostic choice (or ‘epistemic decision’) between alternative hypotheses – risk’ versus ‘no risk’ – the relative seriousness of a false positive versus a false negative plays a crucial role.⁸² Or, to quote Rudner: ‘How sure we need to be before we accept a hypothesis will depend on how serious a mistake would be’.⁸³

A formal analysis of diagnostic judgment may well follow signal detection theory (SDT), a well-established methodology for separating an observer’s discriminative capacity from his/her ‘response bias’.⁸⁴ According to SDT, the useful thing for scientists to do is to show how the probability of a true positive (i.e. 1 minus the probability of a false negative) is related to the probability of a false positive (i.e. 1 minus the probability of a true negative) when the evidentiary requirement is gradually relaxed (cf. Table 5). Note that the probability of a true positive reflects the *sensitivity* of the diagnostic test (which may just be an expert’s decisive judgment), while the probability of a true negative reflects the test’s *specificity*.

Obviously, when the evidentiary criterion is weakened, the probability of a true positive (and thus the test sensitivity) increases, but so

⁸² Resnik, above n. 51.

⁸³ R. Rudner, ‘The scientist *qua* scientist makes value judgments’ (1953) 20 *Philosophy of Science* 1 at 2.

⁸⁴ J.A. Swets, W.P. Tanner and T.G. Birdsall, ‘Decision processes in perception’ (1961) 68 *Psychological Review* 301; J.A. Swets, R.M. Dawes and J. Monahan, ‘Psychological science can improve diagnostic decisions’ (2000) 1 *Psychological Science in the Public Interest* 1; see also S.E. Hradey and W. Leiss, ‘Risk management and precaution: Insights on the cautious use of evidence’ (2003) 111 *Environmental Health Perspectives* 1577.

does the probability of a false positive. However, for a powerful diagnostic test (or expert judgment), the probability of a true positive, $p(\text{TP})$, increases much faster than does the probability of a false positive, $p(\text{FP})$; for a weak test or judgment, $p(\text{TP})$ increases only moderately with a weakening criterion. In the limiting case, where the 'risk' and 'no risk' hypotheses cannot be empirically discriminated at all, there is an equal rate of change for both probabilities when the evidentiary criterion varies.

The primary message from SDT is that there is no single absolute threshold level ('sufficient evidence' or 'standard of proof') for making sensory and/or cognitive judgments about physical signals (e.g. a warning sound) or more complex states of the world (e.g. serious risk), because some kind of response bias grounded in the relative seriousness of judgmental mistakes always plays a role, the more so the greater the uncertainty (the 'noise') about the available evidence.

Thus, the scientist attempting to offer useful information about an uncertain risk might deliver three things: (i) his/her best estimate of the probability that the risk hypothesis is true relative to some null hypothesis, (ii) a specification of the relationship between the true-positive probability and the false-positive probability as the evidentiary requirement varies from strong to weak, and (iii) a demonstration of his/her willingness to virtually bet on the true outcome, given certain negative utilities attached to a false-positive (Type I error) and a false-negative (Type II error) diagnosis. These utilities in fact are or should be decision-maker values that do not seem to belong to the realm of science.⁸⁵

4.4 Precautionary decision-making: balancing over- versus under-protection

Deciding whether to undertake precautionary action is the centre piece of any approach towards uncertain-risk situations. Given that we know reasonably well how to avoid or diminish the relevant uncertain risk (see Section 4.5 about safety actions), key questions here are: How could decisions about uncertain-risk management best be taken? How rational could they be? Who should prepare and/or take such decisions? These issues have attracted considerable attention from theoretical economists, decision theorists, and risk analysts, who all seem to acknowledge that uncertainty itself holds limitations for rational problem solving. A concrete example is elaborated in Section 4.4.3.

⁸⁵ Grandjean emphasises that scientists and policy-makers naturally differ in their desire to avoid false positives and false negatives, respectively, Grandjean and others, above n. 14.

4.4.1 Limitations of rational decision-making

Decision theory is meant to be a rational framework for individual (or single-agent) decision-making in reasonably well-defined situations.⁸⁶

'Rational' here means that:

- the decision-maker obeys certain axioms such as the dominance principle, transitivity of preferences, and consistency of probability estimation;
- relevant choice alternatives, critical uncertain events, and possible consequences are eventually known so that the problem structure is 'closed';
- the decision-maker can assign probabilities (however vague) to uncertain event-outcomes;
- he/she can attach goal-consistent (possibly vague) utility values to possible consequences;
- his/her goal is to maximise the expected utility of an action's possible consequences.

In ill-defined decision situations, one or more of the above conditions often can be fulfilled only with difficulty or not at all. This natural limitation has led to the formulation of different decision rules. Moreover, in multiple-stakeholder problems, the rationality of multiparty decision-making is limited by the interpersonal incomparability of individual utilities. As a result, individual preference orders of alternative courses of action cannot easily be aggregated into a single social preference order free of circularities and/or intransitivities.⁸⁷

Hence, rational decision analysis of uncertain-risk situations may be a useful but inherently limited tool for disciplining one's thoughts and feelings about problem structuring, option evaluation, and the preferential ordering of choice alternatives. The surrounding context of the analysis proper may comprise persistent uncertainties, sheer ignorance about long-term developments, stakeholder differences in judgments and preferences, and difficulties in communication between experts, policy-makers and judicial authorities. The contextual complexities of intentionally rational decision-making are clearly illustrated in the precautionary case studies

⁸⁶ D.V. Lindley, *Making decisions* (London, New York: Wiley 1985 2nd ed.); R.D. Luce and H. Raiffa, *Games and decisions* (New York: Wiley 1957).

⁸⁷ K.J. Arrow, *Social choice and individual values* (New York: Wiley 1963/1951); D.H. Blair and R.A. Pollak, 'Rational collective choice' (1983) 249 *Scientific American* 76; T. Bezembinder, 'Social choice theory and practice' in C. Vlek and G. Cvetkovich (eds.), *Social decision methodology for technological projects* (Dordrecht: Kluwer Academic Publishers 1989) at 15.

reported by Forrester and Hanekamp,⁸⁸ Stern and Wiener,⁸⁹ and Van Asselt and Vos.⁹⁰

4.4.2 Decision rules for uncertain-risk taking

As a *decision principle*, the PP is often related to the maximin utility (or payoff) criterion for decision-making under total uncertainty about which state of the world would obtain after a choice has been made. Under the ‘bad-luck’ assumption that each alternative action would yield the least favourable consequence, one may best choose the alternative having the least-bad consequence (*maximum minimorum*). Maximin, however, is only one of various rules for decision-making under uncertainty. Other rules are maximax, minimax regret, and the principle of insufficient reason.⁹¹

Next to these, weighted combinations of maximax and maximin, or of maximax/maximin and expected utility, have been proposed for uncertain-risk situations characterised by extreme possible consequences.⁹² Various practical examples with numerical exercises might be given that would clearly reveal that different decision rules may lead to different optimal choices. This, however, would far exceed the scope of this paper.⁹³ Instead, the following conclusions are presented about precaution via formal decision rules.

1. For reasonably well-defined decision problems – with known options, states, and payoffs or utilities – under full uncertainty about which state of the world would obtain, there exist different formal decision rules that may lead to different optimal choices depending on what exactly one wishes to maximise or to minimise. Among these, ‘Maximin’ would reflect an indiscriminate belief in bad luck whatever one chooses.

⁸⁸ I. Forrester and J.C. Hanekamp, ‘Precaution, science and jurisprudence: a test case’ (2006) 9 *Journal of Risk Research* 297,

⁸⁹ Stern and Wiener, above n. 6.

⁹⁰ M.B.A. van Asselt and E. Vos, ‘The precautionary principle in times of intermingled uncertainty and risk: some regulatory complexities’ (2005) 52 *Water Science and Technology* 35.

⁹¹ See Luce and Raiffa, above n. 87.

⁹² M. Basili, ‘A rational decision rule with extreme events’ (2006) 26 *Risk Analysis* 1721; Basili and Franzini, above n. 58; C. Henry, ‘Decision-making under scientific, political and economic uncertainty’ (2006) *Working Paper Laboratoire d’Économetrie, École Polytechnique*, available at <economix.u-paris10.fr/pdf.sem_economix/2006-10-12.Henry.pdf>; D. Kelsey and J. Quiggin, ‘Theories of choice under uncertainty’ (1992) 6 *Journal of Economic Surveys* 133.

⁹³ Meanwhile, a more extensive review paper has been completed about different formal models and rules for decision-making under substantial uncertain risk (Ch. Vlek, ‘Judicious management of uncertain risks: II. Simple rules and more intricate models for precautionary decision-making’; 2009, submitted for publication).

Similarly, ‘Maximax’ would reflect an indiscriminate belief in good luck. Formally, such consequence-pessimism/optimism follows a weighted combination of the minimum and maximum possible consequence-utilities (or payoffs) per option, $\alpha\text{Min} + (1-\alpha)\text{Max}$, whereby $0 \leq \alpha \leq 1$ reflects the degree of *consequence-pessimism*.

2. Alternatively, partial uncertainty about future states of the world may be quantitatively expressed in a more or less *event-pessimistic probability distribution*. The latter may serve to compute the Expected Utility (EU) for each choice alternative, which EU may then be used as a maximisation criterion.⁹⁴ Obviously, a more event-pessimistic probability distribution would yield a lower EU value for options implying a lower utility when the relevant ‘negative’ event would occur.
3. To the extent that there is a lack of confidence in the probability distribution under consideration, decision-makers may attenuate the significance of the resulting EU (using a less-than-full-confidence parameter $0 \leq \beta \leq 1$) and assign relative greater (additional) weight $1-\beta$ to some combination of the plausible minimum and maximum consequences of each option.⁹⁵ The latter themselves may also be differentially weighted following a consequence-pessimism parameter $0 \leq \alpha \leq 1$, as above. This may be called the W(eighted)EU- $U_{\text{Min}}/U_{\text{Max}}$ decision rule. The parameter β would reflect the degree of *probability confidence*.
4. When more than one probability distribution over the possible uncertain-event outcomes is considered (e.g. as a result of different experts’ advice), the decision-maker may:
 - a. follow the ‘Maximin EU’ rule and choose the option for which the minimal EU over distributions is maximal across the set of choice alternatives (quite analogous to the pure maximin rule);
 - b. follow a γ -weighted combination of the minimum and maximum EU values per choice alternative and choose the option for which the Weighted-EU $_{\text{Min}}/EU_{\text{Max}}$ value is largest (quite analogous to the pure α -weighted Maximin/Maximax rule). The parameter γ would reflect the decision-maker’s degree of *ambiguity aversion*.
5. ‘Pessimism’ (or rather, fear or aversion) may also be expressed in an especially negative evaluation of the most undesirable plausible consequences, which optimists in turn may not interpret as

⁹⁴ Expected Utility simply is the sum of probability-weighted utilities of possible consequences. This is demonstrated in Section 4.4.3.

⁹⁵ Some (probability) weight of the utilities of extreme consequences is already implied in the EU formula.

catastrophically severe.⁹⁶ Such differences in evaluation may be attributable to variations in risk exposure, system knowledge, perceived controllability, and personal efficacy in risk management.

6. In general, the PP implies giving a high weight to the minimum possible or highest-negative utility, or expected utility, per choice alternative. As indicated above, the pessimism implied may have various reasons.
7. Finally, we should note that there is no logical reason to be either pessimistic or optimistic in situations where probability information about future states of the world is lacking. If one feels strongly attracted by the plausible highest-utility consequence for each option (i.e. one consistently believes in, or hopes for good luck), then maximax utility, or some maximax-EU criterion, would be the decision rule to apply. In contrast, when one is pessimistic and fears bad luck, maximin-utility or maximin-EU should be followed.

4.4.3 Minimal probability for an Avoid-Risk decision

A signal-detection analysis of diagnostic judgment (Section 4.3.4) is only one step away from a full expected-utility analysis of an important precautionary decision problem, as presented below. Let us adapt Rudner's statement slightly: 'How sure we need to be before we accept *an uncertain-risk course of action* [instead of 'a hypothesis'] will depend on how serious a mistake would be'.⁹⁷ This clearly means that the minimal probability of serious harm, however uncertain, should depend on the seriousness of a possible mistake when deciding in favour of a risk-avoiding versus a risk-taking action. To appreciate this, let us elaborate the example of a suspected suitcase left behind ('perhaps by a terrorist?') on a crowded Dutch passenger train, say, between Amsterdam and the Hague.⁹⁸ Table 6 shows fictitious utility values on a 0-100 ('worst-best') scale for the four possible consequences of the authorities deciding to temporarily stop or not to stop all rail transport on the Amsterdam-The Hague line, under the mutually exclusive hypotheses that the unguarded suitcase is either harmless (H_0) or dangerous (H_1).

Briefly, a utility scale covers personal or agency values assigned to possible decision consequences. These may be described initially in terms of 'objective' financial, material, and/or social benefits and/or costs. Utility may be directly judged on a one-dimensional interval scale with an arbitrary

⁹⁶ For example, the release of radioactive materials from a nuclear installation may be evaluated by an optimist as 'a serious but preventable accident', while a pessimist may characterise the same event as 'an alarming signal of potential catastrophe'.

⁹⁷ Rudner, above n. 84, at 2.

⁹⁸ Other examples from Table 1 could be analysed as well, but some cases would require a more complex decision model and extensive elaboration.

zero point and measurement unit (e.g. 0-10, 0-100, or from -10 to + 10). Alternatively, a multi-attribute utility model may be used, to determine for instance a weighted combination of utilities assessed on different independent attributes.⁹⁹

The four cells in Table 6 actually indicate complex consequence-situations having both short- and long-term effects of various kinds. Thus their comprehensive utility assessment may require a separate exercise. Here, final-aggregate utility values are used that should reasonably well indicate the relative attractiveness/unattractiveness of the four consequence situations. Note that, given the utility values, none of the two options is dominating (i.e. always at least as good as) the other.

Table 6 Fictitious utility values ($U_{..}$) on a 0-100 scale for possible consequences of a decision to to stop or not to stop all rail transport between Amsterdam and The Hague after the discovery of an unguarded suitcase on a train.

	H₀: suitcase is harmless	H₁: suitcase is dangerous
Take Risk: let rail transport continue	$U_{T0} = 100$ (TN)	$U_{T1} = 0$ (FN)
Avoid Risk: stop all rail transport	$U_{A0} = 60$ (FP)	$U_{A1} = 80$ (TP)

TN = true negative, FN = false negative; FP = false positive; TP = true positive.

Under a straightforward application of the maximin-utility rule (see above) the optimal choice here would be ‘Avoid Risk’, since its minimal utility value $U_{A0} = 60$ is much higher than the minimal value $U_{T1} = 0$ for ‘Take Risk’. Given that $U_{T0} = 100$ and $U_{T1} = 0$ are fixed as the measurement range and zero point of the interval utility scale, respectively, the mutual relations among the four utility values could only change via variations in U_{A0} en U_{A1} ; the relative focus of the evaluation thus lies in the possible consequences of ‘Avoid Risk’, whereby the problem-characteristic rank order $U_{T0} > U_{A1} > U_{A0} > U_{T1}$ (see Table 6) should be preserved. Thus, should somebody come up and say: ‘Okay, but an actual bomb explosion after a Take-Risk decision would be really disastrous and should therefore be valued even more negatively’, this might be expressed through decreasing the differences among U_{T0} , U_{A1} en U_{A0} . This could be done by setting $U_{A0} =$

⁹⁹ H. Raiffa, *Decision analysis. Introductory lectures on choices under uncertainty* (Reading: Addison-Wesley 1968); K.P. Yoon and C.-L. Hwang, *Multiple attribute decision making. An Introduction*. Series: Quantitative Applications in the Social Sciences, no. 07-104 (Thousand Oaks: Sage Publications 1995).

90 and $U_{A1} = 95$ (instead of 60 en 80).¹⁰⁰

Now, given the utility values in Table 6, suppose that one would start from the prior probabilities $p(H_0) = 0.80$ en $p(H_1) = 0.20$. Thus, the threat would be considerable, but the probability that the suitcase is harmless is four times larger. The ensuing expected utility (EU) values for the two choice alternatives would be:

$$\text{EU (Take Risk)} = 0.80 (100) + 0.20 (0) = 80 \text{ and}$$

$$\text{EU (Avoid Risk)} = 0.80 (60) + 0.20 (80) = 64.$$

By implication, 'Take Risk' appears more attractive than 'Avoid Risk', and rail transport between Amsterdam and The Hague may best be continued.

However, when the utility values of 'false-positive', U_{A0} , and 'true-positive', U_{A1} , come to lie much closer to the value of 'true-negative' ($U_{T0} = 100$), with $U_{A0} = 90$ en $U_{A1} = 95$ as proposed above (and whereby the threat would be evaluated as much worse), we would obtain:

$$\text{EU (Take Risk)} = 0.80 (100) + 0.20 (0) = 80 \text{ and}$$

$$\text{EU (Avoid Risk)} = 0.80 (90) + 0.20 (95) = 91,$$

whereby 'Avoid Risk' would be more attractive than 'Take Risk'. More generally and formally, the expected utility of the two options can be represented as:

$$\text{EU(Take Risk)} = p(H_0) \cdot U_{T0} + p(H_1) \cdot U_{T1} \text{ and}$$

$$\text{EU(Avoid Risk)} = p(H_0) \cdot U_{A0} + p(H_1) \cdot U_{A1}.$$

How large should the danger probability $p(H_1)$ minimally be in order to lead to a preference for 'Avoid Risk'? Consider that $p(H_1) = 1 - p(H_0)$ and let $p(H_1)$ be conveniently written simply as p . Thus,

$$\text{EU(Take Risk)} = (1-p) \cdot U_{T0} + p \cdot U_{T1} = U_{T0} + p \cdot (U_{T1} - U_{T0}) \text{ and}$$

$$\text{EU(Avoid Risk)} = (1-p) \cdot U_{A0} + p \cdot U_{A1} = U_{A0} + p \cdot (U_{A1} - U_{A0}).$$

¹⁰⁰ With this modified set of utility values, one pure-maximin condition would be even better fulfilled. J. Rawls, *A theory of justice* (Cambridge (Mass.): The Belknap Press of Harvard University Press 1971) (Revised ed. 1999: Cambridge (Mass.): Harvard University Press) at 152; see also Gardiner, above n. 58: the additional

The critical (as yet a priori) probability p_{AT} , whereby a preference for ‘Take Risk’ changes into ‘Avoid Risk’, can be inferred from the condition in which $EU(TR) = EU(AR)$, i.e. when

$$U_{T0} + p \cdot (U_{T1} - U_{T0}) = U_{A0} + p \cdot (U_{A1} - U_{A0}).$$

It follows that $p_{AT} = (U_{T0} - U_{A0}) / \{(U_{T0} - U_{A0}) + (U_{A1} - U_{T1})\}$, or the minimum p-value is:

$$p_{AT} = 1 / [1 + (U_{A1} - U_{T1}) / (U_{T0} - U_{A0})].$$

In other words, under an Avoid-Risk decision the critical probability of danger is a simple function of the expected ‘satisfaction’ about a true-positive consequence in comparison to the expected satisfaction about a true-negative consequence under a Take-Risk decision. Inversely expressed, p_{AT} is a function of the ‘regret’ (i.e. the inverse of satisfaction) one expects to experience from a false-positive consequence relative to the expected regret under a false-negative consequence.¹⁰¹

In conclusion, one’s preference for the precautionary option ‘Avoid Risk’, and more generally the preferred degree of precaution, is a function of the estimated probability of serious harm *and* the relative seriousness of a false-negative consequence compared to a false-positive consequence. Thus, PP proponents need not consider the initiator of an uncertain-risk activity as ‘guilty until proven innocent’ (fearing a false negative), nor should they consider him or her ‘innocent until proven guilty’ (fearing a false positive); see Van den Belt.¹⁰² It is all a matter of weighing possible false positives versus false negatives, and this may have to be done differently for different domains such as, for instance, criminal justice, transport safety, and environmental protection. These conclusions and the above analysis are fully compatible with the signal detection-theoretic argument explained in Section 4.3.4.¹⁰³

benefits of what could be obtained above the maximin-utility value (now $U_{A0} = 90$ instead of 60) are of limited significance only.

¹⁰¹ For lack of space, enlightening decision models about the minimisation of anticipated regret (e.g. M. Braun and A. Muermann, ‘The impact of regret on the demand for insurance’ (2004) 71 *Journal of Risk and Insurance* 737) cannot be discussed here; see Vlek, above n. 94.

¹⁰² H. Van den Belt, ‘Debating the precautionary principle: “guilty until proven innocent” or “innocent until proven guilty”?’ (2003) 132 *Plant Physiology* 1122.

¹⁰³ Inspired by M.L. DeKay and others, ‘Risk-based decision analysis in support of precautionary policies’ (2002) 5 *Journal of Risk Research* 391.

4.4.4 Decision deferral and the value of new information

For an Avoid-Risk versus Take-Risk decision, the prior probability or plausibility, $p(H_1)$, of serious harm plays a crucial role.¹⁰⁴ However, prior beliefs may be a weak basis for justifiable decisions, except when already considerable, perhaps intuitive, statistical evidence is available. For example, one may hold a clear, low prior probability about the delayed arrival of a train, plane, or ferry boat. However, in fairly unique situations of uncertain risk the latter is rarely the case. There, often under time pressure and despite a lack of sufficient evidence, important choices may have to be made. Hence, what could or would a rational actor do to avoid simply taking chances?

If at all possible, the uncertain decision-maker would prefer to gather new information, t_x , which may lead him/her to revise the prior probability of harm, $p(H_1)$, into a posterior probability $p(H_1 | t_x)$, whereby t_x represents a particular test result x , e.g., 'positive' or 'negative'. The test may actually consist of systematic research, closer inspection and/or further observation of the situation.¹⁰⁵ Formally, such probability revision may follow Bayes' Theorem:¹⁰⁶

$$p(H_1 | t_x) = \frac{p(H_1) \cdot p(t_x | H_1)}{p(t_x)} = \frac{p(H_1) \cdot p(t_x | H_1)}{p(H_0) \cdot p(t_x | H_0) + p(H_1) \cdot p(t_x | H_1)} .$$

Expressed in words, the posterior probability $p(H_1 | t_x)$ of danger given the test result t_x equals the product of the prior probability $p(H_1)$ and the likelihood of t_x under H_1 , divided by the unconditional probability of t_x (across all available hypotheses). Thus, to revise the danger-probability $p(H_1)$ into a more empirically supported $p(H_1 | t_x)$, it is important to know how likely a certain test result, say t_{pos} , is if H_1 were actually true, but also how likely the same t_{pos} is when H_0 is true (t_{pos} would be indicative of serious danger).

In a two-hypotheses situation, Bayes' Theorem can be written conveniently in terms of the odds of H_1 relative to H_0 :

¹⁰⁴ Decision-theoretically, a certain degree of plausibility is inevitably treated as an uncertain probability (having a certain confidence interval) about a particular event-outcome.

¹⁰⁵ Note that in Section 4.3.4 it is indicated that a diagnostic result t_x itself may depend on evidence strength *and* seriousness of possible mistakes.

¹⁰⁶ W. Edwards, H. Lindman and L.J. Savage, 'Bayesian statistical inference for psychological research' (1963) 70 *Psychological Review* 192; Lindley, above n. 87.

$$\frac{p(H_1 | t_x)}{p(H_0 | t_x)} = \frac{p(H_1)}{p(H_0)} \cdot \frac{p(t_x | H_1)}{p(t_x | H_0)}.$$

This formula shows that the *posterior odds* of H_1 versus H_0 equal the product of the *prior odds* and the *likelihood ratio* of the test result in light of H_1 versus H_0 . One implication of this is that when $p(H_1)$ equals $p(H_0)$, which would reflect perfect uncertainty, the likelihood ratio would be decisive. Hereby, one may hope that the latter is appreciably different from 1, indicating that the test itself has a significant diagnostic value; an undiagnostic ('worthless') test result would be about equally likely under both hypotheses – $p(t_x | H_1) \approx p(t_x | H_0)$ – and would not lead to an appreciable change in prior probability.

The above formula also demonstrates that the prior odds, $p(H_1) / p(H_0)$, always have a moderating (either strengthening or weakening) effect on the posterior odds $p(H_1 | t_x) / p(H_0 | t_x)$, apart from the test result t_x itself via the likelihood ratio. Thus 'evidence' may or may not go against prior beliefs, and when the evidence is weak prior probabilities may remain most important.

4.4.5 Analysing the value of new information

In the example discussed above, the expected utility (EU) of the actual decision for the optimal course of action equals:

$$\begin{aligned} & \text{Max}\{\text{EU}(\text{Take Risk}), \text{EU}(\text{Avoid Risk})\}, \\ & \text{or: Max}\{p(H_0) \cdot U_{T0} + p(H_1) \cdot U_{T1}, p(H_0) \cdot U_{A0} + p(H_1) \cdot U_{A1}\}; \end{aligned}$$

see Section 4.4.3. After the acquiring of new information concerning H_1 versus H_0 , by way of a test possibly yielding result t_{pos} or t_{neg} , the prior probability $p(H_1)$ can be revised into a posterior probability $p(H_1 | t_x)$ carrying index $x = \text{'pos'}$ or 'neg' (for the test result cannot be known in advance).

The obvious question then is: In light of the newly obtained information, is the expected utility of the best option higher than the EU of the best option (possibly an other one) determined without that information? In other words, is it worth the inevitable costs and efforts to conduct the test and to obtain the new information? This question can be answered as follows.¹⁰⁷

Taking into account the new information t_x , the expected utility of

¹⁰⁷ Lindley, above n. 87; Raiffa, above n. 100; see also Graham, above n. 35.

‘Take Risk’ and ‘Avoid Risk’ can be written formally as:

$$EU(\text{Take Risk} | t_x) = p(H_0 | t_x) \cdot (\dot{U}_{T0} - k_t) + p(H_1 | t_x) \cdot (\dot{U}_{T1} - k_t), \text{ and}$$

$$EU(\text{Avoid Risk} | t_x) = p(H_0 | t_x) \cdot (\dot{U}_{A0} - k_t) + p(H_1 | t_x) \cdot (\dot{U}_{A1} - k_t),$$

whereby t_x could be either t_{pos} or t_{neg} , \dot{U}_{\dots} (instead of U_{\dots}) represents the revised utility of the four original decision consequences (Table 6), and k_t indicates the costs (all-in) of conducting the test. The expected utility of the postponement option ‘get new information’ can be written as:

$$EU(\text{New Information}) = p(t_{\text{pos}}) \cdot \text{Max}\{EU(\text{Take Risk} | t_{\text{pos}}), EU(\text{Avoid Risk} | t_{\text{pos}})\} + p(t_{\text{neg}}) \cdot \text{Max}\{EU(\text{Take Risk} | t_{\text{neg}}), EU(\text{Avoid Risk} | t_{\text{neg}})\}.$$

If this ‘postpone and decide after test’ strategy appears to have a higher expected utility than the best option (Take Risk or Avoid Risk) without the test result, it is better to defer the original decision and to first collect new information.

Thus, the value of new information about an uncertain-risk situation depends on the revision of the prior probability of serious harm into a posterior probability, the unconditional probability $p(t_x)$ of a particular test result, the all-in costs of acquiring the new information, and the possibly revised utilities: \dot{U}_{T0} , \dot{U}_{T1} , \dot{U}_{A0} , \dot{U}_{A1} , of the four original consequences (Table 6). In other words, acquiring new or further information seems especially meaningful when:

- one is a priori uncertain about which hypothesis is correct;
- the test has a high diagnostic value (i.e. it may discriminate well between H_1 and H_0);
- the test itself is not costly in terms of money, time, and effort; and/or
- the test may lead to a more valid evaluation of the relevant decision consequences.

4.4.6 Risk-risk tradeoffs

Many authors have criticised the PP for being focused on the uncertain risks of particular, often controversial activities, such as using hazardous chemicals, GMOs, and nanotechnology.¹⁰⁸ In an early critique, Bodansky

¹⁰⁸ J. Adler. ‘More sorry than safe: assessing the precautionary principle and the proposed international Biosafety Protocol’ (2000) 35 *Texas International Law Journal* 173; G. Calzada, C. Philippe and X. Méra, *The precautionary principle: a high-risk principle - Institute of Economic Affairs: Economic Viewpoints* (Oxford: Blackwell Publishers 2005); H.T. Engelhardt and F. Jotterand, ‘The precautionary principle: a dialectical reconsideration’ (2004) 29 *Journal of Medicine and*

wrote: ‘The precautionary principle seems to suggest that the choice is between risk and caution, but often the choice is between one risk and another’.¹⁰⁹

The gist of this persistent critique is well in line with the decision-theoretic treatment presented above, requiring a weighing of possible false-positive versus false-negative consequences. Basically, precaution – if called for – should result (and inevitably does result) from a decision between at least two alternatives: do/do not do, go/do not go, or permit/restrict. The fact that only one of these may involve a serious uncertain risk does not absolve the decision-maker from the task of weighing pros and cons, comparing risks, however difficult, and ordering his/her preferences about the available courses of action. Stern and Wiener conclude that: ‘Full portfolio-driven risk analysis can be a powerful counterweight to mission-driven agencies, passion for precaution, neglect of unintended consequences, and “groupthink”’.¹¹⁰

An illustration of the need to trade off one type of risk against another is the case of GMOs in food production. Here the proposed tradeoff is between genetic contamination of natural ecosystems (around GMO fields) and the occurrence of large-scale food shortages, especially in poorer countries, due to insufficient crop harvests.¹¹¹ Other examples are nuclear-powered versus fossil-fuelled electricity generation – in view of radioactive waste versus global warming, and of course the USA’s pre-emptive war in Iraq.¹¹²

4.5 Precautionary safety actions

Immediate responses to uncertain-risk situations are meant to eliminate or reduce the threat, evade it, or effectively cope with its potential implications (e.g. a serious accident). Here, the search is for a type and degree of ‘uncertain safety’ (as WRR, 2008, has titled its report) that would

Philosophy 301; Graham, above n. 35; IEM, above n. 24; Marchant, above n. 26; W.J. McKinney and H.H. Hill, ‘Of sustainability and precaution: the logical, epistemological, and moral problems of the precautionary principle and their implications for sustainable development’ (2000) 5 *Ethics and the Environment* 77; Weiss, above n. 20.

¹⁰⁹ Bodansky, above n. 2, at 43.

¹¹⁰ Stern and Wiener, above n. 6, at 442.

¹¹¹ Adler, above n. 109; Engelhardt and Jotterand, above n. 109; R. Hill, S. Johnston and C. Sendashonga, ‘Risk assessment and precaution in the Biosafety Protocol’ (2004) 13 *Review of European Community and International Environmental Law* 263.

¹¹² Stern and Wiener, above n. 6.

compensate properly for the uncertain risk under consideration.¹¹³ Separately, one may start further explorations aimed at reducing major uncertainties: for example, about choice alternatives, possible consequences, groups of people at risk, and optimal methods of eventual victim assistance. Through precautionary actions, the PP is applied as a *control principle* having the double character of both immediate protection and deeper investigation.

Meeting the challenges of an uncertain risk head-on generally means that, at least for the time being, one adopts a restrictive strategy of early prevention or reduction of the possibilities and conditions of serious harm or damage, while trying to get risks As Low As Reasonably Achievable.¹¹⁴ Given the uncertainties involved, this may best be done such that the activity, system, or situation under consideration becomes – or remains – robust, resilient, and flexible.¹¹⁵ Being practically precautionary may be aimed either at reducing the threat or at enhancing victim protection, accompanied by further research. Orthogonal to this, precautionary actions may be organisational, technical, or behavioural in nature. Combining these two dimensions of practical action, we obtain the set of nine categories of specific possibilities given in Table 7.

¹¹³ WRR, Wetenschappelijke Raad voor het Regeringsbeleid (Scientific Council for Government Policy), *‘Onzekere Veiligheid. Verantwoordelijkheden rond fysieke veiligheid’*, (2008) [Uncertain safety, responsibilities around physical safety.] (The Hague: WRR and Amsterdam: Amsterdam University Press).

¹¹⁴ See for example ALARA; S. Lierman and L. Veuchelen, ‘The optimisation approach of ALARA in nuclear practice: An early application of the precautionary principle? Scientific uncertainty versus legal uncertainty and its role in tort law’ (2006) 15 *European Environmental Law Review* 98; O. Godard, ‘Justification, limitation, and ALARA as precursors of the precautionary principle’ in G. Eggermont and B. Feltz (eds.), *Ethics and Radiological Protection* (Louvain-la-Neuve: Bruylant-Academia s.a. 2008) at 133; M.D. Rogers, ‘Risk analysis under uncertainty, the precautionary principle, and the new EU chemicals strategy’ (2003) 37 *Regulatory Toxicology and Pharmacology* 370.

¹¹⁵ L. Clarke, ‘Worst-case thinking. An idea whose time has come. Invited comment’ (2005) XXIX *Natural Hazards Observer* 1; Klinke and Renn, above n. 30; T. O’Riordan, J. Cameron and A. Jordan, ‘The evolution of the precautionary principle’ in T. O’Riordan, J. Cameron and A. Jordan (eds.), *Reinterpreting the Precautionary Principle* (London: Cameron & May 2001) at 9; Unesco-COMEST, above n. 41.

Table 7 Nine kinds of practical measures (illustrations) for realising precautionary safety

	Reducing the threat	Enhancing victim protection	Further research: topics
Organisational	Strengthening/enforcement of rules, standards, quota; introducing strict damage liability; changing, forgoing, prohibiting activity.	Organising emergency aid; evacuation, area closure; communicating on self-help; supplying immediate practicalities; regular feedback.	Supervisory management; revision of rules, standards, quota; effects and side-effects of precautions; public health screening.
Technical	Best available control technology (BACT); spatial and temporal restrictions; reducing size or volume; adopting safer alternatives.	Warning signs/labels, safety devices, survival packages, communication equipment, transport opportunities, evacuee accommodation.	Safer technical design; feasible alternatives; self-help products and facilities; technical/physical infrastructure for emergency.
Behavioural	Organising group action for safety; reducing individual contributions to collective risk; urging authorities; assisting other potential victims.	Avoiding risk exposure; shielding from immediate danger; assisting others and being prepared to offer medical first aid.	Immediate self-protection; motivation and capabilities of safety operators; risk/safety communication; social response to emergency.

The lower left quadrant of Table 7, reducing the threat via behavioural measures, gains a special meaning when the uncertain risk under consideration is the collective outcome of numerous individual behaviours

such as, for example, fish consumption, car driving, or household energy use. To resolve such commons dilemmas, well-coordinated large-scale changes in individual behaviours are required.¹¹⁶ To promote social cooperation for the common good, one may not only wish to apply instrumental strategies for behaviour change (e.g. regulation, pricing and/or persuasion) but may also need to strengthen important effectiveness conditions, such as subjects' problem awareness, the availability of behaviour alternatives, and a future perspective on a safer living environment.

For all precautionary actions, careful monitoring and evaluation of their actual impact and effects is necessary for enhanced learning about the practical meaning and usefulness of precaution. As Borgers remarks, government protection of public safety against terrorist acts may well infringe ('false-positively') on democratic values and civil liberties.¹¹⁷ This poses political choice dilemmas whereby it is vital to know how effective (and side-effective) precautionary measures actually are or could be. Proper monitoring and evaluation is also needed to decide at some point when, where, and for whom current measures could be mitigated, withdrawn, or otherwise changed because new risk information has become available and important uncertainties have been reduced.¹¹⁸

5 Largely procedural key issues of the PP

Compared to the substantive issues 1-5 in Table 3, issues 6-10 are of secondary importance. However, they cover vital elements of an orderly procedure to apply the PP as an assessment, decision, and control principle for uncertain-risk situations. Each of these remaining issues is discussed briefly below, following their numbering in Table 3.

¹¹⁶ G. Hardin, 'The tragedy of the commons' (1968) 162 *Science* 1243; E. Ostrom and others (eds.), *The drama of the commons* (Washington D.C.: National Academy Press 2002); Ch. Vlek and L. Steg, 'The commons dilemma as a practical model for research and policy making about environmental risks' in G. Bartels and W. Nelissen (eds.), *Marketing for sustainability. Towards transactional policy-making* (Amsterdam, Berlin, Oxford: IOS Press 2002) at 205.

¹¹⁷ Borgers, above n. 7.

¹¹⁸ C. Gollier and N. Treich, 'Decision-making under scientific uncertainty: the economics of the precautionary principle' (2003) 27 *The Journal of Risk and Uncertainty* 77; ILGRA, Interdepartmental Liaison Group on Risk Assessment, *The precautionary principle, policy and application* (London: UK Health and Safety Executive 2002) available at: <<http://www.hse.gov.uk/aboutus/meetings/ilgra/pppa.pdf>>; Kourilsky and Viney, above n. 29.

5.1 Issue 6: Optional versus obligatory precaution

The necessity and the strength of precaution cannot but depend on the seriousness of the threat, judged by its possible consequences and their probability or plausibility. ‘Wait!’, ‘Don’t!’, ‘Defer!’, or ‘Do something else!’ are natural responses to avoid taking chances in potential-catastrophe situations. Thus the difference between ‘optional’ and ‘obligatory’ precaution can only be relative. Obligation, of course, also depends on the distribution of responsibilities, and power, among relevant authorities, entrepreneurs, and other expert safety managers.

5.2 Issue 7: Who carries the burden of proof of risk or safety?

Clearly, while safety cannot be proven, risk can.¹¹⁹ However, if the proponent of an uncertain-risk activity does not already believe him-/herself that precautions are needed and further safety research is required, the other parties involved may demand that the initiator of the activity demonstrate the likelihood of safety. Again, this shifting of the burden of proof should depend on the seriousness of the threat and, of course, on the ease with which the proponent of the activity might obtain and/or deliver the relevant data. Strong precaution, if called for, implies a stronger shift in the burden of proof than does weak precaution. Gollier and Treich, however, warn that producers in a competitive market may feel pressed to market new and uncertain-risk products before convincing safety research has been conducted.¹²⁰ In such situations, precautionary government policies may be at variance with venturesome free-market conditions.

5.3 Issue 8: Further research and policy development

This topic has already been formally discussed under the headings of Bayesian probability revision and value-of-information analysis; see Section 4.4.4. The conclusions there should speak for themselves. However, uncertainties may spoil the direction and progress of an optimal information-processing and policy-development strategy. Admittedly, safety tests may be costly and time-consuming, and opponents’ enduring concerns may be pressing proponents into ‘paralysis by analysis’.¹²¹ Nevertheless, a systematic consideration of the uncertain-risk problem at hand may

¹¹⁹ A thousand black crows do not prove that all crows are black; one white crow proves that a crow can be white.

¹²⁰ Gollier and Treich, above n. 119.

¹²¹ Presidential-Congressional Commission on Risk Assessment and Risk Management, *Risk Assessment and Risk Management in Regulatory Decision-Making* (1997) Final Report, available at <www.riskworld.com> at 29.

significantly facilitate a quick search for the most relevant data, possibly safer alternatives, and/or a revision of the original problem definition.¹²²

5.4 Issue 9: Multiparty communication and deliberation

A comprehensive precautionary approach could well comprise elements that may be appreciated differently by different stakeholder groups. A natural strategy in such situations is to organise stakeholder meetings where diverse participants can exchange information, deliberate options, and try to formulate common preferences.

However, as already mentioned in Section 4.4.1, the rationality of multiparty judgment and decision-making is limited. First, participant views should be ‘informed’ and well considered so that they can be taken seriously, particularly vis-à-vis expert scientific opinions.¹²³ Second, conditions should enable participants to express common interests instead of strictly personal values. Even so, inconsistent social preferences may occur because of the impossibility of designing a practical method that simultaneously meets the three fundamental principles of collective-choice theory: rationality, equal participation, and decisiveness.¹²⁴

Since public-interest decisions must be made frequently anyway, there exist various pragmatic ways to resolve interindividual preference aggregation problems. Majority voting on at most two alternatives (‘yes/no’), consensus seeking through orderly deliberation, and some kind of benevolent leadership (formally ‘dictatorship’) are obvious solutions, each having its own strengths and weaknesses. However, theoretically as well as methodologically there is no guarantee that participative procedures lead to convergent results that might impress responsible authorities. Bekkers, Dijkstra, and others document the ‘democratic deficit’ of various new ways to compensate for the shortcomings of representative democracy.¹²⁵ About ‘environmental democracy’, Edwards concludes that pluralistic participation may enrich representative government, whereby elected officials may well function as process managers.¹²⁶

¹²² Hansen, Carlsen, and Tickner, above n. 15; Martuzzi, above n. 17; Unesco-COMEST, above n. 41.

¹²³ See Scott and Vos’ 2002, thoughtful conclusions on this point; Scott and Vos, above n. 35.

¹²⁴ Blair and Pollak, Bezembinder, above n. 88.

¹²⁵ V. Bekkers and others (eds.), *Governance and the Democratic Deficit. Assessing the Democratic Legitimacy of Governance Practices* (Aldershot: Ashgate 2007).

¹²⁶ A. Edwards, ‘Embedding deliberative democracy: local environmental forums in The Netherlands and the United States’ in V. Bekkers and others (eds.), above n. 126, at 165.

5.5 Issue 10: Distribution of responsibilities

Determining the need for, the nature of, and the proper execution of a precautionary strategy is a labour-intensive and time-consuming process. Key issues 1-5 in Table 3 specify the substantive focus of such a process, while issues 6-10 indicate procedural essentials. An obvious question here is: Who may best do what, and when? An organised answer follows the three phases of precautionary assessment, decision-making, and risk control, followed by coordination.

Assessment comprises an initial problem definition, signalling the preliminary need for precaution, and estimating the probability or plausibility as well as the seriousness of possible harm. In addition, feasible choice alternatives with their likely benefits, costs, and risks may be identified. Through further investigation and deliberation, the problem definition may be revised such that hitherto unrecognised options and/or consequences are also incorporated. Assessment tasks are diverse enough to involve experts of various kinds, proponents and opponents of an activity, and responsible policy-makers. Available opinions and data may be collected and evaluated from different viewpoints, and different results may be aggregated and jointly discussed. Expert committees, proponent-opponent debates, and discussions about preliminary policy conclusions are feasible ways to achieve reasonable clarity and consensus about an overall assessment.

Decision-making involves an evaluation and rank-ordering of some reasonably well-defined action versus inaction and perhaps further alternatives, such as more or less stringent packages of safety measures. One may also, quite rationally, postpone the decision proper and first obtain new information, especially about the nature and the likelihood of possible serious harm (see Section 4.4.4). Decision tasks are sensitive to participants' goals and values and to their prior positions *vis-à-vis* the uncertain-risk problem. Some kind of systematic decision analysis may reveal specific uncertainties and/or differences in valuation, which might be resolved by further investigation, debate, and/or aggregation of judgments. Inevitably, any remaining controversy about the decision(s) to be made should be resolved by the competent authority.

Control amounts to the careful execution of the chosen course of action under pre-specified safety conditions. Here, a general tendency of precaution following the ALARA principle would be obvious. Precautionary action may be organisational, technical, and/or behavioural in nature and it should be aimed at reducing the threat and/or enhancing victim protection. To improve future risk control, various further research and observation may also be undertaken (see Section 4.5). Control of uncertain risks could best be divided among the parties most responsible for particular risk factors (cf. Table 7). Depending on the nature of the uncertain risk and the location, the

sectors, and the persons potentially affected, relevant parties may each be assigned a significant role in reducing the threat and/or enhancing victim protection.

Coordination properly carried out is necessary in the entire process of uncertain-risk assessment, decision, and control. Should this be somehow institutionalised? Should a formal protocol be developed and distributed among various relevant parties? Or should the competent authorities nominate an independent project group or steering committee? These questions need further consideration and experimentation in the field.

6 Concluding questions and answers

To clarify focal points for a precautionary-principled approach towards uncertain risk, this paper so far has emphasised the substantive meaning of the PP as an assessment, decision, and control principle. Let us put the paper's conclusion in terms of several Questions and Answers.

Q1. Are there not often so many uncertainties that your only recourse is to a careful procedure?

A1. No. Procedure can never make up for lack of substance, if only because participants in any procedure must know *what* to assess, decide about, and control, and *how* this could be usefully done. Good decision-making always depends on structure, content, and process regarding the problem at hand. Thus, a substantive-analytical framework for precautionary risk management seems indispensable for the careful management of uncertainties and a proper weighing of false positives versus false negatives.¹²⁷

Q2. Is a decision-theoretic perspective not too limited for handling uncertain-risk problems: for example, in consideration of the more extensive and long-term risk categories in Table 1?

A2. Of course, but this goes for just about every theory or model of a complex phenomenon. However, decision theory – thoroughly and broadly developed since the 1950s – is a rich framework for systematising one's thoughts, data, and judgments about more or less uncertain decision problems. In the quest for 'rational' applications of the PP, decision-theoretic thinking may offer useful support, although it will never be sufficient.¹²⁸ For more-encompassing and far-reaching uncertain-risk

¹²⁷ Cf. Gardiner, above n. 58; Graham, above n. 35; M. Feintuck, 'Precautionary maybe, but what's the principle? The precautionary principle, the regulation of risk and the public domain' (2005) 32 *Journal of Law and Society* 371.

¹²⁸ Cf. R.L. Keeney and D. Von Winterfeldt, 'Appraising the precautionary principle – a decision analysis perspective' (2001) 4 *Journal of Risk Research* 191; Resnik, above n. 50; E. Soule, 'The precautionary principle and the regulation of U.S. food and drug safety' (2004) 29 *Journal of Medicine and Philosophy* 333.

problems (as in Table 1), decision-theoretic discipline – including issues of spatial-temporal discounting – may enhance the quality of procedures while reducing the risk of participants losing the forest among the trees.

Q3. Should the PP be considered a normative principle?

A3. No, at least not distinctly. Precautionary behaviour and the preceding decision(s) may be rational survival strategies based on human goals and values. Ideological disputes about the PP are often rooted in differing views about the long-term sustainability of particular technologies and/or behaviour patterns. Understandably, serious uncertain-risk situations may appeal to more fundamental ('ethical') values than do more familiar risk problems.

Q4. Could the PP not be formulated as a rule of law, clearly identifying the conditions, actors, and obligations involved?¹²⁹

A4. No. As a general principle the PP reflects the wisdom of prudence in risk assessment, decision-making, and risk control. Its very generality allows for, and invites, well-tuned elaboration for various domains. Decision-theoretic instrumentation may serve to clarify the judgments, choices, and actions required.

Q5. Why should we apply the PP if we have such sophisticated approaches towards risk assessment and management?

A5. The sophistication of safety can be significantly enhanced by conceiving 'risk' as a multistage process, accounting for plural roles and responsibilities, and incorporating precaution as a logical response to increasing uncertainty. As indicated in Section 2, modern 'risk governance' and precautionary safety management seem to be gradually converging. From a decision-theoretic perspective this is inevitable if one accepts that uncertainty about risk is a continuous, not a dichotomous variable.¹³⁰

Q6. What are vital research questions about the practical meaning and application of the PP?

A6. First, what are different people's (or groups' and organisations') gut responses to uncertain-risk situations that are systematically varied in benefits-at-stake, worst-case consequence, uncertainty of 'disaster', and immediacy versus delay of possible disaster?

Second, what would people deliberately expect, and what would they favour, by way of common-authoritative measures to assess, decide about, and control collective uncertain risks?

Third, which policy domains are most burdened with uncertain risks, which safety measures (if any) are in place, and how effective are or were these? Which domains and types of uncertain risk elicit most public concern,

¹²⁹ See J. Ellis, 'Overexploitation of a valuable resource? New literature on the precautionary principle' (2006) 17 *The European Journal of International Law* 445; Lierman and Veuchelen, above n. 115; and Trouwborst, above n. 38.

¹³⁰ Cf. Majone, above n. 25.

and why?

Fourth, what are the merits and drawbacks – in different domains – of various specific precautionary strategies (cf. Table 7) such as technical facilities, behavioural education, lawful regulation, and financial incentives?

Q7. Should the PP not be rejected for its basic ‘pessimism’ whereby innovation may be stifled and society might become largely scrupulous and conservative?

A7. No. Being precautionary is a time-honoured social and behavioural strategy vis-à-vis serious threats. The pressures from uncertain risk should lead to preventive anticipation, deeper reflection, better-balanced decisions, and stronger, more flexible control. Pessimism, like optimism, can very well be a rational strategy, depending on what is at stake. But, agreed, ‘fear is a bad counsellor’, and optimism is often necessary to maintain or restore self-confidence.¹³¹ Would hope be a better counsellor?

¹³¹ R. Pieterman, *De voorzorgscultuur. Streven naar Veiligheid in een Wereld vol Risico en Onzekerheid* [The Precautionary Culture. Striving for Safety in a World full of Risks and Uncertainty] (The Hague: Boom Juridische Uitgevers 2008) at 200.

THE MEANING OF THE PRECAUTIONARY PRINCIPLE FOR THE ASSESSMENT OF CRIMINAL MEASURES IN THE FIGHT AGAINST TERRORISM

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Abstract

Criminal lawyers and criminologists often refer to contemporary society as the risk society, dominated by an awareness and fear of risks that threaten security: for instance, terrorist attacks. Governments respond to this fear by taking measures that prevent such risks as much as possible. This has led to the development of a concomitant change to preventive criminal justice, illustrated most prominently with regard to recent anti-terrorism legislation. There is much debate in criminal law circles, engaging both scholars and politicians, on the need for preventive criminal law. Different points of view are expressed. Often, the framework against which preventive criminal law is assessed is human rights law: in European circles, the European Convention for the Protection of Human Rights. In this paper, we opt for a different approach: preventive criminal justice is evaluated on the basis of the precautionary principle.

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1 Introduction

It is a more or less established fact that we live in a risk society, a notion that is supported by references to sociological and criminological studies. Frequently mentioned studies are *Risk Society* by Ulrich Beck and *The Culture of Control* by David Garland.¹ While these two studies have laid the groundwork for the study of criminal justice in current society, their line of argument varies considerably. Beck's argument essentially entails that technological innovations have occurred so rapidly in society that they have given rise to uncontrollable risks. Because of this, the modernisation process not only results in an increase in prosperity but is characterised at the time by threats that are the product of human hands. Consequently, contemporary society is, on the one hand, focused on controlling and managing the risks and, on the other hand, spreading the risks across the societal actors. Beck had in mind mainly ecological developments and the stability of financial markets, although he subsequently related his (*world*) *risk society* explicitly to the threat of terrorist attacks as well.² Beck barely deals with criminal law. Garland, however, does. His analysis is intended as an explanation for a radical change in ideas on the approach to crime. A multiplicity of developments have led to loss of the perspective in the United States and the United Kingdom, on which Garland focuses, in which 'real' solutions are sought for crime; for example, by placing a strong accent on resocialisation and an improvement in socio-economic conditions. Most of the attention is now paid to controlling crime and the risks of crime. The use of criminal law as an instrument to control safety risks has become part of an all-encompassing *culture of control*.

What connects these and related studies is that they map out diverse social, legal, economic, and political developments that are the cause or possible explanation of the fact that in modern times the central notion is the protection of citizens against all manner of dangers.³ This means that the use and desirability of preventive action is placed in the foreground, where it also concerns criminal law.⁴ This development is 'foreign' to the system in a certain sense. After all, criminal law proceeds from the standard model in

¹ U. Beck, *Risk Society. Towards a New Modernity* (London: Sage 1992, reprint 2005); D. Garland, *The Culture of Control. Crime and Social Order in Contemporary Society* (Chicago: University of Chicago Press 2002).

² U. Beck, 'The Terrorist Threat. World Risk Society Revisited' (2002) 19 *Theory, Culture & Society* 39.

³ See for example B. Hudson, *Justice in the Risk Society. Challenging and Re-affirming Justice in Late Modernity* (London: Sage 2003), H. Kemshall, *Understanding Risk in Criminal Justice* (Maidenhead: Open University Press 2003) and D. Denney, *Risk and Society* (London: Sage 2005).

⁴ Cf. R. Pieterman, *De verzorgingscultuur. Streven naar veiligheid in een wereld vol risico en onzekerheid* (Den Haag: Boom Juridische Uitgevers 2008) at 122.

which action is taken on the basis of harm that has already occurred. The background of this is both instrumental and based on the legal protection. On the one hand, the repressive approach is based partly on the presumption that people are rational actors and are therefore deterred by the threat of the penalty that can be imposed if they act in conflict with the rules. On the other hand, preventive action entails the risk that – in retrospect – people are wrongfully subjected to far-reaching measures.⁵ Indeed, there are strong arguments to be critical of preventive criminal justice, if only from the point of legal protection of the suspect. However, there is another side to the latter arguments. What if people are shown not to act so rationally that they are deterred by the threat of punishment? And does avoidance of the risk of ‘false positives’ automatically outweigh the misery experienced if action cannot be taken in time? Precisely these considerations arise when a serious threat is experienced and fear sets in.⁶

2 Definition of the problem and plan of approach

In this paper, we consider the emergence of preventive measures in criminal law and the concomitant shift of the scales in the weighing of the interest of safety against the interest of legal protection as an established fact. This does not mean, however, that this development is considered desirable. There is much debate in criminal law circles, engaging both scholars and politicians, on the perceived need for preventive criminal law. This issue has been most vigorously debated with regard to anti-terrorism legislation. The feature of the latter debate is that those who engage in it tend to reason from one specific point of view. When legislators adopt counterterrorism measures, they assume without giving a further or satisfactory explanation that there exists a serious threat of terrorism, which requires preventive action through criminal law. This has led to amendments to substantive criminal law and the law of criminal procedure. Only reasons that favour such amendments are relied upon; scant attention is paid to the disadvantages that attend these particular measures. The argumentation pattern of critics of such measures concentrates precisely on these disadvantages. Preventive criminal law measures are assessed against the human rights framework: the European Convention for the Protection of Human Rights.⁷ Taking the whole into

⁵ A.M. Dershowitz, *Preemption: A Knife That Cuts Both Ways* (New York: W.W. Norton & Company 2006) at 7 and 19.

⁶ Cf. for example W. Hoffmann-Riem, ‘Freiheit und Sicherheit im Angesicht terroristischer Anschläge’ (2002) *Zeitschrift für Rechtspolitik* 497 at 499.

⁷ An illustration of such an assessment of counterterrorism measures is the recently published report ‘Assessing Damage, Urging Action’ by the International Commission of Jurists. We endorse many of the points of the analysis in this report.

consideration, the image therefore arises of a stratified and polarised debate: positions are exchanged, but each of the two strata reasons on the basis of a single point of view, that of the expected advantages or the foreseen disadvantages. A weighing of interests in such a way that advantages and disadvantages are actually viewed in their interrelationship does not take place.

In this paper, we adopt a different point of view. This is not because we disagree with the arguments that are raised. What concerns us is the question of whether a more integrated assessment of preventive measures is possible in order to avoid a stratified and polarised debate as sketched above. We wish to explore the extent to which it is possible to arrive at a normative assessment of the developments in criminal law on the basis of another argument/norm: the precautionary principle. The full extent of this assessment could not be included in this paper and has been elaborated elsewhere.⁸ Firstly, since it is impossible to discuss all relevant legislative developments in criminal law, we limit ourselves to discussing anti-terrorism legislation. Secondly, a limit lies in viewing the precautionary principle in the light of Sunstein's *Laws of Fear*.⁹ Thirdly, rather than presenting an all-encompassing normative framework, we aim to outline some viewpoints that are important for a normative assessment of anti-terrorism measures. Our main contention is that no proper evaluation is possible without full knowledge of the actual threat and the effectiveness of certain measures. Only after all arguments *pro* and *contra* have been taken into consideration can one properly appraise anti-terrorism measures. Our considerations relate to the *manner* of assessment rather than its outcome.

We use the following plan of approach. In Section 3, developments in the Netherlands relating to counterterrorism legislation are discussed and compared to developments in Italy, Germany, England, and the United States. This section ends with a list of the common characteristics of the legislation in these countries. Section 4 deals with the substance of the precautionary principle on the basis of Sunstein's book and the criticism of that principle. From there, partly on the basis of the anti-catastrophe principle mentioned by Sunstein, we discuss the meaning of the precautionary principle for the fight against terrorism under criminal law. In

One must, however, note that such findings are somewhat one-sided. Precisely because individual rights to liberty are taken as a starting point, the view focuses mainly on the disadvantages of counterterrorism policy. The arguments in favour of taking preventive measures are not mentioned or are worked out only superficially.

⁸ M.J. Borgers, *De vlucht naar voren (The way forward)*, VU inaugural lecture (The Hague: Boom Juridische Uitgevers 2007).

⁹ C.R. Sunstein, *Laws of Fear: Beyond the Precautionary Principle* (Cambridge: Cambridge University Press 2005).

Section 5 we formulate several viewpoints that may be useful in the assessment of anti-terrorism legislation.

3 Criminal law and terrorism: developments in and outside the Netherlands

3.1 Counterterrorism legislation in the Netherlands

In the 1970s, the Netherlands was faced with terrorism in the form of Moluccan actions. The government responded with a policy based on dialogue and negotiation. This was known abroad as 'the Dutch approach'. A brief anecdote illustrates how the Dutch attitude towards terror has changed.

In 1970, when a group of Moluccan youths occupied the official residence of the Indonesian ambassador in Wassenaar, Premier Piet De Jong and Foreign Affairs Minister Joseph Luns went to Wassenaar. They moved into a house opposite the residence, from which they conducted negotiations with the hostage takers. At a given moment, they left the house and explored the garden of the residence and, as one of them was proudly able to relate later, even came within shooting distance of the Moluccans. Luns even tried to climb over the iron gate but this action failed. He fell from the gate and landed awkwardly.

This almost naive manner of fighting terrorism, which otherwise ended well – the hostage takers surrendered after a few hours – is not representative (for its lack of professionalism) of the *whole* of the 1970s. In later actions, professional negotiators were employed and a crisis centre was set up, far from the scene of the disaster. The example nevertheless gives a good illustration of the primacy of negotiation.

A major difference between fighting terrorism in the 1970s and nowadays is that since 11 September 2001, the government has pinned its faith on the criminalisation of terrorism. The 'Dutch approach' to negotiation has faded completely into the background. Islamic terrorism, of course, is very different in nature from Moluccan terrorism. The latter was not religiously inspired, remained confined to the Netherlands as a movement, and did not pursue narrowly defined political goals. But that did not make it less dangerous. On the contrary, the Moluccan actions, including two train hijackings and the occupation of a primary school, claimed more victims in the Netherlands than the Islamic terrorism that has held the world in its grip since the attacks on the World Trade Center.

What measures has the Dutch legislature introduced since 2001? We mention the most striking:

Firstly, a broadening of criminal liability by criminalising the preliminary stage before a harmful act has taken place. The Dutch Terrorism

Act (Wet terroristische misdrijven) has resulted in more severe sentences for the commission of certain (common) crimes committed with a terrorist purpose, criminal conspiracy has been expanded,¹⁰ and recruitment for 'armed combat' (i.e. jihad) has become a criminal offence.¹¹ The most recent offshoot of the expansion of criminal liability is participation and cooperation in setting up a terrorist training camp;¹²

Secondly, an expansion of investigatory and prosecutorial power with regard to terrorism.¹³ 'Indications' of a terrorist crime are already sufficient as a threshold that triggers special investigative powers, while a 'reasonable suspicion' was previously required. Furthermore, pre-trial detention is possible on the basis of an 'ordinary' suspicion instead of the more stringent requirement of 'incriminating evidence'. This can last until the start of the trial, subject to a maximum of 27 months. During that period, the accused can be denied access to his file and to incriminating evidence against him;

Thirdly, the possibility to use official notifications from the AIVD (General Intelligence and Security Service) as evidence in a criminal case and provisions for a special procedure in which an AIVD official can be heard by the examining judge as a protected witness;

Fourthly, the possibility to prohibit terrorist organisations included on a UN or EU sanction list, as a result of which assets can be frozen and possessions liquidated. Participation in the continuation of the activities of such an organisation is punishable by a one-year term of imprisonment.

¹⁰ Bulletin of Acts and Decrees (*Staatsblad*) 2004 at 290 and 373.

¹¹ For a comprehensive discussion of the 'Wet Terroristische Misdrijven', see J.M. Lintz, *De plaats van de Wet terroristische misdrijven in het materiële strafrecht. Een onderzoek naar de wederzijdse beïnvloeding door de Wet terroristische misdrijven en het Wetboek van Strafrecht en enkele bijzondere wetten* (Nijmegen: WLP 2007). See also M.J. Borgers, 'Strafbaarstellingen in de strijd tegen terrorisme. Werving ten behoeve van de gewapende strijd en samenspanning tot terroristische misdrijven', in A.H.E.C. Jordaans and others (eds.), *Praktisch strafrecht Liber Amicorum J.M. Reijntjes* (Nijmegen: WLP 2005) at 25.

¹² To be included in the new provision 134a Sr. Parliamentary papers II, 2007-2008, 31 386, nr. 3 at 5. See T. Barkhuysen and others, 'Mensenrechten-Actualiteiten' (2008) 33 *NJCM-Bulletin* 554.

¹³ For a discussion, see Borgers, above n. 8, at 44; P.H.P.H.M.C. van Kempen, 'Terrorismebestrijding door marginalisering van strafvorderlijke waarborgen' (2005) 80 *Nederlands Juristenblad* 397; Th. De Roos, 'Opsporingsbevoegdheden verruimd in de strijd tegen terrorisme. De nieuwe wetsvoorstellen helpen niet' (2006) 86 *Advocatenblad* 176; P.A.M. Verrest, 'Wet ter verruiming van de mogelijkheden tot opsporing en vervolging van terroristische misdrijven' (2007) 56 *Ars Aequi* 158.

3.2 Counterterrorism legislation outside the Netherlands

It is clear that these developments in the Netherlands do not stand alone. Since 9/11, many countries have taken measures to fight terrorism. We outline briefly, by way of random samples, the developments in Italy, Germany, the UK and the US. These countries were selected because of the mix of common and civil law (the UK and the US v. the Netherlands, Germany and Italy) and for their experience or lack of experience with fighting terrorism under criminal law before 9/11 (Germany, Italy and the UK v. the US and the Netherlands).

3.2.1 Italy

Italy, which had already taken radical measures in the 1960s and 1970s to combat domestic terror from both leftists (Brigate Rosse) and rightists (neo-fascists), passed anti-terrorist legislation after 9/11. Inciting, forming, organising, leading, or financing terrorist organisations were made punishable.¹⁴ Later, in a second set of measures just after the bomb attacks in London in 2005, the commission of crimes for terrorist purposes¹⁵ and the recruitment¹⁶ and training of terrorists were added.¹⁷ In certain cases, a person can be held in preventive custody for five days without an actual suspicion, during which time that person may be examined without the assistance of a lawyer.¹⁸ Strict immigration measures have also been adopted: administrative detention and deportation of non-nationals is possible if they appear to constitute a threat to national security. In addition,

¹⁴ Art. 270bis: (1) Codice penale: Chiunque promuove, costituisce, organizza o dirige o finanzia associazioni che si propongono il compimento di atti di violenza con finalità di terrorismo o di eversione dell'ordine democratico (2) è punito con la reclusione da sette a quindici anni.

Amended by Act n. 438, 2001 (Decreto-Legge 18 ottobre 2001, N. 374 coordinato con la Legge di Conversione 15 December 2001, n. 438 (Disposizioni urgenti per contrastare il terrorismo internazionale). See <www.parlamento.it/parlam/leggi>. For comments infra: L. Filippi, 'Terrorismo internazionale: le nuove norme interne di prevenzione en repressione' (2002) 2 *Diritto Penale en Processo* 163; V. Patanè, 'Recent Italian Efforts to Respond to Terrorism at the Legislative Level' (2006) 4 *Journal of International Criminal Justice* 1166; *Italian Contribution to the NCTb (National Coordinator for Counterterrorism) Counterterrorism Project, Research and Documentation Centre (WODC)*, Università degli Studi di Trento – Università Cattolica del Sacro Cuore Milano (Milan, January 2006) at 24.

¹⁵ Art. 270 sexies (Condotte con finalità di terrorismo).

¹⁶ Art. 270 quarter (Arruolamento con finalità di terrorismo anche internazionale).

¹⁷ Art. 270 quinquies (Addestramento ad attività con finalità di terrorismo anche internazionale).

¹⁸ Art. 13 Act n. 155, 2005 (Nuove disposizioni in materia di arresto e di fermo).

some legal constraints on recording confidential communication and gathering information have been removed.¹⁹ Such information is gathered for preventive purposes: namely, information thus obtained may be used only for the purposes of investigation and not at the trial itself. The basis is vague: 'when it is indispensable for the prevention of terrorist activities'. The authority can be exercised for 40 days and can constantly be extended by 20 days: indefinitely therefore, in theory.

3.2.2 Germany

Germany also has past experience with counterterrorism. In the 1960s and 1970s, it was engaged in a fight against the Rote Armee Fraktion (RAF). Several far-reaching counterterrorism laws were passed.²⁰ The most well-known and controversial measure from that period is the *Kontaktsperregesetz*,²¹ which made it possible to detain RAF suspects in complete isolation and seriously limited their right to legal assistance.²² Eight days after the attacks on the WTC in New York, the German government presented a set of counterterrorism measures to Parliament.²³ This legislative initiative can be understood against the background of the discovery/ascertainment that three of the four Arabian hijackers lived in Hamburg and had planned the attack on the WTC there. The definition of the crime 'membership of a terrorist organisation' was expanded and was also declared applicable to foreign/international terrorism²⁴ and the right of association was restricted.²⁵ In a second set of measures, the security services were given wider powers, immigration laws were tightened, and the exchange of information and storage of data was facilitated.²⁶ While no new criminal provisions or powers were created, an old investigation method

¹⁹ Art. 226 (Intercettazioni telefoniche preventive).

²⁰ Gesetz zur Ergänzung des Ersten Gesetzes zur Reform des Strafverfahrensrechts vom 20. Dezember 1974, BGBl. 1974 I, 3686; Gesetz zur Änderung des Strafgesetzbuches, des Strafprozessordnung, des Gerichtsverfassungsgesetzes, des Bundesrechtsanwaltsordnung und des Strafvollzugsgesetzes vom 18 August 1976, BGBl. 1976 I, 2181; Gesetz zur Änderung der Strafprozessordnung vom 14 April 1978, BGBl. 1978 I, 497.

²¹ 30 September 1977 (BGBl. I S 1877).

²² The BVerfG ruled that the Act was constitutional, 1 August 1978, BVerfG 49, 24.

²³ Terrorismusbekämpfungsgesetz (TBG), 9 January 2002, BGBl. I, 2002 at 361.

²⁴ Vierunddreißigstes Strafrechtsänderungsgesetz - § 129b StGB vom 22. August 2002, BGBl. 2002 I, 3390.

²⁵ Erstes Gesetz zur Änderung des Verinsgesetzes vom 14. Dezember 2001, BGBl. 2001 I, 3319.

²⁶ Terrorismusbekämpfungsergänzungsgesetz (TBEG), 5 January 2007, BGBl. I, 2007 at 78.

from the RAF period was dusted off and reintroduced: the ‘*Rasterfahndung*’.²⁷ ‘*Rasterfahndung*’ is the method of searching the files of banks, libraries, universities, benefit agencies, and airline companies, without criminal suspicion, for the purpose of using a certain profile or specific characteristics to trace and keep an eye on suspect persons or dormant cells.

3.2.3 The United Kingdom

Britain has ample experience with fighting terrorism on its own territory. The fight against the IRA dates from 1922 and since that time different measures have been adopted, both criminal and non-criminal. Emergency legislation in those years made internment and preventive detention possible.²⁸ This line has been further pursued since 9/11. For instance, the Anti-Terrorism, Crime and Security Act (ACTSA) 2001²⁹ provides for the administrative detention of foreign terrorism suspects against whom there is insufficient evidence to involve them in criminal proceedings.³⁰ In 2004, the House of Lords ruled that the detention order was in conflict with the right to liberty and the prohibition of discrimination on the grounds that the measure affects only non-nationals.³¹ The successor to the ACTSA, the Prevention of Terrorism Act (PTA) 2005,³² provides for house arrest or ‘control orders’ instead of detention.³³ Breach of the conditions under which a control order

²⁷ For a critical review, see for example R. Gössner, ‘Computergestützter Generalverdacht. Die Rasterfahndung nach “Schläfern” halten einer bürgerrechtlichen Überprüfung kaum Stand’ (2002) 41 *Vorgänge* 41.

²⁸ For a good overview see Clive Walker, *Blackstone’s Guide to the Anti-terrorism legislation* (Oxford: Oxford University Press 2002).

²⁹ The Anti-Terrorism, Crime and Security Act (ACTSA) 2001 (14 December 2001) available at <www.opsi.gov.uk/Acts>. See H. Fenwick, ‘Legislation: The Anti-Terrorism, Crime and Security Act 2001: A Proportionate Response to 11 September?’ (2002) 65 *Modern Law Review* 724.

³⁰ Part 4 (Immigration and Asylum – Suspected international terrorists), section 23 (Detention).

³¹ *A(FC) and others (FC) (Appellants) v. Secretary of State for the Home Department* (Respondent), 16 December 2004, [2004] UKHL 56.

³² The Prevention of Terrorism Act (PTA) 2005 (11 March 2005) available at <www.opsi.gov.uk/Acts>.

³³ The Act provides for two types: a control order that *restricts* the right to liberty and a control order that *violates* the right to liberty (section 1(10)(a) PTA 2005). In the latter case, this is a ‘derogating control order’, an order that, on the basis of Article 15 ECHR derogates from the rights guaranteed by the ECHR because an emergency situation exists. A ‘derogating control order’ can be imposed by a court at the request of a Minister if ‘on the balance of probabilities’ (the civil standard of proof) a suspect is involved in terrorism-related activities (section 4(7)(A) PTA 2005).

is imposed is a criminal offence.³⁴ The bomb attacks in London in 2005 were the trigger for the adoption of the Terrorism Act (TA) 2006.³⁵ The Act introduced several new crimes: for example, inciting and preparing terrorism, distributing terrorist writings, training terrorists, and merely being present at places where terrorists are trained.³⁶ In criminalising terrorism, the legislature has made use of reverse onus provisions, a legislative technique that dates back to the ‘Diplock report’,³⁷ and antiterrorism legislation in Northern Ireland.³⁸ Procedural measures in the TA 2006 pertain to the extension of ‘detention without charge’ from 14 to 28 days.³⁹ The original Bill went further and provided for 90 days detention. Blair defended the 90-day rule in the House of Commons by arguing that the police and judicial authorities need more time to gather incriminating evidence against terrorism suspects in order to prepare for a trial. He did not win the desired support. This episode will go down in history as Blair’s first defeat in the House of Commons. His successor Gordon Brown won the approval of the House of Commons for an extension to 42 days, but was defeated in the House of Lords.⁴⁰

3.2.4 United States

The most talked about counterterrorism legislation is undoubtedly that of the US. From 2001, the Bush administration – which ended in January 2009 – pursued a policy characterised by the expansion of executive powers and the marginalisation of civil rights and liberties. The USA PATRIOT ACT 2001, a framework act in which a large number of laws are amended, contains a definition of terrorism on American territory⁴¹ and provides for the criminalisation of harbouring terrorists and providing ‘material support’ to

³⁴ Section 9 PTA 2005. For a critical discussion, see L. Zedner, ‘Preventive Justice or Pre-Punishment? The Case of Control Orders’ (2007) 60 *Current Legal Problems* 174.

³⁵ The Terrorism Act (TA) 2006 (30 March 2006) available at <www.opsi.gov.uk/Acts/>.

³⁶ Sections 1, 5, 2, 6 and 8, respectively, of the TA 2006.

³⁷ Report of the Commission to consider legal procedures to deal with terrorist activities in Northern Ireland, Cmnd. 5185, London, 1972.

³⁸ Section 7 Emergency Powers Act 1973.

³⁹ Section 23(7) TA 2006.

⁴⁰ On 14 October 2008, with 309 against 118 votes. See ‘Falconer leads assault on 42-day plan’ available at <www.guardian.co.uk/politics/2008/oct/14/terrorism-uksecurity1>.

⁴¹ Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act (USA PATRIOT Act), H.R. 3162, October 24, 2001, Section 802 (a): Domestic Terrorism Defined - Section 2331 Title 18, United States Code.

terrorism.⁴² Other measures are for the purpose of widening the powers of the security services, the National Security Agency (NSA) and the CIA, including wiretapping and tracing number data.⁴³ A commotion arose in 2004 when telecom companies were revealed to have given security services access to all their number data by order of the President and without court intervention, thereby allowing anyone and everyone to be wiretapped by these services. A law was recently passed providing for a prior judicial review, albeit a limited one. The most controversial measure is the detention of 'enemy combatants' at Guantánamo Bay, Cuba. These persons are detained on the basis of the laws of war, though only a few have been prosecuted. Criminal prosecution takes place before a military commission.⁴⁴ The rules of procedure and evidence of military commissions differ from those of regular criminal proceedings and courts martial. The prohibition on using pressure in interrogating suspects has been qualified; evidence obtained under pressure may be used under certain circumstances.⁴⁵ The rules of evidence have also been eased: anonymous and hearsay evidence from witnesses is admissible. The burden of proof is on the accused to show that such evidence is unreliable or has no 'probative value'.⁴⁶ The accused has no right to 'disclosure' of information that could jeopardise national security. The military commission judge may nevertheless order that a summary of such information be disclosed to the accused.⁴⁷

3.2.5 Characteristics of counterterrorism legislation

From the survey of measures in the Netherlands and elsewhere I have derived several characteristics of counterterrorism legislation:

Firstly, criminalisation in the early preliminary stage, or to use the German term: *Vorfeldkriminalisierung*. This occurs in all the countries studied. Criminalisation in the preliminary stage is made permissible in different ways: in an 'external' objective way, by criminalising certain acts of endangerment, and in an 'internal' subjective way by criminalising the

⁴² USA PATRIOT Act, H.R. 3162, 24 October 2001, Section 805 (a) In general, see Section 2339A of Title 18, Unites States Code.

⁴³ USA PATRIOT Act, H.R. 3162, 24 October 2001, sections 201-225.

⁴⁴ An Act to authorise trial by military commission for violations of the law of war, and for other purposes ('Military Commissions Act 2006), H.R. 3930, 3 January 2006.

⁴⁵ Military Commission Act 2006, § 948 r (Compulsory self-incrimination prohibited; treatment of statements obtained by torture and other statements) sub c (Statements obtained before enactment of Detainee Treatment Act 2005) and sub d (Statements obtained after enactment of Detainee Treatment Act 2005).

⁴⁶ Military Commissions Act, § 949a (Rules) (E) (ii).

⁴⁷ Military Commissions Act, § 949j (c) (Protection of Classified Information)(B).

purpose for which a certain action is performed.⁴⁸ In the UK, criminalisation at the preliminary stage is based on the objective model; these are crimes of endangerment. The Netherlands has chosen to focus on the terrorist purpose and has therefore adopted a subjective criminalisation model;

Secondly, a broadening of investigative powers. The lower threshold of ‘indications’ in the Netherlands is one example. In Italy, the threshold that triggers the application of investigative powers has even been completely separated from an actual offence. Confidential communication can be recorded if it is ‘indispensable for the prevention of terrorist activities’ ‘Rasterfahndung’ in Germany goes just as far.⁴⁹ Without criminal suspicion, files of banks, libraries, and universities can be searched in order to use a certain profile to trace dormant cells;

Thirdly, an expansion of the permissibility of pre-trial detention. This is already possible in the Netherlands on the basis of an ‘ordinary’ suspicion. In the UK the possibility of detention without charge has been extended, as likewise in Italy, where five days’ preventive detention is permissible without an actual suspicion, during which time the detainee can be examined without the assistance of a lawyer;⁵⁰

Fourthly, the use of non-criminal measures to achieve a similar repressive effect. This practice is best illustrated by the detention of ‘enemy combatants’ at Guantánamo Bay. The British practice of control orders also falls under this heading; they are effectively a type of house arrest. The sanction lists can also be defined as quasi-criminal on grounds of their punitive effect. It is worth noting that in several of these measures, criminal law is ‘smuggled in’ through the back door. Violation of a control order is a criminal offence, as is participation in an organisation on a sanction list.

From these four characteristics of anti-terrorism legislation it is not hard to draw the overall conclusion that these measures are all centred on the notion of ‘prevention’.

⁴⁸ A subjective approach has been chosen in the Netherlands. Stamhuis regrets this and argues that it would have been more logical for the legislature to criminalise terrorist crimes and conspiracy, just like the other crimes of endangerment in the Dutch Penal Code, by using the objective model. E.F. Stamhuis, *Gemeen gevaar* (Nijmegen: WLP 2006) at 21.

⁴⁹ Art. 226(1) Codice di Procedure Penale: ‘... quando siano ritenute indispensabili per la prevenzione di attività terroristiche ...’.

⁵⁰ Art. 13 Act n. 155, 2005 (Nuove disposizioni in materia di arresto e di fermo).

4 Prevention as the point of departure for criminal legislation

4.1 The precautionary principle

The precautionary principle was developed mainly in areas of law aimed at protection of the environment and public health.⁵¹ Generally speaking, the precautionary principle entails that if and when a threat of serious or irreparable harm arises, a lack of scientific certainty cannot apply as a reason not to take or to postpone preventive measures. Such uncertainty relates to the occurrence of the harm. The precautionary principle prevents taking action only when it has been sufficiently or irrefutably established that harm will occur or has already occurred. In that case, it may no longer be possible to take effective measures to remedy the harm, while imposing an obligation to pay compensation can also be a complex matter: for example, because of a multi-causal connection. The precautionary principle can be used in different gradations of ‘mandatoriness’.⁵² In the formulation used above, the principle is still reasonably weak. It states only that a lack of conclusive evidence in itself does not prohibit the taking of measures.⁵³ This does not mean that the lack of such evidence may no longer play a part in the decision-making process, which actually centres on the question of how much risk one is willing to bear, given the scientific uncertainty regarding the harm.

In a much stricter variant, the precautionary principle can be viewed as the obligation to use a safety margin at all times in the decision-making process. This gives rise to a normative action principle: if serious or irreversible harm can occur, action – taking precautionary measures – is *mandatory*. In that formulation, there is room for inaction only if it has been irrefutably established that no harm will occur. But because of the uncertainty regarding the occurrence of the harm, inaction is in fact no option.⁵⁴ We do not consider the extent to which this mandatory formulation of the precautionary principle is actually professed in relation to

⁵¹ The precautionary principle and ‘the principle of preventive action’ are referred to, for example in Art. 174 EC Treaty.

⁵² The following interpretation of the precautionary principle is taken from Sunstein, above n. 9, at 18. For a summary of the literature about the precautionary principle, see Pieterman, above n. 4, at 37.

⁵³ To this extent, the precautionary principle relates to ‘... regulating the *reasons* for a decision and the basis for action.’ See L. Fisher, ‘Book review: Cass Sunstein, *Laws of Fear: Beyond the Precautionary Principle*, Cambridge: Cambridge University Press, 2005’ (2006) 69 *Modern Law Review* 288.

⁵⁴ It is doubtful as well whether science can produce conclusive proof that there is *no* relationship between activity and harm. The results of a study can never be anything but that *this* study does not show any relationship. The reverse is also true: research showing that a relationship does exist can always be falsified by later research.

environmental protection and public health.⁵⁵ It is noteworthy that this action logic seems characteristic of the risk society; based on a feeling of threat of risks, the central idea is that one must remain a step ahead of danger and subsequently take preventive measures, even if it is not certain whether the feared risk/danger will actually materialise. In view of this parallel, it is interesting to look at possible criticism in relation to the strict variant of the precautionary principle.

4.2 Criticism of the precautionary principle

In his book, *Laws of Fear*, Sunstein summarises such criticism very concisely. He states: 'The principle [the strict formulation of the precautionary principle; MJB/EvS] threatens to be paralyzing, forbidding regulation, inaction, and every step in between'.⁵⁶ If the risk of harm gives reason to take precautionary measures, it should be realised that taking those measures in itself gives rise to a risk of different harm. If drinking water contains a certain substance that can eventually result in serious damage to health, the precautionary principle compels the taking of measures in the form of purification of the water to remove this substance. Nevertheless, the purification method may involve certain disadvantages (e.g. high cost), with the result that people will use alternative sources of water. Yet, these alternative measures can entail other potential risks for users.⁵⁷ The precautionary principle then compels the taking of precautionary measures again, but this could result in a reversal of the measures first taken. Viewed in this way, the precautionary principle can as a rule function if the precautionary measures taken do not have any or only minor negative effects. But that is an ideal situation that will not occur readily in practice. It will almost always be possible to indicate loss items resulting from the taking of precautionary measures, even if these are just the costs of taking the measures themselves or missing out on certain benefits.

To allow the precautionary principle to function in practice, preferences must be expressed or, as Sunstein puts it somewhat more critically, one must put blinders on. It must be determined in advance which interests at risk are to be protected and which can be ignored. Only if one is willing to protect certain interests and to give up others – which will predetermine the result of the weighing of interests – can the precautionary principle function in its strict interpretation. Sunstein points out in this

⁵⁵ Fisher, above n. 53, at 290, reproaches Sunstein for criticising an interpretation of the precautionary principle that is hardly professed. In practice, mainly the 'weak' version of that principle is said to be used.

⁵⁶ Sunstein, above n. 9, at 13; see also C.R. Sunstein, *Worst-case Scenarios* (Cambridge, Massachusetts: Harvard University Press 2007) at 123.

⁵⁷ For this and other examples, see Sunstein, above n. 9, at 32.

context that, where dealing with risks is concerned, it is very easy for people to put on blinders *unconsciously*. He indicates several social-psychological mechanisms for this, which explain that people pay selective attention to risks. We mention three of these mechanisms, without developing them further.⁵⁸ People, for instance, pay attention to the risks they see or that are forced on them in some way or other, while simply overlooking other, perhaps greater risks. In addition, people tend to look mainly at the risk that will manifest itself in the *worst-case scenario*, even if the chance that this scenario will manifest itself is highly unlikely. Lastly, the systematic connection between risks – the fact that preventive action can create new risks – is usually ignored.

From these considerations – the paralysing effect on decision-making and people's unconscious selectivity in dealing with risks – Sunstein draws the conclusion that the precautionary principle should be rejected as a normative principle for action. Preventive action should not be taken automatically if the possibility exists that it will cause serious or irreversible harm. If preventive action is taken, it should be based on a weighing of all interests: that is, all costs and benefits involved in the preventive action. It will usually be hard to map the costs and benefits and to express or quantify them in such a way that they can actually be weighed. But that does not relieve us of the obligation to weigh all pros and cons of preventive action before taking it.

4.3 From precautionary principle to anti-catastrophe principle

Sunstein's argument does not conclude with the above-mentioned criticism of the strict formulation of the precautionary principle. Because, notwithstanding that criticism, Sunstein recognises that this principle does indeed play a certain part in situations in which there is a threat of a large, wide-ranging disaster, while the probability of that disaster occurring cannot be determined. Even if there is little chance that the disaster will occur, if it did occur, the damage would be incalculable. In such a situation, the insistence on taking precautionary measures would be great. Sunstein introduces a decision rule for choosing these precautionary measures, in the form of the anti-catastrophe principle. This principle entails that the worst possible scenario is to be considered, and that preventive measures are taken

⁵⁸ This concerns *availability heuristics*, *probability neglect* and *system neglect*. Sunstein also refers to *loss aversion* (people vote conservatively and are therefore risk averse) and *a belief in the benevolence of nature*. See, with further references to the literature, Sunstein, above n. 9, at 35, and Sunstein, above n. 56, at 17. Cf. further V.V. Ramraj, 'Terrorism, risk perception and judicial review' in V.V. Ramraj and others.(eds.), *Global anti-terrorism law and policy* (Cambridge: Cambridge University Press 2005) at 107.

to prevent that scenario. The catastrophe principle is therefore an application of the maximin rule: one chooses to maximise the minimum position.⁵⁹ Taking precautionary measures only avoids the worst conceivable position. Sunstein sets several preconditions for applying the anti-catastrophe principle. Summarised briefly, these come down to the fact that (i) the probability of the occurrence of the disaster (even if that probability cannot be determined accurately) should not be so small that all costs – disadvantages and risks – attached to taking precautionary measures are accurately mapped out, (ii) that the total costs of the precautionary measures cannot be huge, (iii) that the burdens involved in the precautionary measures cannot be placed unilaterally on specific minority groups and (iv) that in spending the available funds, one should not lose sight of perhaps more pressing social problems.⁶⁰

If one considers the formulation of the anti-catastrophe principle and the preconditions attached to it, it should be clear that Sunstein does not provide a tight decision-making schedule for taking or not taking precautionary measures to avoid a disastrous catastrophe.⁶¹ The formulation is too open for this. What constitutes a major wide-ranging catastrophe? How much material and immaterial damage can be expected? And with the first precondition in mind, how does one estimate that the chance the catastrophe will occur is small or very small, given the point of departure that the probability cannot be determined?

If we understand Sunstein well, the anti-catastrophe principle appears to be based on two considerations. First of all, the *realisation* that it is perfectly normal for a society to take precautions when the dominant perception is that a catastrophe threatens.⁶² Everyone is at liberty to question the correctness of the perception,⁶³ but that does not affect the fact that once the dominant perception that the society will be faced with a major

⁵⁹ The maximin rule comes from decision theory. In legal literature, attention is paid to this rule in, for example, John Rawls. See J. Rawls, *A Theory of Justice* (Oxford: Oxford University Press 1999, revised edition) at 133: ‘The maximin rule tells us to rank alternatives by their worst possible outcomes: we are to adopt the alternative, the worst outcome of which is superior to the worst outcomes of the others.’ The maximin rule can also be related to Beck’s *risk society*. See Beck, above n. 1, at 49: ‘Basically, one is no longer concerned with attaining something “good”, but rather with *preventing* the worst; *self-limitation* is the goal that emerges. (...) The utopia of the risk society is that everyone should be *spared* from poisoning’.

⁶⁰ Sunstein, above n. 9, at 109. See also Sunstein, above n. 56, at 135.

⁶¹ This is also the tenor of Fisher’s criticism, above n. 53, at 291.

⁶² According to Sunstein, the anti-catastrophe principle takes ‘a definitive place in both life and law’. See Sunstein, above n. 9, at 114.

⁶³ Such criticism will usually have an effect only if one can demonstrate that the fear is unrealistic: namely, that the chance the catastrophe will occur is negligibly small.

catastrophe has been established, action *will* be taken.⁶⁴ The second consideration comes down to the fact that in seeking appropriate precautionary measures, one must observe a certain degree of common sense and not take arbitrary measures. One should ensure that the precautionary measures are effective and do not themselves become a catastrophe. Considered in this way, Sunstein argues in favour of realistic and sensible decision-making with regard to the preventive approach to threatening catastrophes.

4.4 From anti-catastrophe principle to fighting terrorism under criminal law

The threat of terrorism today is considered realistic. While considerable debate exists in scholarly writing about the characteristics of modern terrorism and the threat emanating from it, the existing perception of risk is not strongly disputed.⁶⁵ This would be difficult to do because the threat analyses are often based on confidential information from intelligence and security services. Indeed, the lack of transparency does not affect the perception of a threat. On the contrary, it seems to contribute to the elusive nature of the risk, which strengthens rather than reduces the feeling of the threat. Anyone familiar with the politics of counterterrorism, with the endless pile of policy documents and literature on the threat of terrorism, knows it is inevitable to accept that in modern times considerable value is placed on taking preventive measures in the fight against terrorism, also in relation to criminal law.⁶⁶ The perceived threat of catastrophic terrorism largely dictates the taking of precautionary measures by the government.⁶⁷ The field of counterterrorism is not about a 'traditional' form of prevention in the sense of an objectifiable and knowable risk, but about potentially

⁶⁴ Cf. also B. van Klink, 'Der Mythos der verlorenen Unschuld. Gewalt und Gewaltbekämpfung in den Niederlanden' (2005) *The Tilburg Working Paper Series on Jurisprudence and Legal History No. 04/2005* at 2 <www.uvt.nl/eer/papers/WP05-04.pdf> (accessed 1 November 2008) which in this context mentions a duty of the State to 'do something about the feelings of insecurity existing in society, and Dershowitz, above n. 6, at 38, who relies on human nature.

⁶⁵ For a brief survey, see G. Mythen and S. Walklate, 'Communicating the terrorist risk: Harnessing a culture of fear?' (2006) 2 *Crime, Media, Culture* 123 at 125.

⁶⁶ Cf. also in this sense W. Hassemer, 'Sicherheit durch Strafrecht' (2006) *Strafverteidiger* 321 at 329.

⁶⁷ Cf. Beck, above n. 1, at 24: 'Risk society is a *catastrophic* society. In it the exceptional condition threatens to become the norm.' Cf. further Ramraj, above n. 58, at 113.

disastrous harm. This is exactly why far-reaching precautionary measures have been taken.⁶⁸

This outline makes it clear that the political perception of the threat of terrorist attacks can be captured effortlessly in the preconditions of Sunstein's anti-catastrophe principle: there is a threat of a large, wide-ranging disaster, while the probability of that disaster occurring cannot be determined. It is, of course, quite possible to question the classification of terrorism as a catastrophic risk. In our opinion, however, it is not at all unreasonable to consider terrorism a catastrophe.⁶⁹ This does not hold as much because each terrorist attack needs to be considered a catastrophe in itself, and it is quite possible that an actual terrorist attack will result in little damage. But one must not lose sight of the fact that terrorist attacks are committed precisely with the intention 'to intimidate a population, or to compel a government or an international organization to do or to abstain from doing any act'.⁷⁰ When terrorist actions succeed in realising this intention, the consequences for the stability of democratic societies are far-reaching. In our opinion, it is therefore quite possible to place the taking of counterterrorism measures in the key of the anti-catastrophe principle. It should be noted that this in itself does not justify those measures.

The conclusion is often drawn that the foregoing consideration of the precautionary principle and the anti-catastrophe principle provide viewpoints useful in assessing the desirability of and need for the criminal measures in the fight against terrorism outlined in Section 3.⁷¹ First of all, we are reminded by the fact that when the desirability or necessity of taking precautionary measures is an issue, it is inevitable that the decision-making will be based on preferences. If this were not the case, there would be a risk of paralysing the decision-making process. One should know what one wants to preserve or protect as well as what one is willing to sacrifice. For two obvious reasons, the clarity of the debate is served by expressing these preferences in exact terms. The first reason is that a debate based on general

⁶⁸ Cf. C. Aradau and R. van Munster, 'Taming the Future: the *dispositive* of risk in the war on terror' in L. Amore and M. de Goede (eds.), *Risk and the War on Terror* (London, New York: Routledge 2008) at 23; Pieterman, above n. 4, at 37, 83 and 174; M. Schuilenburg, 'De paradox van het voorzorgsbeginsel. Over "unk-unk" en uitsluiting' in D. Siegel and others (eds.), *Culture criminologie* (Den Haag: Boom Juridische Uitgevers, 2008, forthcoming).

⁶⁹ Sunstein relates the anti-catastrophe principle himself somewhat casually to counterterrorism. See Sunstein, above n. 9, at 114.

⁷⁰ See article 2 of the International Convention for the Suppression of the Financing of Terrorism (1999).

⁷¹ The viewpoints referred to here can be found in different words also in M. Valverde, 'Governing Security, Governing Through Security' in R.J. Daniels and others (eds.), *The Security of Freedom: Essays on Canada's Anti-Terrorism Bill* (Toronto: University of Toronto Press 2002) at 84.

notions does not make it sufficiently clear what exactly should be prevented, which makes it impossible to determine what measures would have to be taken. This is illustrated by the debate over the introduction of a fundamental right to safety. Such a fundamental right does not mean anything as long as nothing is said about what 'safety' means. When one studies arguments carefully for the introduction of such a fundamental right, it usually becomes clear that they are backed by specific arguments: for example, dissatisfaction with the emphasis placed on protecting the rights of the accused. By expressing this in veiled terms, one blocks an open debate over the preferences to be made. This touches on the second reason to formulate the preferences clearly. The preference to be made largely determines which precautionary measures can be considered acceptable or not. The focus of the debate should therefore be on preferences.

The second viewpoint is the requisite indication of the costs and benefits of taking precautionary measures. This of course is an open door; careful decision-making is always based on weighing the pros and cons. Still, it is good to emphasise it with regard to precautionary measures. The cost-benefit analysis is in a certain sense a counterpart of making preferences. The precautionary measures taken are dictated to a great extent by the preferences made. But by subsequently mapping out precisely all costs and benefits of the measures to be taken, one can estimate whether the precautionary measures will also provide the expected solution.⁷² We emphasise in this regard that, certainly when the anti-catastrophe principle is involved in a legal context, one should not take the terms 'costs' and 'benefits' too literally. The point is that the disadvantages (the costs) and the advantages (benefits) should be examined. This cannot be called a literal weighing of costs and benefits in the sense of an arithmetical addition or subtraction. That would imply that one could attribute an arithmetical weight to the advantages and disadvantages to determine whether a positive or negative final balance remains. This does not diminish the fact that interests are often weighed in law, which requires a view of all interests at stake when a certain decision is made. The point is that the pros and cons can be *taken into consideration* and be the subject of debate before the decision is made to take precautionary measures. This impetus is not only intended for those who argue in favour of taking precautionary measures. Opponents should also realise that costs are involved in *not* taking precautionary measures, which should not only be compared to the benefits of not taking the measures but also related to the costs and benefits of *taking* preventive measures. In short, the argumentation must be complete

Both these viewpoints are important for the area from which the following examples have been taken – the fight against terrorism under criminal law – an area in which Sunstein's catastrophe principle plays an

⁷² Cf. also Pieterman, above n. 4, at 181 and 195.

important part. It is especially important to assess the measures to be taken in a matter-of-fact and businesslike manner. Cost-benefit analyses are important for this, not so much in a quantitative sense but rather in the sense of taking stock of the pros and cons, viewed from practically or fundamentally different viewpoints. Such analysis can to a certain extent prevent one from being too easily tempted to take ineffective or even counterproductive measures.

5 Viewpoints with regard to a further assessment of the measures taken

5.1 Further development

The observation that a rational and businesslike assessment is necessary – based on taking into account the pros and cons – naturally cannot suffice, because the question of how to give specific shape to that assessment arises. No all-encompassing scheme can be given for that, but several relevant viewpoints and angles of approach can be explained. These viewpoints and angles of approach relate first of all to the way in which the knowledge needed to make that matter-of-fact and businesslike assessment can be gathered, and also to the organisation of the legal debate. As we have already noted in Section 2, we are concerned with the *manner* of assessment and not its outcome. For this reason – but also because of the prohibitive length of this paper – we refrain from making a further general evaluation of specific components of the current counterterrorism policy.

5.2 Acquiring the necessary knowledge

An important task for criminal law research is first of all to bear in mind what one *does not* know and therefore formulate where the gaps in knowledge can be found and what their consequences are. Characteristic of the debate on the role of criminal law in fighting terrorism is that there is no good insight into the threat situation that is the basis of all sorts of measures. The bottleneck connected with this – a good assessment of the need for the measures is not possible without specific threat analysis – has been identified, but it usually does not go beyond that. This resignation may arise from the realisation that it is characteristic of a terrorist threat to be unpredictable in nature, regarding both the chance that an attack will take place and the form in which that can or will happen. The political drive to act is rather the fear that the consequences of an attack will be catastrophic. The question is whether criminal law researchers should leave it at that. There are increasingly more calls for horizon legislation – such legislation already exists in part in some countries – and those pleas can be well founded scientifically on the basis of the inscrutability of the threat of

terrorist attacks.⁷³ Along that line, one can also seek new guarantees with a view to ‘unguided’ prosecutorial action, such as the development of rules for compensation. A step further would be to study, in cooperation with researchers from other disciplines, the extent to which more specific threat situations can be formulated. Such research is not without its complications, but it is surely worth the trouble to try.

The foregoing indicates that precisely the need to gain a better insight into the effectiveness of government measures compel us to engage in more multidisciplinary research. In relation to counterterrorism, the question frequently arises as to whether the new penalisations and prosecution powers have the intended effect, or whether perhaps the opposite effect is achieved.⁷⁴ An attempt can be made to gather more information about the availability of alternative, less far-reaching measures. For instance, with regard to penalising ‘recruitment’ or ‘training’ of potential terrorists, knowledge of the social and psychological characteristics of radicalisation processes can presumably shed more light on the usefulness of the prosecution of recruiters, partly in connection with other, non-criminal interventions in those processes.⁷⁵ Such knowledge contributes at any rate to a wise prosecution policy.

5.3 The legal debate

Suppose that one has all the relevant information about all the interests involved, or that one accepts that a consideration is based on a limited number of identified and listed interests. This is a crucial step in law, because preferences – or formulated more negatively: blinders – will then start playing a part. Attributing weight to interests largely determines the result of the weighing. This is inevitable. Here, too, the most important thing is to be aware that the preferences actually determine the choice. It is desirable as well to explain as far as possible the criteria on the basis of which the choice is determined, because the extent to which this explanation is possible is subject to limitations. What we call ‘meta-criteria’ are usually set, and are intended as guidelines for allowing far-reaching forms of

⁷³ Cf. more generally Pieterman, above n. 4, at 38 and 196 on the periodic reconsideration of precautionary measures.

⁷⁴ On the importance of striving for *evidence based* solutions, see Valverde, above n. 71, at 88. For a survey of the relatively little knowledge about the effectiveness of some counterterrorist measures, see C. Lum and others, *The Effectiveness of Counter-Terrorism Strategies: A Campbell Systematic Review* (2006) available at <www.campbellcollaboration.org> (accessed 1 March 2007).

⁷⁵ For studies of psychology and (counter)terrorism, see for example C.E. Stout, *Psychology of terrorism: coping with the continuing threat* (Westport, London: Praeger 2004, condensed edition) and J. Horgan, *The Psychology of Terrorism* (London, New York: Routledge 2005).

criminal-related government action or not. Much is written about this in relation to counterterrorism. A certain consensus seems to have been reached on the applicable meta-criteria. Often mentioned in this context are the requirements of proportionality and subsidiarity, the importance of a thorough threat analysis, a well-founded expectation that the proposed measures will be effective, respect for fundamental human rights and principles, and access to the courts.⁷⁶

The application of such meta-criteria in making assessments is undoubtedly useful, because it gives more insight into the reasons that certain choices are made. At the same time, these meta-criteria are abstract in nature, which enables both proponents and opponents to rely on the same criteria. For instance, legislators frequently argue that terrorism legislation is closely in line with the existing criminal law and prosecution system – and therefore meets the requirements of proportionality and subsidiarity – whereas scholars/criminal law commentators argue that important starting points of that system are under review, and that such legislation therefore does not meet the requirements of proportionality and subsidiarity. This does not mean that the aforementioned meta-criteria are worthless, but it is difficult to ‘operationalise’ them. In our view, therefore, a criminal law scholar should not get caught up in relying on meta-criteria. The remarks that follow relate to this.

A researcher may be expected to look at the development of preventive criminal measures in the fight against terrorism from a certain distance, and therefore adopt a rational and somewhat detached approach. This does not mean that one cannot criticise legislative amendments creating anti-terrorism measures. Not at all. However, a rational analysis should precede the criticism. We should see to it that criticism does not become a reflex every time legislation is amended. Not every amendment necessarily implies deterioration; it may indicate the need to rethink certain starting points or principles. One example of a principle that can be seen to have changed over time, and which can be given new meaning – at least in continental (European) legal systems – is the presumption of innocence. As has been argued elsewhere, one can detect an erosion of the meaning of the presumption as a limiting principle with regard to pre-trial detention.⁷⁷ This is partly because of societal developments that can be brought under the term ‘risk society’ but more importantly by being superseded by the right to liberty and the normative framework that has been drawn up in that context. This development may trigger a change in the emphasis. Indeed it is argued that the presumption of innocence is a rule of evidence and decision-making: namely, a prohibition on wrongful convictions. This entails that (1) the

⁷⁶ See for example M. Ignatieff, *The Lesser Evil: Political Ethics in an Age of Terror* (Princeton: Princeton University Press 2004) at 23.

⁷⁷ E. van Sliedregt, *Ten to One* (Den Haag: Boom Juridische Uitgevers 2009).

accused person does not have to prove his/her innocence and that (2) a person may only be convicted beyond a reasonable doubt. This 'redefinition' does not affect the rule of law character of the presumption of innocence. The point of departure is still the same: the state may not cause a person to suffer unless its right to do so has been demonstrated by law.

The above can be referred to as an attempt to keep an open mind in criminal law research with regard to a changed context and to look beyond the almost instinctive reaction to criticise and reject certain counterterrorism measures. An attempt to shift the emphasis of the presumption of innocence is also an attempt to bolster the principle in its latter capacity. As criminal law researchers, we may be well advised to find other ways to make ourselves heard when analysing and commenting upon new legislative proposals. Instead of debating with the legislature, criminal law researchers could debate more amongst themselves over the current meaning of criminal law starting points and principles and the need and possibilities to revise them. Numerous interesting, smaller research questions can emerge from such an approach. For example, as well as the question of what fundamental objections are attached to penalisations that are strongly embedded in the malicious intention of the person concerned, the question can be studied of how practical that actually is. It is one thing for the legislature to give that intention a central place in order to take criminal action at the earliest possible stage, but from a tactical point of view – think of gathering information about a possible terrorist network – disadvantages are also involved.⁷⁸

Attention should also be paid to the fact that the legislature sometimes deliberately chooses to arrange things outside of criminal law, for the purpose of evading certain criminal law guarantees. The detention of enemy combatants at Guantánamo Bay is a very clear example of this, as is the blocking of bank balances of persons on the UN or EU sanction list.⁷⁹ Less radical, but not less controversial, is a Dutch bill to subject potential terrorists to area-related and personal obligations to report by way of administrative law. On closer analysis, from the legislature's point of view there is always a certain room for choice concerning the 'legislative complex' within which shape is given to certain measures. This results in a dilemma for a criminal law researcher who participates in the debate about the way in which that room for choice is to be filled. Should one accentuate

⁷⁸ Cf. the 'Early Intervention Dilemma', as outlined by R.M. Chesney, 'Beyond Conspiracy? Anticipatory Prosecution and the Challenge of Unaffiliated Terrorism' (2006) *Wake Forest Legal Studies Research Paper Series. Research Paper No. 932608* <ssrn.com/abstract=932608> (accessed 27 October 2006) at 11.

⁷⁹ More and different examples can be found in L. Amoore and M. de Goede, 'Governance, risk and dataveillance in the war on terror' (2005) 43 *Crime, Law & Social Change* 149.

the criminal law guarantees and emphasise that the use of criminal law is subject to inherent limitations? In that case, the door to measures on the periphery of criminal law would be open wider. Or does one choose the position that criminal liability in the preliminary phase and the scope of prosecution powers can best be extended a bit further? Extending the criminal law playing field does, after all, have the advantage that the newly added elements will be integrated in the existing criminal law *checks and balances*. But in that case, one may throw the baby out with the bath water, because such integration will lower the level of legal protection to the level of the periphery of criminal law. Needless to say, this issue is not as black and white as we have outlined here. Here, too, it mainly concerns maintaining a balance. The main point is that, in our opinion, the emergence of preventive actions on the periphery of criminal law compels an open attitude to the possibilities of criminal law. Because what the aforementioned dilemma shows is that the position chosen on the role of criminal law does not stand alone, but can have consequences for what is happening on the periphery of criminal law.

One can criticise the options outlined for being too limited. It is conceivable that one chooses to reject criminal law as a 'legislative complex' within which antiterrorism measures can be taken and at the same time oppose the inclusion of such measures on the periphery of criminal law because of poor legal protection. There is nothing wrong with taking such a position, yet one must be aware of the political counterforce. The legislature seeks precisely the periphery of criminal law because different and in particular also fewer guarantees apply there than in criminal law. This may give rise to strategic questions. Should one completely reject the taking of measures on the periphery of criminal law because there is less legal protection compared to criminal law? Or should one make suggestions as to how legal protection can be provided for on the periphery of criminal law, without removing the distinction between alternative enforcement mechanisms and criminal law?⁸⁰ This is a dilemma. We do not presume to have any ready-made answers, but consider that we can gain from opening up criminal law research to the awareness of these dilemmas and to include them in determining positions.

6 In conclusion

The risk society is a challenging point of view from which to study the developments in current criminal law, but it is not free of problems. The

⁸⁰ This implies that one must formulate independent criteria for preventive actions outside the context of criminal law. The desirability of and possibilities for this are discussed extensively in Dershowitz, above n. 5.

concept 'risk society' can be used to explain certain developments in criminal law, particularly the increasing preventive use of criminal law. At the same time, the role of criminal law in the risk society gives rise to complex questions as to whether those developments are in keeping with the existing criminal law system. In this paper, we have explored the extent to which the precautionary principle can be helpful in assessing the emergence of preventive criminal law, in particular the fight against terrorism. Within the limitations outlined in this paper, it has proved possible to formulate some relevant viewpoints for a future research agenda. We are aware of the large knowledge gap with regard to making a good assessment of the measures taken. This should be an impetus to initiate more multidisciplinary research. Furthermore, criminal law researchers should take a rational and somewhat detached view with regard to antiterrorism legislation. Testing measures against 'meta-criteria' can produce reasonably predictable results. More interesting and challenging is the question of to what extent do fundamental principles of criminal law retain their value and meaning in the social context of, for instance, the risk society? And has their value changed over time? Our recommendations have produced no concrete results. At best they may be regarded as giving a sense of direction involving avenues of future criminal law research.

PRECAUTIONARY CULTURE AND THE RISE OF POSSIBILISTIC RISK ASSESSMENT

*Frank Furedi**

Abstract

The shift from probabilistic to possibilistic risk management characterises contemporary cultural attitudes towards uncertainty. This shift in attitude is paralleled by the growing influence of the belief that future risks are not only unknown but are also unknowable. Scepticism about the capacity of knowledge to help manage risks has encouraged the dramatisation of uncertainty. One consequence of this development has been the advocacy of a precautionary response to threats. This article examines the way in which precautionary attitudes have shaped the response to the threat of terrorism and to the millennium bug. The main accomplishment of this response has been to intensify the sense of existential insecurity.

1 Introduction

On the very day that Mumbai came under attack by small groups of mobile gunmen, newspaper headlines in Britain were informing the public that a terrorist strike could infect the country with bird flu. This scenario was contained in a report published by the Institute of Public Policy Research's Commission of National Security for the 21st century. This document speculated that the threat from pandemic diseases such as SARS and Avian Flu is

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growing all the time, and because of inadequate preparation ‘a serious disease outbreak or bio-terrorism incident in the next 18 months could tip the global economy from serious recession into global depression’. In line with current Hollywood fantasy plot lines, the report invited us to imagine the possibility of a terrorist purchasing ‘genes for use in engineering of an existing and dangerous pathogen into a more virulent strain’.¹ A day after the publication of this report, a panel of experts informed the American Congress that a biological terrorist attack on the nation was likely by 2013. ‘The consequences of a biological attack are almost beyond comprehension’ noted former Senator Bob Graham before adding that ‘it would be 9/11 times 10 or a hundred in terms of the number of people who would be killed’.² Both of these threat assessments are based on a precautionary logic that dominates contemporary risk management. This article argues that the institutionalisation of this logic is underpinned by a shift from probabilistic to possibilistic risk analysis.

A speculative orientation towards the future is intrinsic to precautionary thinking. Precautionary culture, which has a powerful influence on risk management, is ambiguous about the status of knowledge in assessing risk.³ Through encouraging policy-making and action on the basis of what we do not yet know, it encourages the kind of worst-case thinking that underpins the war against terror or the panic about the millennium bug and environmental problems.

2 Unknown and unknowable

Western society’s culture of fear signals the idea that contemporary risks are qualitatively more dangerous than previous ones because we know very little about them. There is a growing body of opinion among academic risk experts and risk managers that suggests that what we have to worry about is not simply a future that is unknown but one that is unknowable. Throughout history, societies have tended to be apprehensive about uncertainty and have feared the unknown. But the way that communities respond to uncertainty fluctuates in line with how much at ease a society is with itself and how confident it feels about its future. Historically, an intense consciousness of

¹ This report is available on-line <<http://www.ippr.org.uk/ipprcommissions/index.asp?id=2656>> (accessed 1 December 2008).

² Available online <<http://edition.cnn.com/2008/US/12/02/terror.report/index.html>> (accessed 5 December 2008).

³ For a discussion of the rise of precautionary thinking, see J.C. Hanekamp, G. Vera-Navas and S.W. Versteegen, ‘The historical roots of precautionary thinking: the cultural ecological critique and “Their Limits to Growth”’ (2005) 8 *Journal of Risk Research* 295.

uncertainty expresses the realisation that it is not possible to know what will happen in the future. Although experience and knowledge provide insights into likely developments and outcomes, the future always contains an element of the unknown.

How people respond to the unknown is subject to historical and cultural variations. There are times when people's response to the unknown is one of excitement, curiosity, inquisitiveness and eager anticipation. These are moments when people adopt a robust and optimistic sensibility towards the unknown. European sailors setting out to discover an unknown world and enthusiastic space travellers in the 1960s embraced the challenge of turning the unknown into the knowable. From this standpoint, uncertainty served as a stimulus to the positive act of discovery. At other times, communities respond with anxiety to uncertainty and regard the unknown as merely a threat to avoid rather than as an opportunity for discovery. In these circumstances, fear and dread express the dominant mood towards uncertainty. Today this response to the unknown has acquired an unprecedented significance.

One of the defining features of our times is that anxiety about the unknown appears to have a greater significance than the fear of known threats. Politicians and campaigners often hint darkly about the grave challenge posed by threats that are perilous precisely because they are unknown. These are threats to which as yet we can give no name and whose trajectory cannot be calculated. One of Europe's leading sociologists, Zygmunt Bauman, gives voice to this vision of unnamed threats when he states that 'by far the most awesome and fearsome dangers are precisely those that are *impossible* or excruciatingly *difficult* to anticipate, the *unpredicted*, and in all likelihood *unpredictable ones*'.⁴

Bauman's analysis is closely based on the work of the German sociologist Ulrich Beck, who argues that technological development has created a world where society simply cannot understand the destructive consequences of human intervention. Beck stated that

through our past decisions about atomic energy and our present decisions about the use of genetic technology, human genetics, nanotechnology, and computer science, we unleash unforeseeable, uncontrollable, indeed even *incommunicable* consequences that threaten life on earth.⁵

The formulation 'incommunicable consequences' is used to highlight the claim that humanity lacks the intellectual resources with which to interpret future trends. Consequently, empirical evidence or analysis can provide little

⁴ Z. Bauman, *Liquid Fear* (Cambridge: Polity Press 2006) at 11.

⁵ U. Beck 'The Silence of Words: On Terror and War' (2003) 34 *Security Dialogue* 255 at 257.

assistance in this quest, since contemporary experience has little to say about an imagined or radically different future.

The culture that has been described as the culture of fear or as precautionary culture encourages society to approach human experience as a potential risk to our safety.⁶ Consequently every conceivable experience has been transformed into a risk to be managed. One leading criminologist, David Garland, writes of the ‘Rise of Risk’ – the explosion in the growth of risk discourse and risk literature. He notes that little connects this literature other than the use of the word risk.⁷ However, the very fact that risk is used to frame a variety of otherwise unconnected experiences reflects a taken-for-granted mood of uncertainty towards human experience. In contemporary society, little can be taken for granted other than an apprehensive response towards uncertainty. Arguably, like risk, fear has become a taken-for-granted idiom, even a cultural affectation for expressing confusion and uncertainty. The French social theorist Francois Ewald believes that the ascendancy of this precautionary sensibility is underwritten by a cultural mood that assumes the uncertainty of causality between action and effect. This sensibility endows fear with a privileged status. Ewald suggests that the institutionalisation of precaution ‘invites one to consider the worst hypothesis (defined as the “serious and irreversible” consequence) in any business decision’.⁸ The tendency to engage with uncertainty through the prism of fear and therefore anticipate the worst possible outcome can be understood as a *crisis of causality*. Riezler in his early attempt to develop a psychology of fear draws attention to the significant influence of the prevailing system of causality on people’s response to threats. ‘They have been taken for granted – and now they are threatened’ is how he describes a situation where “causes” are hopelessly entangled’.⁹ As noted previously, the devaluation of people’s capacity to know has significant influence on the way that communities interpret the world around them. Once the authority of knowledge is undermined, people become hesitant about interpreting new events. Without the guidance of knowledge, world events can appear as

⁶ F. Furedi, *The Culture of Fear Revisited* (London: Continuum Press 2007) and R. Pieterman, ‘Culture in the Risk Society, An Essay on the Rise of a Precautionary Culture’ (2001) 22 *Zeitschrift für Rechtssoziologie* 145.

⁷ D. Garland, ‘The Rise of Risk’ in R. Ericson and A. Doyle (eds.) *Risk and Morality* (Toronto: University of Toronto Press 2003) at 52.

⁸ F. Ewald, ‘The Return of Descartes’ Malicious Demon: An Outline of a Philosophy of Precaution’ in T. Baker and J. Simon (eds.), *Embracing Risk: The Changing Culture of Insurance and Responsibility* (Chicago: University of Chicago Press 2002).

⁹ K. Riezler, ‘The Social Psychology of Fear’ (1944) 49 *The American Journal of Sociology* 489 at 497.

random and arbitrary acts that are beyond comprehension. This crisis of causality does not simply deprive society from grasping the chain of events that has led to a particular outcome; it also diminishes the capacity to find meaning in what sometimes appears as a series of patternless events.

The question of causation is inextricably bound up with the way communities attempt to make sense of acts of misfortune. The way people interpret such events – an accident or a catastrophe – is processed through the prevailing system of meaning. Questions like ‘was it God’ or ‘was it nature’ or ‘was it an act of human error’ have important implications in terms of how we understand acts of misfortune. Today such questions are complicated by the fact that Western societies possess a weak sense of shared meaning and therefore often lack a consensus about how to attribute blame and responsibility. The absence of consensus means that the link between cause and negative outcome is continually contested. Confusion about causation encourages speculation, rumours, and mistrust. As a result, events often appear as incomprehensible and beyond human control.

3 The ambiguities of knowing

Disappointment with the promise of the Enlightenment has diminished public confidence in society’s ability to know, understand, and ultimately control the future. The view that we live in a world that is so complex as to render meaningless the claim to know is systematically promoted by radical critics of modernity. Critics are also worried that the advance of knowledge itself creates problems, because it threatens to encourage activity and behaviour whose consequences cannot be known in advance. This attitude is most forcefully expressed in the view that one of the products of science and knowledge is risk. Leading sociologists Ulrich Beck and Anthony Giddens forcefully argue the case for the close association between the sense of risk and the increase in knowledge. ‘Many of the uncertainties which face us today have been created by the very growth of knowledge’, wrote Giddens, and Beck has noted that the ‘sources of danger are no longer ignorance but knowledge’.¹⁰ In this scenario, knowledge through its application creates both new hazards and an awareness of their risk. From this standpoint the problem is not ignorance but knowledge that questions the authority of science. The implicit preference of ignorance over knowledge represents a contemporary variant of the conservative embrace of prejudice in the 19th century. In both cases, knowledge is perceived as undesirable because of its disruptive and disorienting effect.

¹⁰ A. Giddens ‘Risk, Trust, Reflexivity’ in U. Beck, *Risk Society: Towards a New Modernity* (London: Sage 1992) at 85 and 183.

The association of knowledge with risk is based on a model of society that feels uncomfortable with change and uncertainty, and regards technological development as potentially threatening. Such a society experiences the advance of knowledge and the unintended consequences of technological development as a source of anxiety and disorientation. These days, arguments that associate knowledge with risks are implicitly questioning the human potential for knowing. It is claimed that human knowledge cannot grasp the chaotic patterns of events set in motion by global capitalism, and the impossibility of knowing or calculating the consequences of technology and human action is widely insisted upon. This view is justified by the argument that technological development in a globalised environment has become so complex as to destroy the foundation for understanding the future. As a result, the German sociologist Nikolas Luhmann claims that 'no one is in a position to claim knowledge of the future nor the capacity to change it'.¹¹ For Luhmann, knowledge is restricted to providing insights into what has already happened, and limited insights at that. Consequently, the development of knowledge is not only perceived as potentially dangerous but it is also represented as having a limited value for guiding society towards the future.

Historically, knowledge and science were upheld because of their capacity for transforming uncertainty into calculable risk. In recent times, this view of science has been undermined by a sensibility that stresses our inability to know. Often what is at issue is not just not knowing but the impossibility of knowing. The association of knowledge with potential danger is based on a self-consciously anti-Enlightenment intellectual outlook. In this model, knowledge and science are both limited in their grasp of the truth; and because they set in motion innovations that have unintended effects, they also create problems. Such an outlook is, of course, strongly shaped by the negative experience of political change in the 20th century. The failure of political experimentation in the Soviet Union and China, disappointment with the record of the Welfare State, and disenchantment with the promise of the Enlightenment is interpreted as direct proof that ambitious political programmes do not work; and, retrospectively, such negative experiences confirm that we simply do not know how to know. Thus, the authority of knowledge is further devalued.

The preoccupation with uncertainty and risk does not lead explicitly to the rejection of knowledge. Rather, it helps to consolidate a mood that assigns to knowledge an essentially defensive role. From this precautionary perspective, knowledge is required to accommodate the prevailing climate of uncertainty and anxiety. The sense of powerlessness with which change is perceived has weakened people's belief in the possibility of knowing what

¹¹ N. Luhmann, *Risk: A Sociological Theory* (New York: Walter de Gruyter 1993) at 48.

lies ahead, reflected in the demand that ‘science must not run ahead of public opinion’, and the notion that the ethos of precaution must dictate the pace at which knowledge develops. The development of knowledge has always been subject to pragmatic concerns, but today such concerns have a distinctly defensive focus. And because the authority of knowledge has been compromised through experience, the argument that it should be allowed to be pursued for its own sake carries less conviction than in previous times.

Time and again the public is informed that the most dreadful dangers are not just ones that we cannot predict or anticipate but ones about which we cannot say anything because they are literally unknown. Security analysts and military planners often refer to such threats as ‘unknown unknowns’. It was the former Defence Secretary Donald Rumsfeld who brought the concept unknown unknowns to the attention of a wider public. At a press briefing in February 2002 he astounded those in his audience when he stated:

Reports that say that something hasn't happened are always interesting to me, because as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns — the ones we don't know we don't know.¹²

At the time, many commentators responded with a mixture of incredulity and hilarity to what they interpreted as Rumsfeld's convoluted attempt to avoid accounting for the absence of information or evidence regarding Iraq's alleged weapons of mass destruction programme. Others treated it as yet another example of dishonest double-speak. However, Rumsfeld's comments convey an orientation towards the problems of the future that is widely shared by political and cultural elites on both sides of the Atlantic.

As far as Rumsfeld is concerned, the problems of the future fall into three categories: firstly, they are ones that we know and understand (known knowns); secondly, they are ones that we know that we neither know nor understand (known unknowns); and thirdly, they are ones that we do not even know we do not know and understand. These are the unknown unknowns. The burden of Rumsfeld's argument is that in the war against terrorism it is the unknown unknowns that constitute the greatest threat. From this standpoint the problem is not simply the absence of intelligence about a specific terrorist threat; it is a more fundamental quandary of not even possessing the capacity to know what the intelligence that is lacking should be about. The very frequency with which Rumsfeld and his colleagues use the suffix **un** is testimony not only to a lack of facts but of

¹² US Department Of Defense, Department of Defense News Briefing, ‘Secretary Rumsfeld and Gen. Myers, <www.defenselink.mil/transcripts/2002/t02122002_t212sdv2.html> (accessed 7 June 2007).

meaning. A palpable sense of disorientation is transmitted by Rumsfeld when he states that ‘our challenge in this new century is a difficult one: to defend our nation against the unknown, the uncertain, the unseen, and the unexpected’.¹³ Rumsfeld’s three-fold categorisation of risks also informs the work of the Office of Homeland Security. One of its risk managers defines unknown unknowns as ‘risks of which there is no awareness at the present time of their existence and effect’. Apparently one can do little to anticipate these risks other than put a ten percent contingency aside ‘without knowing exactly where this reserve will be applied’.¹⁴

An examination of official deliberations on the subject of terrorism indicates that the unknown has taken on a life of its own. The term does not simply mean strange, unfamiliar, or unidentified. It signifies a state or a condition. Indeed, it is treated as a distinct sphere of existence, a kind of parallel world that cannot be grasped through the workings of the human mind. Take the UK’s *Intelligence and Security Committee Report into the London Terrorist Attacks on 7 July 2005*. One of this report’s sections is actually titled ‘Reassessing “the Unknown”’. For the authors of this report, the unknown does not simply refer to the dearth of intelligence about a specific group or threat. The unknown has been transformed into a world for which we have no mental map. At several points the authors of the report are lost for words as they attempt to conceptualise the unknown. They note that the July 2005 bombings had ‘sharpened’ the perception of how big ‘the unknown’ was, since the Government knew next to nothing about home-grown terrorism. They go on to acknowledge that the July attacks emphasised ‘how much was unknown by the police and the Security Service about ideologically motivated extremist activity at the local level’.¹⁵ What the report’s threat assessment could not accomplish was to provide a strategy for dealing with a problem that is unknowable. All that it could offer was to exhort the intelligence services to embark on a journey into the unknown. It reported with approval that

the Director-General of the Security Service told the Committee that the main lesson learned from the July attacks was the need to get into ‘the unknowns’ – to find ways of broadening coverage to pick up currently unknown terrorist activity or plots.¹⁶

¹³ Remarks as prepared for Secretary of Defense Donald Rumsfeld, the National Defense University in Washington D.C., (31 January 2002) <www.defenselink.mil/speeches/2002/s20020131-secdef.htm> (accessed 11 March 2008).

¹⁴ B. Jiang, ‘Risk Management and the Office of Homeland Security’s Antiterrorism Tasks’ (2002) 4 *The Online Journal of Peace and Conflict Resolution* at 31 and 36.

¹⁵ House of Commons, *Report of the Official Account of the Bombings in London on 7 July 2005*, HC1087 (London: The Stationery Office 2006) at 30 and 36.

¹⁶ *Id.*, at 35.

4 The consolidation of ‘what if’ thinking

Rumsfeld’s deliberation on unknown unknowns resonates with a radically new orientation towards the perception and management of risks in Western societies. The traditional association of risk with probabilities is now contested by a growing body of opinion that believes that humanity lacks the knowledge to calculate them. Numerous critics of probabilistic thinking call for a radical break with past practices on the ground that we simply lack the information to calculate probabilities. Environmentalists have been in the forefront of constructing arguments that devalue *probabilistic thinking*. They claim that the long-term irreversible damage caused to the environment cannot be calculated and therefore a probability-based risk analysis is irrelevant. ‘The term “risk” is very often confused with “probability”, and hence used erroneously’ writes an opponent of genetic modification.¹⁷ Of course once risk is detached from probabilities it ceases to be a risk. Such phenomenon is no longer subject to calculation. Instead of risk assessment the use of intuition is called for.

The emergence of a speculative approach towards risk is paralleled by the growing influence of *possibilistic* thinking, which invites speculation about what can possibly go wrong. In our culture of fear, frequently what can possibly go wrong is equated with what is likely to happen.

The shift towards possibilistic thinking is driven by a powerful sense of cultural pessimism about knowing and an intense feeling of apprehension about the unknown. The cumulative outcome of this sensibility is the routinisation of the expectation of worst possible outcomes. The principal question posed by possibilistic thinking, ‘what can possibly go wrong’, continually invites the answer ‘everything’. The connection between possibilistic and worse-case thinking is self-consciously promoted by the advocates of this approach. The American sociologist Lee Clarke acknowledges that ‘worst case thinking is *possibilistic* thinking’ and that it is ‘very different’ from the ‘modern approach to risk’ which is ‘based on probabilistic thinking’.¹⁸ However he believes that the kinds of dangers confronting humanity today require us to expect the worst and demand a different attitude towards risk. He claims that:

Modern social organization and technologies bring other new opportunities to harm faraway people. Nuclear explosions, nuclear accidents, and global warming are examples. We are increasingly ‘at risk’ of global disasters, most if not all of which

¹⁷ Professor Terje Traavik, ‘GMO risks and hazards: Absence of evidence is not evidence of absence of risk’, Third World Network <www.twinside.org.sg/title/terje-cn.htm>.

¹⁸ L. Clarke, ‘Worst Cases: Terror and Catastrophe’ (2006) *The Popular Imagination* (Chicago: The University of Chicago Press) at 5.

qualify as worst cases.¹⁹

Warning us about 'how vulnerable we are to worst case events', Clarke concludes that 'we ought to prepare for possible untoward events that are out of control and overwhelming'.²⁰

Politicians and their officials have also integrated worse-case thinking into their response to terrorism and to other types of catastrophic threats. Appeals to the authority of risk assessment still play an important role in policy-making. However, the prevailing culture of fear dictates that probabilistic-led risk management constantly competes with and often gives way to possibilistic-driven worst-case policies. As an important study of Blair's policy on terrorism notes, he combines an appeal to risk assessment with worse-case thinking. David Runciman, the author of this study, observed that in his response to the threat of terrorism, 'Blair relied on expert risk assessment and on his own intuitions'. Runciman added that Blair 'highlighted the importance of knowing the risk posed by global terrorism, all the while insisting that when it comes to global terrorism the risks are never fully knowable'.²¹ In practice, the co-existence of these two forms of threat assessment tends to be resolved in favour of the possibilistic approach. The occasional demand for a restrained and low-key response to the risk of terrorism is overwhelmed by the alarmist narrative of a worse-case scenario.²²

The swing from probabilistic to possibilistic thinking is closely linked to changing society-wide attitudes and perceptions of the future. The future is perceived increasingly as predetermined and independent of present human activities. It is an unknown world of hidden terror. The amplification of threat and of fear is inextricably linked with possibilistic thinking. As Lipschutz argues, the 'paradox of unknowability' leading to 'worst case analysis' reinforces the 'narratives of fear' of terrorism.²³ The future of the world appears to be a far darker and frightening one when perceived through the prism of possibilities rather than probabilities. Probabilities can be calculated and managed, and adverse outcomes can be minimised. In contrast, worse-case thinking sensitises the imagination to just that – worst cases. Clarke acknowledges the contrast between these two ways of

¹⁹ *Id.*, at 35.

²⁰ *Id.*, at 35.

²¹ D. Runciman, *The Politics Of Good Intention* (New Jersey: Princeton University Press 2006) at 11.

²² For an example of a call for restraint in policymaking see Sir Ken MacDonald QC speech cited in 'DPP warning over "war on terror"' *BBC News* (23 January 2007) <<http://news.bbc.co.uk/1/hi/uk/6292379.stm>>.

²³ R. Lipschutz, 'Terror in the Suites; Narratives of Fear and the Political Economy of Danger' (1999) 13 *Global Society* 17.

perceiving the future. He notes that ‘if we imagine the future in terms of probabilities, then risks look safe’ but ‘if we imagine the future in terms of possibilities, however, horrendous scenarios appear’.²⁴ While it is simplistic and inaccurate to suggest that probability analysis works towards portraying the future as safe, it is definitely true that worst-case thinking strives to highlight the worst. A possibilistic interpretation of problems works to normalise the expectation of worse possible outcomes and fosters a one-sided and fatalistic consciousness of the future. Why? Because it minimises the potential for understanding a threat. Since understanding is a precondition for countering a problem, the declaration of ignorance intensifies a sense of impotence, which in turn augments the threat. That is why alarmist campaigns that warn of unbounded dangers tend to embrace possibilistic thinking. ‘Consequential, possibilistic thinking has been commonplace among antinuclear activists and other environmentalists for years’, writes Clarke.²⁵ Other interests advocating this approach are the counter-terrorism industry and fear entrepreneurs who actively promoted a mood of panic about the millennium bug.

Probabilistic thinking has become an anathema to fear entrepreneurs because it offers a problem-solving and positive orientation towards calculating and managing risks and securing safety. Those who regard uncertainty with apprehension and dread experimentation and innovation depict probabilistic thinking as irresponsible and dangerous. This rejection of probabilities is motivated by the belief that the dangers that we face are so overwhelming and catastrophic that we simply cannot wait until we have the information to calculate their destructive effects. From this standpoint the procedure of acting on the basis of the worst-case scenario makes more sense than waiting for the information necessary to weigh up probabilities. In any case, it is argued that since so many of the threats are unknown, there is little information on which basis a realistic calculation of probabilities can be made. One of the many regrettable consequences of this procedure is that policies designed to deal with threats are increasingly based on feelings and intuition rather than on evidence or facts. For example, a discussion paper published by Greenpeace is sceptical about using probabilistic thinking. It argues that ‘risk-based approaches simply equate “absence of evidence” of an impact with “evidence of absence” of that impact’. Yet they claim ‘all too often the absence of evidence flows simply from the limits of available scientific evaluation techniques’.²⁶ According to critics of probabilistic thinking, the absence of evidence regarding human impact on the

²⁴ Clarke, above n. 18, at 42.

²⁵ *Id.*

²⁶ P. Johnston and D. Santillo, ‘The Precautionary Principle: A Barrier to Innovation and Progress?’ (2006) *Greenpeace Research Laboratories Discussion Paper 01/2006*, University of Exeter at 2.

environment should not influence decision-making based on worst-case thinking.

The scepticism that some environmentalist thinkers express towards the authority of evidence is echoed by proponents of a pre-emptive strike against potential enemies. It is worth noting that after his pronouncement on unknown unknowns, Rumsfeld responded to a question about whether he had any evidence about Iraq supplying weapons of mass destruction to terrorists by stating that 'the absence of evidence is not an evidence of absence'.²⁷ From the worst-case perspective, military action does not require authentication of evidence. For Rumsfeld, ignorance or not knowing can be a spur to action. And the very absence of evidence served as a valid clue with regard to a hidden, invisible military threat that justified military action.

Since possibilistic thinking presents the future through the prism of worst-case scenario, it creates a demand for immediate action. In this catastrophic perspective there is no time to wait for evidence. The entirely unknown quality of the threat is itself proof of the danger ahead. That is why, instead of properly evaluated evidence, worse-case thinking is often the driver of anti-terrorist policy. The anticipation of catastrophic consequences continually demands that something be done. As Durodie explained, 'act now, find the evidence later' is the imperative driving this form of thinking.²⁸ The logic of worst-case thinking is used by the US Government to justify the adoption of its pre-emptive security strategy. According to this doctrine

the greater the threat, the greater is the risk of inaction – and the more compelling the case for taking anticipatory action to defend ourselves, even if uncertainty remains as to the time and place of the enemy's attack.²⁹

US officials frequently argue that they cannot wait until they have proof of some catastrophic threat, since by that time action would be too late. As President Bush argued,

America must not ignore the threat gathering against us ... we cannot wait for the final proof, the smoking gun that could come in the form of a mushroom cloud.³⁰

And he added that 'we have every reason to assume the worst, and we have

²⁷ See 'transcript: Defense Department Briefing, (12 February 2002) <www.globalsecurity.org/military/library/news/2002/02/mil-020212-usia01.htm>.

²⁸ Bill Durodie, 'Life, liberty and politics after 9/1', <www.spiked-online.com/index.php?site/printable/1602>.

²⁹ *The National Security Strategy of the United States of America* (White House: Washington D.C. September 2002), <www.whitehouse.gov/nsc/nss.pdf> at 15.

³⁰ 'President Bush Outlines Iraqi Threat', White House Press Release (7 October 2002) <www.whitehouse.gov/news/releases/2002/10/20021007-8.html - 42k ->.

an urgent duty to prevent the worst from occurring'. Anticipating the worst rather than weighing up the risks also informed the approach of the Blair regime. 'This is not a time to err on the side of caution; nor time to weigh the risks to an infinite balance' declared Blair.³¹

The security policies associated with possibilistic thinking have been accurately interpreted as the application of the precautionary principle to terrorism by a group of critical scholars.³² Advocates of the possibilistic approach, such as Clarke, explicitly endorse the precautionary principle. He believes that 'we may find that the precautionary principle is most useful for urging policy-makers to try to think about unexpected interactions and unintended consequences'.³³ The Precautionary Principle that Clarke characterises as 'quintessentially worst case thinking' claims action should be taken to protect the environment even if there is no evidence of harm. The Precautionary Principle, which has been adopted by the EU, states that when confronted with uncertainty and possible destructive outcomes it is always better to err on the side of caution. A similar pre-occupation informed the advice of the Dutch Scientific Council for Government Policy when it proposed that 'some version' of the Precautionary Principle should be found a place in the Constitution.³⁴ As Stern and Wiener explain, 'the Precautionary Principle holds that uncertainty is no excuse for inaction against serious or irreversible risks' and that the absence of evidence should not bar preventive action.³⁵ This perspective informed the approach of the European Environment Agency when it insisted in January 2002 that 'forestalling disasters usually requires acting before there is strong proof of harm'.³⁶ The translation of this approach in the 'war against terrorism' is pre-emptive warfare, justified by Bush's claim that the US cannot hold back military action until there is 'the final proof'.

In their discussion of the legitimating role of the Precautionary Principle for justifying the war in Iraq, Stern and Wiener show the similarity of the language used by advocates of EU environmental regulation and American supporters of the war on terror. Bush's warning that if 'we wait

³¹ Blair cited in *The Guardian* (5 March 2004).

³² See J. Stern, 'Fearing Evil' (2004) 71 *Social Research* 1111; C. Aradau and R. van Munster, *Governing terrorism and the (non-) politics of risk* (Political Science Publications, No.11/2003) (Odense: Sysddansk Universite 2005).

³³ Clarke, above n.18, at 181.

³⁴ See 'Onzekere veiligheid' <www.wrr.nl/english>.

³⁵ J. Stern and J.B. Wiener, 'Precaution Against Terrorism' in P. Bracken, D. Gordon, and I. Bremmer (eds.), *Managing Strategic Surprise: Lessons from Risk Management & Risk Assessment* (Cambridge: Cambridge University Press 2006) at 2.

³⁶ European Environment Agency, *Late lessons from early warnings: the precautionary principle 1896-2000* (Copenhagen: EEA 2001) available at: <http://reports.eea.europa.eu/environmental_issue_report_2001_22/en>.

for threats to materialize, we will have waited too long' echoes the EU's Environment Commissioner Margot Wallstrom's statement that 'if you smell smoke, you don't wait until your house is burning down before you tackle the cause'.³⁷ In both cases the language of caution is used to minimise the status of evidence. The intuitively arrived-at conclusion that the threat is far too great to wait for leads to the exhortation for immediate action.

The precautionary approach does not necessarily encourage cautious behaviour. In its search for worst-case scenarios, it continually raises the stakes and fuels the demand for action. If as in the case of terrorism we fear the worst, then swift action is called for. As Aradau and van Munster note, the precautionary principle 'privileges a politics of speed based on the sovereign decision of dangerousness'.³⁸ In the domain of security policy, it promotes a highly interventionist and pre-emptive approach. Paradoxically, a casual approach towards caution is implicit in policies underpinned by a precautionary approach towards managing uncertainty.

Jessica Stern has characterized the interventionist imperative contained within the precautionary approach as that of 'action bias'. She argues that, perversely, the 'precautionary approach as applied to Iraq has made the world more dangerous and more uncertain'.³⁹ The institutionalisation of worst-case thinking through official policy is constantly defended on the ground that the stakes are so high that something must be done. 'The greater the threat, the greater is the risk of inaction' observes the US Government's *2002 National Security Strategy* assessment. It also notes that 'if we wait for threats to fully materialize, we will have waited too long'.⁴⁰ Outwardly this call for military action bears all the hallmarks of an aggressive militarist ethos. But a close examination of the doctrine indicates an intense sense of defensiveness and anxiety towards a threat of catastrophic dimension.

The precautionary approach towards the danger of terrorism is justified on the ground that it represents a threat to our existence. In light of such a grave threat, policy-makers feel entitled to abandon traditional forms of evidence-based policy-making. As Runciman writes:

The trouble with the precautionary principle is that it purports to be a way of evaluating risk, yet it insists that some risks are simply not worth weighing in the balance. This could only make sense if it were true that some risks are entirely off

³⁷ Both are cited in Stern and Wiener, above n. 35, at 6.

³⁸ Aradau and van Munster, above n. 32, at 15.

³⁹ Stern, above n. 32, at 1117.

⁴⁰ *The National Security Strategy of the United States of America* (White House: Washington D.C. September 2002), <www.whitehouse.gov/nsc/nss.pdf>.

the scale of our experience of danger.⁴¹

However, if the threat of terrorism is perceived as beyond society's capacity to manage, it has come close to triumphing over its targets. One of the unfortunate consequences of the worst-case approach is that it inflates the power of terrorism. And once terrorism is depicted as a threat of such cosmic proportions, every precautionary act becomes justifiable. As Stern argues, one disturbing consequence of this perspective has been 'the temptation to imagine that the threats we face are so extreme that ordinary moral norms and laws do not apply'.⁴²

5 Running riot with possibilistic thinking: the case of the millennium bug

Possibilistic thinking has emerged as a distinctive feature of 21st-century life style. During the year leading up to the new Millennium, there were ominous hints about the dreadful hazards that lay ahead. In the late 1990s, experts warned that at midnight on 31 December 1999, there would be problems with computer programmes, which would behave as if it were 1900 instead of 2000. Concern with a potential technical glitch called the Millennium Bug swiftly turned into a powerful scare about the breakdown of the computer system. At the time, industry experts, public officials, and politicians perceived the Y2K bug as the very embodiment of unknown unknowns. They regarded the 'unknown unknowns out there' with dread, and frequently used the term to highlight the apocalyptic dimension of humanity's transition to the 21st century. As Quigley wrote, both the American and British governments 'described the problem as vast and dangerous using the most dramatic terms'.⁴³ Many saw the Y2Kbug as a paradigmatic unknown unknown. 'The full impact of the Year 2000 has always been and is now wrapped up in the domain of unknown unknowns', claimed a leading computer scientist.⁴⁴

During the years leading up to 2000, there were numerous predictions about the massive disruptions that would be caused by the Bug. The mood of alarm and anxiety with which some people anticipated what

⁴¹ D. Runciman, *The Politics Of Good Intention* (New Jersey: Princeton University Press 2006) at 59.

⁴² Stern, above n. 32, at 1122.

⁴³ K. Quigley, 'Bug reactions: Considering US government and UK government Y2K operations in light of media coverage and public opinion polls' (2005) 7 *Health, Risk & Society* 267 at 276.

⁴⁴ 'A Global View of the Year 2000 Crisis' *Federal News Service* (13 October 1999).

would happen at the stroke of midnight on 31 December 1999, indicated that age-old millennial apprehensions could still influence modern societies. It reminded some of the epidemic of fear that haunted European society a thousand year earlier in 999; when religious fanatics prophesised that the world would come to an end, the scene was set for the Last Judgment. The flames of terror caught the imagination of hundreds of thousands of people who waited for the coming Apocalypse.⁴⁵

A thousand years later, millennial anxieties assumed a high-tech form. Religious preachers prophesised a future where widespread computer failures would unleash a cataclysmic struggle between good and evil. A group of American religious activists calling themselves *Concerned Christians* looked forward to an Arab-Israeli War that would give rise to a cycle of violence leading to Armageddon. Prominent American televangelists like Jerry Falwell and Pat Robertson predicted massive computer disruptions that would lead to disasters. One of their colleagues, Morris Cerullo, a Pentecostal healing revivalist, prophesised a catastrophe of biblical proportions:

This panic that will sweep the nation will translate into a global depression. Shutdowns of banks will paralyze the world's financial markets. Global economies will crash ... the Bible predicts an end day when the world will see a global economic crash in one hour! Riots will break out in cities ... at the tick of midnight, 2000, America could be less than thirty minutes away from nuclear devastation.⁴⁶

Numerous alarmist publications cashed in on the panic and invented the most fantastic and frightening scenarios. One book, *Time Bomb 2000*, predicted that Y2K would lead to global chaos. Grant Jeffrey's *The Millennium Meltdown: the Year 2000 Computer Crisis* prophesised a computer meltdown that would set the stage for the rise of a conspiratorial world government of the Antichrist. The title of Richard Wiles' *Judgment Day 2000; How the Coming Worldwide Computer Crash will Radically Change Your Life* summed up the formidable dimension of the threat. Alarmist warnings about the impending catastrophe were forcefully transmitted by Michael Hyatt in his *The Millennium Bug; How to Survive the Coming Chaos*. This book provided a frightening vision of a world where air traffic would come to a standstill, military defence systems collapse, banking and credit facilities cease to operate, and power and electricity fail to function. This point was echoed by the Christian Coalition. A retired minister, Tim LaHaye, warned that Y2K could 'trigger a financial

⁴⁵ C. Mackay, *Extraordinary Popular Delusions and the Madness of Crowds* (Ware, Hertfordshire: Wordworth Editions 1995) at 257.

⁴⁶ Cited in N.A. Schafer, 'Y2K as an Endtime Sign: Apocalypticism in America at the *fin-de-millennium*' (2004) 38 *The Journal of Popular Culture* 82 at 87.

meltdown' that would lead to 'an international depression, which would make it possible for the Antichrist or his emissaries to establish a one-world economic system, which will dominate the world commercially until it is destroyed'.

Scaremongering about Y2K was not confined to millennial cults and groups of religious zealots. Leading politicians and business leaders portrayed the problem as a threat of disastrous proportions. *The New York Times* reported that 'it makes sense to prepare for the worst' since 'lack of attention could be crippling'. The cover of one American magazine asked 'Could two measly digits really halt civilisation?' and replied 'Yes, yes – 2000 times yes!' Dr Edward Yardeni, a well known Wall Street economist, claimed that the millennium bug could cause a famine in the US because of the threat it posed to America's highly networked agricultural sector. Yardeni urged his business audiences to regard the threat as a coming war. Many leading policy-makers and business people took it upon themselves to raise the public's awareness of this threat. Dr Douglass Carmichael, a Pentagon consultant, stated that if the worst-case scenario materialised 'we could not rule out that social collapse would turn us into Rwanda, a Bosnia, a worldwide spasm of social reaction grasping for power and control'. James Adams, the former CEO of United Press International launched, a Y2K website to 'sound a public wake up call'.

Indeed, it is striking that many businessmen, corporate executives, and computer consultants were no less alarmist in their predictions than were zealous religious preachers. Some of them predicted that the cost of fixing this problem was so high that it would destabilise the world economy and lead to a recession. Publications with titles like, *THE COMPUTER TIME BOMB: HOW TO KEEP THE CENTURY DATE CHANGE FROM KILLING YOUR ORGANIZATION* transmitted the message of fear whilst also making a sales pitch. The Millennium Bug scare helped produce a thriving fear market in promoting services to fix the problem. Companies peddling millennium-bug-related services were in the forefront of scaremongering. One American business, The Gartner group, predicted that 30 per cent of companies worldwide would experience some critical software failure because of YK2. Consultancies claimed that the damage caused by an impending computer crash would run into trillions of dollars.

The scale of this major internationally co-ordinated effort and the massive expenditure of hundreds of billions of dollars to deal with possible technologically induced crisis were unprecedented. Only a tiny minority of IT experts were prepared to question those devoted to constructing and inflating the 'millennium bug problem'.⁴⁷ Even social scientists, who usually

⁴⁷ One critic of the doom mongers was Ross Anderson 'The Millenium Bug – Reasons not to Panic' 11 December 1999, <<http://www.ftp.cl.cam.ac.uk/ftp/users/rja14.y2k.html>> (accessed 23 May 2005).

make an effort to interrogate exaggerated claims about an impending disaster, failed to raise any probing questions. One IT industry commentator, Larry Seltzer, noted that ‘looking back on the scale of the exaggeration, I have to think that there was a lot of deception going on’. He added that the ‘motivation – mostly consulting fees – was all too obvious’. Nevertheless, it was not simply about money. Seltzer believes that there were also a lot of experienced people with no financial interest who deeply believed it was a real problem.⁴⁸

The YK2 experience shows that precautionary delusions about impending disasters can exact colossal financial costs. Some cynics have argued that scaremongering about a technical glitch served as a job creation scheme. For example, David Starr, chief information officer of the Reader’s Digest Association, portrayed the hype over Y2K as the ‘biggest fraud perpetrated by consultants on the business community since re-engineering’. But the fantasies that surrounded Y2K also influenced the thinking of hardened entrepreneurs. As a result, insurance companies sought to cover themselves and some of them excluded Y2K cover because of the perception that it posed an unacceptable level of risk. Lloyds of London announced that it would not insure any ship without certification of Y2K compliance.

When worst-case thinking captures the public’s imagination, there is always a price to pay. In the case of the millennium bug, it is possible to see that the main accomplishment of precautionary thinking was the transformation of technical problems into apocalyptic threats. This was a threat that swiftly mutated from a technical problem into a peril that appeared to threaten the global economy and according to some account human existence. Many who were not influenced by evangelical preachers and did not interpret the problem as a form of divinely ordained punishment nevertheless feared the consequences of the coming disaster.

6 The philosophy of the fear entrepreneur

Possibilistic thinking succeeds in transmitting the philosophy of fear entrepreneurs in a coherent form. This form of thinking successfully captures and expresses the dominant mood of cultural pessimism. In the name of directing the public’s attention to its worst fears, it adopts a cavalier stance towards the authority of knowledge and of evidence. A philosophy that objectifies the idea that the absence of evidence is not an evidence of absence conveys the proposition that acting on the basis of an absence of evidence is as valid as evidence-based action. *Indeed this proposition provides the rationale for the sentiment that it is precisely the absence of*

⁴⁸ L. Seltzer, *PC Magazine* (16 February 2005).

evidence that constitutes the proof that precautionary action needs to be taken. This enthronement of ignorance has been described as ‘you never knowism’ by two critics of worst-case thinking. Friedman and Sapolsky explain that ‘You Never Knowism earns its name from its insistence on planning around what we do not know rather than what we do’.⁴⁹

The significance that precautionary anti-terrorism attaches to the status of the unknown has the pernicious consequence of systematically devaluing the status of knowledge. It exhorts society to take what we do not know as seriously as what we do. Indeed it sometimes appears that what we do not know plays a greater role in influencing policy-makers than what we do know. Furthermore, by suggesting that many future threats are unknowable it fundamentally calls into question people’s capacity to reason and to understand. Not knowing or ignorance become as much a driver of policy as hard-won evidence. As the experience of the Millennium Bug showed, the precautionary approach displaces evidence-based policy with revelation-based calls to action. What is unknown is not an obstacle to action. Apprehension about the unknown continually invites action that is oriented towards the worst case.

Worse-case thinking encourages society to adopt fear as of one of the dominant principles around which the public, its government, and institutions should organise their life. It institutionalises insecurity and fosters a mood of confusion and powerlessness. Through popularising the belief that worst cases are normal, it incites people to feel defenceless and vulnerable to a wide range of future threats. In all but name it constitutes an invitation to terror. The elevation of terrorism into an existential threat is one of the disturbing accomplishments of precautionary-driven policies. Once the threat of terrorism is perceived according to the possibilistic paradigm, real live terrorists do not have to do very much to achieve their objectives. Societies that are wedded to fantasising worst cases soon learn to live them.

Commentators often associate current military action and anti-terrorist policies with a narrow neo-conservative agenda promoted by Bush and a small circle of ideologues. However, what this analysis overlooks is that these policies draw on cultural resources that influence attitudes towards uncertainty and risk in general. Fear entrepreneurs promoting campaigns around public health issues, child safety, or global warming are equally responsible for encouraging the expansion of the empire of the unknown. The devaluation of knowledge and the enthronement of ignorance are systematically conveyed through policy statements and popular culture. Speculation and worse-case thinking resonate with a cultural imagination that feels so uncomfortable engaging with uncertainty. Indeed, the readiness with which today’s elites are prepared to defer to the unknown is evidence of

⁴⁹ B. Friedman and H. Sapolsky Harvey, ‘You Never Know(ism)’ (2006) XV *Breakthroughs* 4.

a pervasive sense of cultural pessimism.

7 Precautionary culture

By all objective accounts, it is difficult to explain why Western societies should feel so overwhelmed by the condition of vulnerability. Compared with the past, people living in Western societies have less familiarity with physical pain, suffering, debilitating disease, poverty, and death than previously. Western societies enjoy what is by historical standards a high level of stability and relative prosperity. Critics of the precautionary culture note that:

By any historical measure, Americans are particularly safe. And we live in an especially safe neighbourhood. The sorts of security threats that plagued nations since their invention, indeed that necessitated their creation – invasion and civil war – are unthinkable here.⁵⁰

And yet despite an unprecedented level of stability and prosperity, contemporary culture continually communicates the idea that humanity is confronted by powerful destructive forces that threaten our everyday existence. Despite a

century of extraordinary successes in public health: we complain of more symptoms, spend more days in bed and rate our health as worse than we did 40 years or even 80 years ago.⁵¹

Of course, the perception of safety is an existential rather than an objective fact. Social scientists know that whether people feel safe or insecure is to a considerable extent a matter of subjective judgement. Surveys show that young men are far less likely to be worried about crime than are elderly women. Yet crime statistics indicate that elderly women suffer far lower levels of victimisation than young men. A society's sense of safety is also not directly an outcome of the statistical incidence of physical threats. It is widely known that people in prosperous societies living in relatively privileged circumstances can feel unsafe and insecure. Individuals who are freed from the grinding routine of day-to-day survival can shift their concern from being worried about hunger and chronic disease to a preoccupation with their emotional well-being.

In contemporary society, we can never feel safe or healthy enough.

⁵⁰ *Id.*

⁵¹ S. Wessely, 'Risk, psychiatry and the military' (2005) 186 *British Journal of Psychiatry* 459 at 464.

With every advance in medical science, communities demand an even higher standard of health. It is widely recognised that contemporary society regards safety as an end in itself and tends to look upon failures in safety regimes as unacceptable. The 21st-century obsession with safety has become so pervasive that in the UK some officials have warned that ‘enough is enough – it is time to turn the tide’. One report has called for a campaign to emphasise the ‘importance of resilience, self-reliance, freedom, innovation and a spirit of adventure in today’s society’.⁵² However, such pleas are overwhelmed by powerful cultural forces that insist that people can never be safe enough. Consequently, safety and the attitude of caution are now treated as inherently positive values across the entire political spectrum. According to this ethos of safety, even the term ‘accident’ is now regarded as inconsistent with contemporary Western values. Public health officials often claim that most injuries suffered by people are preventable and that to attribute such an event to an accident is irresponsible. The American emergency medicine establishment has been in the forefront of the campaign to expunge the word ‘accident’ from its vocabulary.⁵³

Safety consciousness is not simply the direct consequence of the growth of prosperity. Society’s obsession with safety has also gained momentum through the growth of scepticism towards innovation, change, and experimentation. Throughout modern times, people looked to medicine, science, and technology to make their lives safer. They still do, of course. But there is now a powerful mood of suspicion towards innovation and change. The very term ‘human intervention’ has acquired negative connotations. Terms like ‘human impact’, ‘human intervention’, and ‘ecological footprint’ convey a negative sense of folly and destruction. Human intervention has always been associated with the belief that its positive consequences outweighed its downside. This modernist orientation has given way to a more pessimistic account wherein human intervention is associated with loss as much as gain, and the former is increasingly seen to outweigh the latter. Rather than serving as a solution to our problems, new technology is often indicted for its potential to increase the power of human destructiveness. Former American Vice-President Al Gore expressed this concern when he warned that the ‘power of technologies now at our disposal vastly magnifies the impact each individual can have on the natural world’.⁵⁴

Western societies have become so obsessed with safety that virtually every human experience comes with a health warning. It is not simply

⁵² Better Regulation Commission, *Risk, Responsibility and Regulation: Whose Risk Is It Anyway?* (London: Better Regulation Commission 2006) at 3.

⁵³ R.M. Davis and B. Pless, ‘*BMJ* bans “accidents”’ (2001) 322 *British Medical Journal* 1320.

⁵⁴ Al Gore, ‘The time to act is now: the climate crisis and the need for leadership’ (5 March 2006) <www.mi2g.net>.

children's playgrounds and schools that have become dominated by the ethos of safety for its own sake. Even organisations such as the police and the army have become subject to the dictates of health and safety. As a result, both of these institutions are becoming increasingly risk averse. One British journalist has noted that the police rarely venture out, and even when they are confronted with a serious situation they rarely take risks. In one case, armed police stood for 15 days besieging a London home, only venturing in after the hostage had escaped by his own efforts and the lone gunman perished in the fire that he started.⁵⁵ The ethos of safety has also become institutionalised within the military. Army commanders have to draw up risk assessments for every dimension of their soldiers' training. Some have given up testing soldiers to the limit lest they inadvertently contravene health and safety rules.⁵⁶ General Sir Michael Rose, former head of the SAS, has spoken out about the destructive consequences of risk aversion and the ethos of safety for the morale of the military. He has denounced the 'moral cowardice' that has encouraged what he describes as the 'most catastrophic collapse' of military ethos in recent history.⁵⁷ If anything, the decline of the warrior ethos is far more comprehensive within the US military. One analyst believes that risk aversion has undermined the effectiveness of the US military. 'As emphasis on risk avoidance filters down the chain of command, junior commanders and their soldiers become aware that low-risk behaviour is expected and act accordingly', he notes.⁵⁸

Unlike some institutions in society, the military cannot survive without taking risks. However, the military values associated with the warrior ethos face a challenge from potent cultural influences that negate risk-taking behaviour. Despite the many Hollywood action-packed movies that celebrate heroism and bravery, there is little cultural valuation for risk-taking military behaviour. The military is not immune to the influence of precautionary culture. Prevailing norms towards health and safety decry risk-taking behaviour. A culture that shows a low threshold towards losses in everyday life is unlikely to possess the capacity to celebrate risk-taking behaviour within military institutions. That is also one reason that the status and the authority of the military have declined. The elites of society have distanced themselves from military values, and the military and their participation in this institution have significantly diminished. Even the mainstream of society has become estranged from military values. As two radical critics remark,

⁵⁵ Mick Hume, 'A police state, without any police' *The Times* (25 February 2004).

⁵⁶ See *The Daily Telegraph* (23 February 2004).

⁵⁷ 'J'Accuse! Top General lambasts "moral cowardice" of government and military chiefs' *The Daily Mail* (12 April 2007).

⁵⁸ R. Lacquement, 'The Casual-Aversion Myth' (2004) 57 *Naval War College Review* 39 at 46.

the representative image of the U.S. soldier is no longer that of a John Wayne, and more important, the profiles of U.S. soldiers do not resemble the profiles of the U.S. citizenry.⁵⁹

In Britain too, fighting in a war is increasingly outsourced to private contractors, foreign mercenaries, and the most economically disadvantaged section of society.

One of the most striking manifestations of society's estrangement from military and warrior values is the ascendancy of a powerful mood of casualty aversion. The military are continually concerned about the ability of the public to tolerate casualties. Casualty aversion appears to have influenced the 1989 decision of the US Department of Defense to prohibit media coverage of deceased military personnel returning from Dover Air Force Base.⁶⁰ One critic of what he calls America's 'elite casualty phobia' has noted that in many recent military engagements – Bosnia and Kosovo – 'US ground forces were deliberately withheld from participation' and that in Afghanistan local ground forces were often used to hold down casualties.⁶¹

The significance attached to safety and loss avoidance not only undermines the capacity of Western societies to deal with violent opponents but it also makes them uniquely vulnerable to the risk of terrorism. Preoccupation with safety and the constant acknowledgement of vulnerability acts as an invitation to terrorism. As Homer-Dixon observed, 'our increased vulnerability makes us more risk-averse, while terrorists have become more powerful and more tolerant of risk'. He added that as a result 'terrorists have significant leverage to hurt us'.⁶² These different cultural attitudes have important implications for the way that the War on Terror is played out globally. It appears that Western concerns towards avoiding losses encourage the response of terror.

The powerful sense of vulnerability and insecurity that prevails in the Western world is frequently blamed on a rapidly changing globalised world that produces unprecedented levels of uncertainty. As Tobias Arnoldussen argues in this issue of *Erasmus Law Review*, vulnerability and uncertainty are 'absolute presuppositions of precautionary logic'.⁶³ Virtually every official document and expert statement on the problem of terrorism repeats a version of this mantra. 'It has become something of a cliché that the beginning of the twenty-first century is marked by increasing complexity

⁵⁹ M. Hardt and A. Negri, *Multitude* (London: Penguin Books 2005) at 47.

⁶⁰ Lacquement, above n. 58, at 41.

⁶¹ J. Record, 'Why the Strong Lose' (2005-2006) 35 *Parameters* 16.

⁶² T. Homer-Dixon, 'The Rise of Complex Terrorism' (2002) 128 *Foreign Policy* 12.

⁶³ See T. Arnoldussen, 'Precautionary logic and politics of moderation' (2009) This issue of *Erasmus Law Review* at 259.

and uncertainty, on a national, regional and international scale' begins a report arguing a case for a new national security strategy for the UK.⁶⁴ Yet the cliché of unprecedented level of uncertainty is rarely contested. However, ideas about certainty and uncertainty are not founded on objective facts but are shaped by cultural attitudes towards the future. Humanity actually knows quite a lot about the world. There are some threats that lurk in the background and occasionally catch us unaware, but most of the time, at least by the standards of historical experience, we live in a relatively stable world. What makes us feel uncertain are not the uncontrollable forces unleashed by globalisation but our lack of clarity about our place in the world. Concern about risk and safety express the difficulties that Western culture has in making sense of change in an uncertain world. The response of precaution is an attempt to deal with this predicament.

⁶⁴ C. Edwards, *The Case For A National Security Strategy* (London: Demos Report 2006) at 5.

NEITHER ACCEPTABLE NOR CERTAIN - COLD WAR ANTICS FOR 21ST CENTURY PRECAUTIONARY CULTURE

*Dr. Jaap C. Hanekamp**

Abstract

Precaution is regarded as the paradigmatic approach to uncertainty. Either proposed as a form of radical prevention or, as put forward recently, as an innovative normative procedure to handle uncertainties in advancing human activities, it nevertheless finds its source in Cold War research dealing with the uncertainties of a potential nuclear war. The work of Herman Kahn and the Club of Rome in its first report *The Limits to Growth* are shown to be exemplary in understanding the present 21st century discussion on precaution. Two themes specifically emerge in the discussion about precaution, which includes two examples: the shift from the scientific aim of securing objective knowledge (which we will specify in due course) towards acceptability and the exigency to manage uncertainty. Both themes are closely related. In the final analysis we will see that neither acceptability nor the management of uncertainty, respectively, is acceptable or attainable. Precaution will render nothing within the confines within which it is regarded to function.

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1 Introducing precaution

The can things with the sharp little edges/That can cut your fingers when you're not looking/The soft little things on the floor that you step on/They can all be DANGEROUS.

As the lyrics of *The Dangerous Kitchen* by Frank Zappa show, one can never be too careful. The song has an absurd quality that is not easily missed when you actually hear it. The music intensifies the text, until it saturates your mind. Whether this song exemplifies a perspective now dominant in our Western world culture, we cannot tell. However, precaution, the main theme of this issue, is intensely portrayed in Zappa's lyrics.

In this contribution I want to critically assess precaution for what I believe it is: neither new nor innovative, yet problematical at best and injurious at worst. Nevertheless, in their recent report *Onzekere Veiligheid*, the Dutch Scientific Council for Government Policy (Wetenschappelijke Raad voor het Regeringsbeleid) suggest a *new* precautionary paradigm.¹ In a few words, the WRR posit that precaution expresses alacrity to respond proactively vis-à-vis uncertainty considering people's vulnerability and that of society and the natural environment. Thus precaution is not so much a form of radical prevention, whereby precaution will only come into its own when the potential for serious irreversible damage is suspected, but is regarded as a paradigm shift towards the centrality of the vulnerability of the environment and the concomitant potential risks of activities.² This shift highlights the fact that we are not so much confronted with risks but with uncertainties that subsequently require an adequate translation into *potential risks*, which in turn need to be pursued and managed proactively. If precaution is espoused as normative, organisational processes need to be structured in such a way that early warnings with regard to uncertainty are integrated into corporate policies.

Simply put, precaution generates policies that focus on uncertainty. As the most widely cited definition of the precautionary principle states:

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.³

This formulation of the precautionary principle is considered the most

¹ Wetenschappelijk Raad voor het Regeringsbeleid (WRR) *Onzekere veiligheid. Verantwoordelijkheden rond fysieke veiligheid* (Amsterdam: Amsterdam University Press 2008) [*Uncertain Safety. Responsibilities of Physical Safety*, Scientific Council for Government policy].

² *Id.*, at 125.

³ See <<http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=78&ArticleID=1163&l=en>> (accessed 9 April 2009).

authoritative among the many formulations that can be found nowadays.⁴ It is also known as the triple-negative definition: 'not having scientific certainty is not a justification for not regulating'.⁵ It can be found in abundance in national and international legislation and treaties.⁶ In view of the many legal experiences with precaution, of which we will give two examples shortly, the most widely accepted understanding of the precautionary principle, the Rio definition included, should be construed in a strong way.⁷ Concisely, precaution is taken to mean that prohibitions should be imposed on activities that have an uncertain potential to impose substantial harm, unless those in favour of these activities can show that they present no (appreciable) risk.⁸ This is illustrated most poignantly in *The Final Declaration of the First European 'Seas at Risk' Conference Annex I*:

The principle of precautionary action requires that:

1. the lack of scientific certainty regarding cause and effect is not used as a reason for deferring measures to prevent harm to the environment. Science, while important in providing evidence of effect, is no longer required to provide proof of a causal link between pollutant/disturbing activity and effect, and where no clear evidence is available one way or the other the environment must be given 'the benefit of the doubt';
2. the environmental implications of each and every planned activity are considered first – the use of the 'economic availability' reservation in the application of precautionary measures, e.g., when considering the adoption of clean or cleaner technology/production processes, is inconsistent with this, and must be abandoned;
3. the 'burden of proof' is shifted from the regulator to the person or persons responsible for the potentially harmful activity, who will now have to demonstrate that their actions are not/will not cause harm to the environment;

⁴ J.D. Graham, 'Decision-analytic refinements of the precautionary principle' (2001) 4 *Journal of Risk Research* 127.

⁵ C.D. Stone, 'Is there a precautionary principle?' (2001) *Environmental Law Reporter* 10789.

⁶ A. Trouwborst, *Evolution and Status of the Precautionary Principle in International Law* (The Hague: Kluwer Law International 2002); The *Convention on Biological Diversity* also incorporates a similar definition of the precautionary principle, when is mentioned in the preamble that 'where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat, ...' See <<http://www.biodiv.org/convention/articles.asp?lg=0&a=cbd-00>> (accessed 9 April 2009).

⁷ R.B. Stewart, 'Environmental Regulatory Decision Making Under Uncertainty' in T. Swanson (ed.), *An Introduction to the Law and Economics of Environmental Policy: Issues in Institutional Design (Research in Law and Economics, Volume 20)* (Leiden: Elsevier 2002) at 71; C.R. Sunstein, 'Beyond the Precautionary Principle' (2003) *Public Law and Legal Theory Working Paper No. 38*. This paper can be downloaded at <http://ssrn.com/abstract_id=307098> (accessed 9 April 2009).

⁸ Stewart, above n. 7.

4. if the 'worst case scenario' for a certain activity is serious enough then even a small amount of doubt as to the safety of that activity is sufficient to stop it taking place;
5. potentially harmful activities are avoided where, either public debate has not concluded the activity to be a social necessity, or less harmful alternatives exist....⁹

The idea of 'possible risk' will be understood to require some sort of threshold of (scientific) plausibility. However, under the precautionary principle, the threshold burden is minimal, and once it is met, there is something like a presumption in favour of stringent regulatory controls. As Douma remarks (the perspective that Kahn had on nuclear war springs to mind here):

... The default rule applied in both the EC and the WTO that the burden of proof rests with the regulating authorities, obliging them to demonstrate the existence of a risk, should be applied in a precautionary manner. The threshold of producing such proof should not be set too high¹⁰

Conversely, the reversal of the 'burden of proof' within the precautionary context shifts the explanatory burden of the regulator to the person or persons responsible for the potentially harmful activity, who will now have to demonstrate that their actions are not causing or will not cause harm to the environment and to human health. If the 'worst case scenario' for a certain activity is serious enough, then even a small amount of doubt as to the safety of that activity is sufficient to stop it taking place. Although Douma envisions a minimal threshold of proof for regulating authorities, this threshold is set quite high for the societal parties – economic or otherwise – involved, which need to present substantial proofs of *safety*. As Holmes Rolston III remarks:

Chemicals, unlike persons, are not innocent until proven guilty but suspect until proven innocent. So the burden of proof shifts, and it is now up to the industrialists to dispatch it. This puts them again on the frontier, technologically and morally¹¹

The term 'continuous assessment' of science and technology comes to mind when one discusses precaution within these terms, necessarily with the aid of science and technology. Conversely, the notion that absence of evidence indeed is not evidence of absence seems to be running through the precautionary debate, regardless of whether it is seen as radical prevention or, in the analysis of the WRR, a paradigmatic safeguard for a vulnerable world. It seems then

⁹ C.W. Backes and J.M. Verschuuren, 'The Precautionary Principle in International, European, and Dutch Wildlife Law' (1998) 9 *Colorado Journal of International Environmental Law & Policy* 43.

¹⁰ W.T. Douma, *The Precautionary Principle. Its Application in International, European and Dutch Law* (The Netherlands: University of Groningen 2003).

¹¹ H. Rolston III, *Environmental Ethics. Duties to and Ethics in the Natural World*. (Philadelphia: Temple University Press 1988) at 319.

that we need to embrace a precautionary *culture*, though the term is not used by the WRR. This is ironic, since critics of the precautionary principle, of which I am one, are reproached for their limitation of the precautionary principle as radical prevention, while *in fact* precautionary culture on a much wider scale than that proposed by WRR is extensively assessed *and* criticised by many.¹²

To properly set the wheels of criticism in motion we need to go back some 50 odd years, in particular to the *RAND* project. Here we will show in passing that the WRR has unknowingly revived a perspective on life, society, and the natural environment that had already been institutionalised during the Cold War. The Cold War perspective on the uncertain future came to 'full bloom' in the 1970s with the first report to The Club of Rome. This backdrop gives us at least three threads of the precautionary tale that need to suffice here: (i) *Cold War* cautions and the limits to growth; (ii) examples; (iii) science, risk, and precaution. Two themes specifically emerge in a discussion about precaution: *the shift from the scientific aim of securing objective knowledge (which we will specify anon) towards acceptability and the exigency to manage uncertainty*. Both themes are closely related and will surface subsequently in the threads we will follow. In the final analysis we will see that neither acceptability nor the management of uncertainty is acceptable or attainable, respectively.

2 'On Thermonuclear War' and 'The Limits to Growth'

Not long after the end of WWII, the world began to worry yet again about war. The nuclear age presented itself on the viewing screens of the military and citizens alike, with devastating effects. Society as we knew it could be obliterated at the push of a button. As a child, I often spotted Lockheed F104 Starfighters performing their daily routine flights. Their thundering engines were awe-inspiring but added to the gloomy and apprehensive atmosphere in the Netherlands living under the threat of 'the bomb'. These fears spawned a specific albeit somewhat forgotten 'scientific response'. Science was now not only used to enhance the sophistication of nuclear and non-nuclear weaponry, it

¹² See for example R. Pieterman, 'Culture in the Risk Society. An Essay on the Rise of a Precautionary Culture' (2001) 22 *Zeitschrift für Rechtssoziologie* 145; A. Burgess, *Cellular Phones, Public Fears, and a Culture of Precaution* (Cambridge: Cambridge University Press 2003); C.R. Sunstein, *Laws of Fear: Beyond the Precautionary Principle* (Cambridge: Cambridge University Press 2005); J.C. Hanekamp and S.W. Verstegen, 'The problem of the precautionary principle: the paternalism of the precautionary coalition' in J. Panton and O.M. Hartwich (eds.), *Science vs superstition. The case for a new scientific enlightenment* (Buckingham: University of Buckingham Press 2006); R. Pieterman, J.C. Hanekamp and L. Bergkamp, 'Onzekere voorzorg bedreigt rechtszekerheid' (2006) 81 *Nederlands Juristenblad* 2 [*Uncertain precaution threatens legal security*].

was used in ways similar to those in contemporary precautionary culture. Risks and uncertainties relating to thermonuclear war were tackled with a scientific gusto unheard up until then, with risk assessment and management of nuclear exchange as key elements therein.

During WWII, engineers and scientists provided key inventions, such as radar and the atomic bomb. Research and development were seen as even more important in the battles of the future, which undoubtedly would come. The founders of the project Research and Development conceived of *RAND* as a way of retaining and enhancing, for the US Air Force, the considerable benefits of civilian scientific thinking. The project got under way officially in December 1945, and in March 1946 *RAND* was launched as a freestanding division within the Douglas Aircraft Company of Santa Monica, California. This was the genesis of the earliest ‘think tank’.

Operations research, the brainchild conceived in the war years by the young men in the Office of Scientific Research and Development (OSRD), evolved in the 1950s into the speculative fabrications of systems analysis. *RAND* was its nursery. It was at *RAND* that the civilian defence intellectual who specialised in systems analysis took form¹³

Herman Kahn was one of the leading researchers at this newly developed research institute, and one of the most controversial. Kahn began his career in the late 1940s with the *RAND Corporation* as a physicist and mathematician. While working at *RAND*, his co-directorship of the Strategic Air Force Project inspired him to write *On Thermonuclear War*. Published first in 1960, the study simultaneously elevated him to national and international pre-eminence and made him the focus of much derision. *On Thermonuclear War* was the first book to analyse systematically the possible effects of nuclear war and the possible strategic options under various circumstances. In a later study, he expressed his basic investigative approach – which has a very precautionary ring to it – to nuclear war as follows:

I can believe the impossible’, Father Brown notes, in one of G.K. Chesterton’s wonderful priest-detective stories, ‘but not the improbable’.... Unlike Father Brown, we believe not only the impossible and the improbable, but also the implausible, the unlikely, and the unproven. We believe in them and we take them seriously, especially when they involve what is probably the central issue of our time – nuclear war.¹⁴

In the middle of the 20th century, researchers within the US military, and Kahn in particular, tried, with the aid of science, to deal with history before it happened. As Ghamari-Tabrizi observes:

¹³ S. Ghamari-Tabrizi, *The Worlds of Herman Kahn. The Intuitive Science of Thermonuclear War* (Cambridge, Massachusetts: Harvard University Press 2005).

¹⁴ H. Kahn, *Thinking about the Unthinkable in the 1980s* (New York: Simon and Schuster 1984).

The problem for national security was always the unknown unknowns. How can you defend against No Discernable Thing? ... [T]his book is precisely about the unknown unknowns of national security. It is about how analysts in the Cold War developed ways to fill in the ciphers of strategic uncertainty. It explores the peculiarly inventive quality of strategy, *how uncertainty becomes the wellspring of extravagant threat scenarios*. However much nuclear war planning – the fighting, termination, and survival of it – was presented to the public during the Cold War as a practical question for scientific deliberation, war planning could never be a matter of fact. Whether humankind could survive a nuclear war could only be resolved with reference to one's own beliefs about the social and natural world. To flesh out a world where clever men fashioned Something out of Nothing ... I offer a tale about Herman Kahn, a virtuoso of the unknown unknowns.¹⁵

Assessing risks and trying to frame 'unknown unknowns' constituted Kahn's playground, and from the 1960s onwards they were probed increasingly with fallible computer models. In *On Thermonuclear War* Kahn realised that uncertainty stalked the strategist at every point in his analysis. The multiple dimensions of uncertainty gave rise to the 'gap', Kahn's favourite and most compelling of notions. The concept of a 'gap' represented the unexpected and unknown possibilities that emerged from the mix of old and new weapon systems of both the US and the USSR at any one time.¹⁶ The 'gap' comprised either 'knowledge' – the other knows more of certain weapons technologies; 'procurement' – the other has more weapons; or 'operations' – the other has more insight into current strategic forces. Kahn's core problem was this: *how to prop up hypothetical vulnerabilities, above all unknown and undetectable ones, with exigency*. Kahn himself noted that

[t]hese unnoticed operational gaps may determine the course of events and are most likely to cause catastrophic failures of the system, but until one is faced with a disastrous failure, it is most difficult to take them seriously. In general, the only way to find operational gaps is by intense observation of the whole system, reflection on unconventional possibilities, and paper and pencil studies. This means that any gaps that are found will look hypothetical and unreal. It will be difficult for rigid thinkers, the budget-minded, the 'by assumption' type of analyst, the loyal member of an operating organisation, or the partisan advocate to take such worries seriously.¹⁷

Taken as a whole, Kahn's Utopian drive was 'simply' to transcend every earthly limit through human ingenuity, resolve, and technical and scientific prowess. In other words, being aware of the limitations of assessments, Kahn nevertheless thought it possible to overcome these limitations by 'informed

¹⁵ Ghamara-Tabrizi, above n. 13, at 1. Italics added.

¹⁶ H. Kahn, *On Thermonuclear War* (Princeton, Princeton University Press 1962) at 324.

¹⁷ *Id.*, at 325. Compare with WRR report, above n. 1, at 178.

judgement and intuition in addition to rigorous analysis'.¹⁸

At this point, work stemming from the Cold War touches at the heart of the precautionary culture we know today. Despite the fact that the WRR hails its own precautionary insights as novel, more than half a century later the work of Kahn cum suis precedes their work on multiple levels, including the way issues are actually phrased. Substitute the term nuclear war for, for example, nanotechnology, food safety, or phthalates and we have arrived in the 21st century with its precautionary preoccupations. However, the required bridge between on the one hand these mid-20th century nuclear worries and current precautionary fears on the other hand is found in the first report to The Club of Rome, which posited solutions to the 'world problematique' of which nuclear armament was just one of the many issues raised.¹⁹ All the same, its rise to fame was deeply embedded in the gloomy Cold War atmosphere that vexed Western citizens to such an extent. The notions of the report, in other words, found the fertile soil of nuclear threat that was very much felt in the 1960s and 1970s.

The Limits to Growth highlighted the impact of human behaviour on the earth's natural resources and the global society and tried to establish a link between the level of world economic growth and the extent to which our environmental resources are being depleted and polluted. Although The Club of Rome aimed to denounce the harmful effects of a productivity-oriented development policy, it wanted above all to demonstrate that, by pursuing growth, humankind was heading towards global catastrophe, one very much reminiscent of a nuclear doomsday. The main focus was exponential growth in a complex and closed world-system. The main preoccupation was the survival of humankind – bogged down by a political structure not deemed acceptable and not capable of handling the 'world problematique' – on a planet with obvious limited resources and clear political tensions, the most pronounced of which was the threat of nuclear war.

The Club of Rome's principal objective was to analyse and to understand – again with the aid of science-driven systems analyses run on computers – the basic interdependencies that link all the problems facing humankind across the globe, whatever the nature, very much like Kahn tried to do in relation to the effects of a nuclear exchange. The perception that they all interconnect was coined with the term 'world problematique'. It covers a vast sphere of innumerable difficulties confronting humankind, such as social injustice, malnutrition, poverty, illiteracy, unemployment, population growth,

¹⁸ Kahn, above n. 14, at 457.

¹⁹ D.H. Meadows and others, *The Limits to Growth; A Report for the Club of Rome's Project on the Predicament of Mankind* (New York: Potomac Associates 1972); See for an analysis: J.C. Hanekamp, S.W. Versteegen and G. Vera-Navas, 'The historical roots of precautionary thinking: The cultural ecological critique and "The Limits to Growth"' (2005) 8 *Journal of Risk Research* 295.

and the obsession with growth, inflation, the energy crisis, monetary problems, and the degeneration of cities, damage to the environment, the nuclear threat, and political corruption.²⁰ The term ‘world problematique’ pointed to the general feeling of anxiety – not just facts – felt by modern humans in the face of the uncertainty and complexity that came to be known as the ‘predicament of mankind’.

The fundamental thesis of exponential growth in a complex and closed world-system resulted in the projection that no matter how the future unfolds, collapse is imminent unless humankind curbs its growth, both economically and demographically. The Club of Rome, at that time, explicitly linked the risks of science and technology – nuclear power – to the inevitability of centralised assessment and abatement strategies. The goal of these assessment strategies was to gauge new technology in relation to the premeditated checks on growth:

This ignorance about the limits of the earth’s ability to absorb pollutants should be reason enough for caution in the release of polluting substances. The danger of reaching those limits is especially great because there is typically a long delay between release of a pollutant into the environment and the appearance of its negative effects on the ecosystem (at 89)

Pollution generated in exponentially increasing amounts can rise past the danger point, because the danger point is first perceived years after the offending pollution was released. (at 151)

We have felt it necessary to dwell so long on an analysis of technology because we have found that technological optimism is the most common and the most dangerous reaction to our findings from the world model. Technology can relieve the symptoms of a problem without affecting the underlying causes. (at 159)²¹

In the view of The Club of Rome science and technology needs to be assessed on a continuous basis in order to keep a firm grip on its development in order to maintain the envisioned steady-state requirements of economy and humanity in order to keep exponential growth at bay. The common enemy of exponential growth would hopefully unite humanity and thereby overcome political differences and nuclear destruction.

This view on science and technology and the role of governmental policy-making comes together in the precautionary principle, as we know it today. Kahn tried to tackle all uncertainties in relation to the risks of nuclear war and its aftermath, while The Club of Rome, within the same historical setting, tried to rise above the ‘world problematique’ and resolve uncertainties through strong international government that opened up the possibilities for precautionary global assessments of science and technology. *Both* approaches, however, carry the naivety of the ostensible potential to transcend earthly limits

²⁰ A. Peccei, *Human Quality* (New York: Pergamom Press 1977).

²¹ Meadows and others, above n. 19.

through human ingenuity, resolve and technical and scientific knack. *Both* posit the centrality of science. Before we come to that, however, we will first discuss two examples in which precaution and science have their role to play.

3 Risk and precaution – two examples related to human health²²

Chloramphenicol (CAP)²³ was the first antibiotic to be produced synthetically on a large scale; it was first shown to be effective against typhoid and was subsequently used extensively against a broad variety of pathogenic micro-organisms.²⁴ However, it has fallen out of favour in the West due to a rare yet serious side effect relating to medicinal use: namely, aplastic anaemia (in which the bone marrow ceases to produce red and white blood cells). Moreover, research has indicated that it is possibly a genotoxic carcinogen, although only at concentrations 25 times higher than could be achieved with the highest medical dosages.²⁵ Parenthetically, CAP is still very widely used in low-income countries because it is exceptionally cheap, and in the West it is also still widely used, albeit mostly in topical preparations (ointments and eye drops) for the treatment of bacterial conjunctivitis. CAP is banned for veterinary use.

A broad-spectrum antibiotic, CAP was detected in 2001 in shrimp imported into Europe from Asian countries; the discovery was understood to be yet another food scandal. The initial European response was to close European borders to fish products, mainly shrimp, from these countries and to make laboratories work overtime to analyse numerous batches of imported goods for the presence of this antibiotic. Some European countries went so far as to have food products containing the antibiotic destroyed, as public health was deemed to be at stake. This regulatory response spilled over into other major seafood-importing countries such as the United States.

The legislative background to this mainly European response in part is to be found in Council Regulation EEC No. 2377/90 (now superseded by Regulation EC No. 470/2009 as of the 6th of May 2009 we will comment on below), which was implemented to establish maximum residue limits of

²² Here we will not discuss environmental effects and occupational risks in relation to exposure.

²³ J. Ehrlich and others, 'Chloromycetin, a New Antibiotic From a Soil Actinomycete' (1947) 106 *Science* 417.

²⁴ J.C. Patel and D.D. Banker, 'Chloramphenicol in Typhoid Fever. A Preliminary Report of Clinical Trial in 6 Cases' (1949) 22 *British Medical Journal* 908.

²⁵ IPCS-INCHEM (Chemical Safety Information from Intergovernmental Organisations), <<http://www.inchem.org/documents/jecfa/jecmono/v33je03.htm>> (accessed 9 April 2009);

IPCS-INCHEM (2) (Chemical Safety Information from Intergovernmental Organisations), <<http://www.inchem.org/documents/jecfa/jecmono/v23je02.htm>> (accessed 9 April 2009).

veterinary medicinal products in foodstuffs of animal origin.²⁶ This so-called 'MRL Regulation' (maximum residue limit) introduced Community procedures to evaluate the safety of residues of pharmacologically active substances according to human food safety requirements. A pharmacologically active substance may be used in food-producing animals only if it receives a favourable evaluation. If it is considered necessary for the protection of human health, maximum residue limits ('MRLs') are established. They are the points of reference for setting withdrawal periods in marketing authorisations as well as for the control of residues in the Member States and at border inspection posts.

EEC No. 2377/90 contains an Annex IV listing of pharmacologically active substances for which no maximum toxicological levels (Tolerable Daily Intake: TDI) can be fixed, either from lack of toxicological or pharmacological data: for example, the absence of a definable NOAEL (No Observed Adverse Effect Level) or LOAEL (Lowest Observed Adverse Effect Level) or because of genotoxic characteristics of the compound in question.²⁷ These substances are consequently not allowed in the animal food-production chain. Zero tolerance levels are in force for Annex IV for reasons that can be classified as follows:

- Lack of scientific data de facto makes the establishment of a TDI unfeasible;
- The absence of a TDI and the subsequent impossibility to establish an MRL is understood in regulatory terms as 'dangerous at any dose', requiring zero tolerance regulation en lieu with Article 7 of Regulation 178/2002/EC;
- With the introduction of zero tolerance, a veterinary ban on Annex IV compounds (such as CAP) is in place, whereby the listed compounds, when producers' compliance is achieved, would disappear from the food chain;
- When zero tolerance was implemented, analytical equipment was only capable of detecting at the Limit of Detection (LOD) of ppm (parts per

²⁶ 'Council Regulation (EEC) No. 2377/90 of 26 June 1990 laying down a Community procedure to set up maximum residue limits of veterinary medicinal products in foodstuffs of animal origin' (1990) L224 *Official Journal of the European Communities* 1–8; 'Regulation (EC) No 470/2009 of the European Parliament and of the Council of 6 May 2009 laying down Community procedures for the establishment of residue limits of pharmacologically active substances in foodstuffs of animal origin, repealing Council Regulation (EEC) No 2377/90 and amending Directive 2001/82/EC of the European Parliament and of the Council and Regulation (EC) No 726/2004 of the European Parliament and of the Council' (2009) L152 *Official Journal of the European Communities* 11.

²⁷ Genotoxic agents (chemicals, ionising radiation) are those capable of causing damage to DNA. Such damage can potentially lead to the formation of a malignant tumour.

million; mg per kg); nowadays LODs are at least ppb (parts per billion; µg per kg), obviously depending on analysed chemicals.

No tolerable daily intake (TDI) could be established for CAP due to the lack of scientific information to assess its carcinogenicity and effects on reproduction, and because the compound showed some genotoxic activity.²⁸ Overall, CAP – and other Annex IV substances – should not be detected in food products at all, regardless of concentrations. The presence of CAP in food products, which can be detected by any type of analytical apparatus, is a violation of European law and deemed to be a threat to public health. In consequence, food containing the smallest amount of these residues is considered unfit for human consumption.

The core regulatory framework in European food law is Regulation 178/2002/EC, the General Food Law.²⁹ According to this Regulation, ‘food’ (or ‘foodstuff’) denotes ‘any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans’. The scope of Regulation 178/2002/EC concerns ‘all stages of the production, processing and distribution of food ...’ and its general objective is to provide ‘a high level of protection of human life and health and the protection of consumers’ interests ...’. This Regulation thus sets general rules for all products that are brought to market. Importantly, the Regulation also constitutes the European Food Safety Authority (EFSA) and defines the Authority’s task and fields of competence and authority.

With the installation of the EFSA, *precaution* is specifically referred to as a key principle in food regulation, which broadens the explanation of the emergence of the CAP scandal. Especially in relation to antibiotics used in animal rearing, regulation is pervasive and precautionary. This is partly related to reducing the chronic exposure through food as much as possible, but is also in part due to a precautionary risk averseness. Article 7 of the EFSA describes the precautionary principle as follows:

1. In specific circumstances where, following an assessment of available information, the possibility of harmful effects on health is identified but scientific uncertainty persists, provisional risk management measures necessary to ensure the high level of health protection chosen in the Community may be adopted, pending further scientific information for a more comprehensive risk assessment.
2. Measures adopted on the basis of paragraph 1 shall be proportionate and no more

²⁸ IPCS-INCHEM (Chemical Safety Information from Intergovernmental Organisations). See webpage <<http://www.inchem.org/documents/jecfa/jecmono/v33je03.htm>> (accessed 3 February 2009).

²⁹ ‘Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety’ (2002) L31 *Official Journal of the European Communities* 1.

restrictive of trade than is required to achieve the high level of health protection chosen in the Community, regard being had to technical and economic feasibility and other factors regarded as legitimate in the matter under consideration. The measures shall be reviewed within a reasonable period of time, depending on the nature of the risk to life or health identified and the type of scientific information needed to clarify the scientific uncertainty and to conduct a more comprehensive risk assessment.

The unfeasibility of zero-tolerance came to the fore as a result of the analytical progress made in the last two decades of the 20th century. CAP proved to be more ubiquitous in food – albeit at extremely low levels – than mere abuse could probably account for.³⁰ Moreover, it was clear that medicinal products, such as CAP, were banned for veterinary use not because of inherent risks at low-level exposures, on the contrary. JECFA (Joint Expert Committee on Food Additives, FAO) could not establish an Acceptable Daily Intake for lack of scientific data. In Europe this was expediently and erroneously translated, specifically within the context of the precautionary demands in the General Food Law, as ‘dangerous at any dose’ and officially regarded as such.

The regulatory and practical failure of zero-tolerance, and thereby the precautionary approach of food-safety, resulted in a regulatory shift.³¹ The European Commission published a decision on 11 January 2005, according to which CAP no longer is regulated at zero level but at the MRPL (Minimum Required Performance Limit) level.³² The MRPL for CAP is set at 0.3 ppb. Prior to this decision, MRPLs were whatever low concentration levels regulatory laboratories in the European Community could detect and confirm. With this decision MRPLs have now been given legal status in terms of explicit levels of concern. Regulation EC No. 470/2009, as the new regulatory standard for the establishment of residue limits of pharmacologically active substances in foodstuffs of animal origin we referred to above, specifically refers to the issue of LOD’s when it states in the preamble that ‘As a result of scientific and technical progress it is possible to detect the presence of residues of veterinary medicinal products in foodstuffs at ever lower levels.’ This has caused considerable problems that need to be amended of which this new regulation, superseding among others EEC No. 2377/90, is regarded as a step forward.

Ultimately, the precautionary regulatory position and human health perspective proved to be untenable in the case of CAP (but also for other antibiotics not allowed in the food chain and part of the Annex IV such as

³⁰ J.C. Hanekamp, G. Frapporti and K. Olieman, ‘Chloramphenicol, food safety and precautionary thinking in Europe’ (2003) 6 *Environmental Liability* 209.

³¹ J.C. Hanekamp and E. Calabrese, ‘Chloramphenicol, European Legislation and Hormesis’ (2007) 5 *Dose-Response* 91.

³² ‘Commission decision of 11 January 2005 laying down harmonised standards for the testing for certain residues in products of animal origin imported from third countries’ (2005) L16 *Official Journal of the European Union* 61.

nitrofurans) in the face of human health requirements and, more importantly, progressing scientific knowledge. Indeed, the term precaution is not mentioned once in Regulation EC No. 470/2009.³³

A *second* example, and a more complicated case considering the interaction between policy and the advancement of scientific knowledge, concerns man-made chemicals in casu phthalates. Phthalates are liquid organic compounds added to hard polyvinyl chloride (PVC) to act as softeners or plasticisers. These substances make the polymer more malleable and hence more versatile. Due to their low cost and excellent performance characteristics, phthalates are found in a wide range of products that contain PVC. They are used for medical devices, particularly fluid containers (e.g. blood and plasma), tubing, and gloves, as well as household and industrial items such as wire and cable coating, flooring, and clothing. The vast majority of phthalates are used in the production of flexible PVC. The phthalates that concern us here are DEHP (Di(2-ethylhexyl) phthalate), DBP (Dibutyl phthalate), BBP (Butylbenzyl phthalate), DINP (Di-iso-nonyl phthalate), DIDP (Di-iso-decyl phthalate), and DNOP (Di-n-octyl phthalate).

Overall, phthalates are known for their relative innocuous toxicological behaviour, both acutely and chronically. Nevertheless, they have been the focus of intense campaigning by environmental NGOs who brought the potential risks of those compounds to the fore from the 1990s onwards, as part of the NGO campaign against chlorine. The argument ran that if phthalates are manoeuvred out of the equation, the production of chlorine-containing PVC becomes industrially unattractive.³⁴ In terms of toxicity young children and babies were, and still are, the focus of attention, obviously for emotive reasons:

Children in contact with soft PVC toys may, therefore, ingest substantial quantities of phthalates during normal play, especially from toys specifically designed to be chewed. This is of concern, as phthalates are known to present a number of hazards. Although acute toxicity appears to be low, phthalates have been shown to cause a range of adverse effects in laboratory animals following longer exposure, including damage to the liver and kidney and, in some cases, effects on the reproductive tract³⁵

Despite (or rather *because* of) the provisional nature of scientific research phthalates toxicity, in December 1999, the European Commission adopted measures to prohibit the use of phthalate softeners in PVC toys and childcare

³³ Joint FAO/WHO Technical Workshop on Residues of Veterinary Drugs without ADI/MRL. (Bangkok, Thailand 24-26 August 2004) at 37.

³⁴ R. Stringer and others, *Determination of the Composition and Quantity of Phthalate Ester Additives in PVC Children Toys - Greenpeace Technical note 06/97* (Exeter: Greenpeace Research Laboratories 1997).

³⁵ B. Durodié, *Poisonous Propaganda. Global Echoes of and Anti-Vinyl Agenda* (Washington DC: Competitive Enterprise Institute 2000).

articles intended for oral use by children under three years of age.³⁶ Specific reference was made to precaution:

The Commission considers that, should the use of DNOP, DIDP, BBP, and DBP be allowed to replace DINP and DEHP, as a consequence of the prohibition of these two substances as plasticisers in the products in question, the exposure of children to them would increase and consequently the risk would be higher. Therefore, the Commission, adopting a precautionary approach, considers that this Decision should also apply to them;

The six phthalates under scrutiny here are now regulated under Directive 76/769/EEC.³⁷ DEHP, DBP and BBP are not allowed beyond concentrations of 0.1% (by mass) in toys and childcare articles. The term 'childcare article' denotes any product intended to facilitate sleep, for relaxation, hygiene, sucking, or the feeding of children.³⁸ DINP, DIDP, and DNOP are only banned beyond the same concentrations as above in toys and childcare articles that can be placed in the mouth. In all other toys and childcare articles, these compounds are still allowed.

In a move to ban phthalates altogether, DBP, DEHP, and BBP have now been put on the so-called Substances of Very High Concern (SVHC) list.³⁹ In the framework of the authorisation process, Member States Competent Authorities or the European Chemicals Agency may prepare dossiers for the identification of substances of very high concern. These substances are defined in Article 57 of Regulation (EC) No 1907/2006 (the REACH Regulation) and include substances that are carcinogenic, mutagenic or toxic to reproduction (abbreviated as CMR compounds); persistent, bioaccumulative and toxic

³⁶ 'Commission Decision of 7 December 1999 adopting measures prohibiting the placing on the market of toys and childcare articles intended to be placed in the mouth by children under three years of age made of soft PVC containing one or more of the substances di-iso-nonyl phthalate (DINP), di(2-ethylhexyl) phthalate (DEHP), dibutyl phthalate (DBP), di-iso-decyl phthalate (DIDP), di-n-octyl phthalate (DNOP), and butylbenzyl phthalate (BBP)' (1999) L31 *Official Journal of the European Union* 46.

³⁷ 'Council Directive 76/769/EEC of 27 July 1976 on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations' (1976) L262 *Official Journal of the European Union* 201.

³⁸ 'Directive 2005/84/EC of the European Parliament and of the Council of 14 December 2005 amending for the 22nd time Council Directive 76/769/EEC on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations (phthalates in toys and childcare articles)' (1976) L344 *Official Journal of the European Union* 40.

³⁹ See <http://echa.europa.eu/consultations/authorisation/svhc/svhc_cons_en.asp> (accessed 9 April 2009).

(abbreviated as PBT compounds) or very Persistent and very Bioaccumulative (vPvB); identified, on a case-by-case basis, from scientific evidence as causing probable serious effects to human health or the environment of an equivalent level of concern as those above (e.g. endocrine disruption).⁴⁰ It is proposed for DBP, DEHP, and BBP that they are identified as CMR, and we will look further shortly into these phthalates.

Phthalates have been in widespread use for some 50 years, and have been subject to many scientific assessments in relation to their safety. The IARC (International Agency for Research on Cancer) has categorised BBP⁴¹ and DEHP⁴² as not classifiable as to carcinogenicity (category 3), the C in the CMR labelling.⁴³ It should be noted that for DEHP the evaluation has been downgraded from 2B (*possibly* carcinogenic to humans) to 3. This means that for two of the three phthalates on the SVHC list there is no persuasive evidence that they are carcinogens. There is a lack of data concerning the carcinogenicity of DBP. However, phthalate esters are known to induce peroxisomal proliferation in the liver of mice and rats, which is related to tumour formation.⁴⁴ Many peroxisome proliferators have been shown to induce tumours when administered to mice and rats at high dose-levels for long periods, despite being non-genotoxic. It has also been shown that humans are insensitive or even non-responsive to peroxisome proliferators. Hence, carcinogenicity in humans related to phthalates' exposure is highly

⁴⁰ 'Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC' (2007) L136 *Official Journal of the European Union* 3.

⁴¹ IARC, *Some Chemicals that Cause Tumours of the Kidney or Urinary Bladder in Rodents and Some Other Substances - IARC Monographs on the Evaluation of Carcinogenic Risks to Humans Volume 73* (Lyon: World Health Organization 1999).

⁴² IARC, *Some Industrial Chemicals - IARC Monographs on the Evaluation of Carcinogenic Risks to Humans Volume 77* (Lyon: World Health Organization 2000).

⁴³ See for the recent European assessments of the European Chemicals Bureau on DBP, DEHP, and BBP: European Chemicals Bureau, *Dibutyl phthalate (DBP) - European Union Risk Assessment Report Volume 29* (Brussels: European Chemicals Bureau 2004); European Chemicals Bureau, *Bis(2-ethylhexyl)phthalate (DEHP)-European Union risk Assessment Report Volume 80* (Brussels: European Chemicals Bureau 2008); European Chemicals Bureau *Benzyl butyl phthalate (BBP) - European Union risk Assessment Report Volume 76* (Brussels: European Chemicals Bureau 2007).

⁴⁴ Peroxisomes are single-membrane sub-cellular organelles, present in most eukaryotic cells and organisms. The peroxisome fulfills essential metabolic functions in lipid metabolism. The peroxisome also plays a key role in free radical detoxification.

implausible.⁴⁵ There is now a scientific consensus that liver peroxisome proliferation in rodents is not relevant for human risk assessment. Concerning mutagenicity, the M in the CMR labeling, all three phthalates are considered to be non-mutagenic substances, which leaves us with reprotoxicity.⁴⁶

Reprotoxicity seems to be the most critical of the effects of exposure to phthalates. Based on all the available toxicological evidence, it can be surmised that effects on reproduction and development are the most sensitive end-points on which to base the risk assessment of phthalates. Focussing on reproductive disorders of newborn and young adult males, these seem to be common and/or increasing in incidence. It has been hypothesised that these disorders may comprise an overall testicular dysgenesis syndrome (TDS) with a common origin in fetal life.⁴⁷ This has been supported, to some extent, by findings in animal models involving fetal exposure to DBP, as well as other studies.⁴⁸ However:

It is unfortunate that many people wrongly consider that the TDS hypothesis is centered on the idea that it is caused by exposure to environmental chemicals, in particular, endocrine disruptors. The original hypothesis stated that there are likely to be multiple causes of TDS, one of which is exposure to environmental chemicals. However, there is still only limited evidence to support this possibility.⁴⁹ Perhaps confusion has arisen because the TDS hypothesis states that “endocrine disruption,” as encapsulated by altered testosterone production/action by the fetal testis, is at the center of the hypothesis ..., but this alteration could result from any genetic, lifestyle, or environmental factor that causes dysgenesis. Nevertheless, as studies with DBP and certain other phthalates have demonstrated, environmental chemicals that can cause dysgenesis and/or inhibit testosterone production or action, obviously have the right credentials for causing TDS. Whether the human fetus is exposed to sufficient levels of such chemicals to result in any adverse effect remains a point for debate, and is unlikely to be resolved easily because of the inherent difficulties in both obtaining accurate chemical exposure data for the early human fetus and then relating this to clinical outcomes months or decades later.⁵⁰

Concisely, phthalates still seem, when reviewing the scientific findings so far,

⁴⁵ R.C. Cattley and others, ‘Do Peroxisome Proliferating Compounds Pose a Hepatocarcinogenic Hazard to Humans?’ (1998) 27 *Regulatory Toxicology and Pharmacology* 47.

⁴⁶ See above n. 43.

⁴⁷ R.M. Sharpe and N.E. Skakkebaek, ‘Testicular dysgenesis syndrome: mechanistic insights and potential new downstream effects’ (2008) 89 *Fertility and Sterility* 33.

⁴⁸ See for example E. Mylchreest and others, ‘Dose-dependent alterations in androgen-regulated male reproductive development in rats exposed to Di(n-butyl) phthalate during late gestation’ (2000) 55 *Toxicological Sciences* 143.

⁴⁹ S.H. Swan and others, ‘Decrease in anogenital distance among male infants with prenatal phthalate exposure’ (2005) 113 *Environmental Health Perspectives* 1056.

⁵⁰ Sharpe and Skakkebaek, above n. 47.

innocuous chemicals, that is non-carcinogenic and non-mutagenic, with reprotoxicity as the potential exception for some phthalates. Furthermore, the latter is part of the wider context of the proposed multiple-cause testicular dysgenesis syndrome. This leaves us with a complex scientific issue that European policymakers have simply circumvented by banning phthalates from the realm of the consumer, despite the fact that exposure to these compounds from especially food (except perhaps for DBP and DEHP) is well below the Tolerable Daily Intake (TDI), which is an estimate of the quantity of a chemical in food or water which can be ingested daily over a lifetime without posing a significant risk to health.⁵¹

Even though in the mid 1990s nothing was even remotely clear concerning the involved risks, a precautionary ban seemed appropriate as no scientific certainty (whatever that may be) is required (see below), or as Ewald proposes in relation to the function of precaution:

For one must take all hypotheses into account, even and *in particular* the most dubious, one must be wide open to speculation, to the craziest imagined views. ... With precaution, science becomes a principal of challenge. ... Effectively science today interests us less by producing new knowledge than introducing new doubts. ... [A]ll that can be excluded is that anything should be excluded.⁵²

⁵¹ TDIs are derived from No Observed Adverse Effect Levels (NOAEL) established in animal experiments. TDI= NOAEL/100 (or 200 in the case of DBP); ‘Opinion of the Scientific Panel on Food Additives, Flavourings, Processing Aids and Materials in Contact with Food (AFC) on a request from the Commission related to Butylbenzylphthalate (BBP) for use in food contact materials Question N° EFSA-Q-2003-190’ (2005) 241 *The EFSA Journal* 1; ‘Opinion of the Scientific Panel on Food Additives, Flavourings, Processing Aids and Material in Contact with Food (AFC) on a request from the Commission related to Di-Butylphthalate (DBP) for use in food contact materials. Question N° EFSA-Q-2003-192’ (2005) 242 *The EFSA Journal* 1; ‘Opinion of the Scientific Panel on Food Additives, Flavourings, Processing Aids and Materials in Contact with Food (AFC) on a request from the Commission related to Bis(2-ethylhexyl)phthalate (DEHP) for use in food contact materials Question N° EFSA-Q-2003-191’ (2005) 243 *The EFSA Journal* 1; ‘Opinion of the Scientific Panel on Food Additives, Flavourings, Processing Aids and Materials in Contact with Food (AFC) on a request from the Commission related to Di-isobutylphthalate (DIBP) for use in food contact materials Question N° EFSA-Q-2003-194’ (2005) 244 *The EFSA Journal* 1; ‘Opinion of the Scientific Panel on Food Additives, Flavourings, Processing Aids and Materials in Contact with Food (AFC) on a request from the Commission related to Di-isodecylphthalate (DIDP) for use in food contact materials Question N° EFSA-Q-2003-195’ (2005) 245 *The EFSA Journal* 1.

⁵² F. Ewald, ‘The return of Descartes’s Malicious Demon: An Out line of a Philosophy of Precaution’, in T. Baker and J. Simon (eds.), *Embracing Risk, the changing culture of insurance and responsibility* (Chicago: The University of

A decade later, the issue of reprotoxicity has come to the fore more clearly, yet has not been elucidated to the extent of mechanistic understanding within the multi-causal web of TDS. It might be argued that precaution, in hindsight, was warranted for the relevant phthalates and Ewald is on track with his understanding of precaution. However, science, as a means to choose between rival hypotheses about the hidden structure of the world,⁵³ is thereby sidetracked and can *here* only serve as a retrospective confirmation *or falsification* of suspected risks, despite the fact that the latter is hardly ever honoured by lifting a ban or reversing precautionary legislation.⁵⁴ Justice delayed is justice denied. Moreover, one potential example in favour of some precautionary legislation (the scientific jury is yet to come in with regards to the matter of reprotoxicity) does not exonerate the precautionary principle as such, far from it. It is less than evidence in favour of the expediency of precaution, as precaution can by definition function *only ex ante* that is without the comforts of retrospection. Retrospection is not precaution. Thus we are left here with the nagging question: ‘How does science work in precautionary culture?’ We will address this in due course.

4 Schematising opposing views on science and risk in a cautious culture – towards acceptability⁵⁵

Worldviews shape and influence the process of scientific inquiry. Clearly, good science is worldview neutral, that is to say that it is not aligned to, nor does not support, any particular ideology, religion or worldview *over another*.⁵⁶ Indeed, theories, hypotheses and concepts should be accepted in the light of

Chicago Press 2002) at 289. I gratefully acknowledge Tobias Arnoldussen for supplying me this reference.

⁵³ P. Godfrey-Smith, *Theory and Reality* (Chicago: University of Chicago Press 2003).

⁵⁴ See e.g. relation to bacterial resistance and Antibiotic Growth Promoters: I. Phillips and others, ‘Does the use of antibiotics in food animals pose a risk to human health? A critical review of published data’ (2004) 53 *Journal of Antimicrobial Chemotherapy* 28; A. Bezoen, W. Van Haren and J.C. Hanekamp, *Emergence of a Debate: AGPs and Public Health* (Amsterdam: Heidelberg Appeal Foundation 1999).

⁵⁵ Derived from: J.C. Hanekamp and A. Bast, ‘Why RDA’s and UL’s are incompatible standards in the U-Shape Micronutrient Model. A philosophically orientated analysis of micronutrients standardisations’ (2008) 28 *Risk Analysis* 1639

⁵⁶ M. Weber, *On the Methodology of the Social Sciences* (New York: Free Press 1949).

considerations that involve transparent, and reproducible empirical evidence,⁵⁷ other (accepted) theories, and overt *epistemic* values such as consistency, simplicity, integrity, and descriptive, explanatory and predictive power only.⁵⁸ These epistemic values are essential as no theory or hypothesis can ever be verified completely. A scientist is rationally entitled to hold his/her beliefs in relation to the theories at hand with a commitment that surpasses the strength of the evidence (for *or* against).⁵⁹

Progress requires that most scientists get themselves in the grip of a theory which they aim to develop and defend, and without simply trying to dispose of it as fast as possible.⁶⁰

Securing objective knowledge therefore does not abide by the expectations, wishes, and demands of the *global audience* – citizens, NGOs, economic parties, governments, and so forth. Science does not easily accommodate majority consensus views or, for that matter, minority views. Here, the term objectivity involves some kind of impartiality, a lack of bias, basically distinguishing between two ways of forming beliefs about the hidden structure of the world: one way that is dependent on, say, caprice, prejudice, expectations (and other non-epistemic determinants); and one that avoids such influences.⁶¹ Objectivity as defined ties into the *impersonal notion of evidence* as understood in science. If scientists try to convince the rest of the scientific community of the adequacy of the explanations they have put forward in order to have their theories accepted as a part of the *corpus* of scientific knowledge, then their evidence *e* cannot constitute personal reasons for believing hypothesis *h*. The scientists claim that *e* provides grounds for *anyone* to be convinced that *h*. Although evidence in science should not be relative to a person it is contextualised in relation to historical and epistemological circumstances surrounding the evidential claim. Scientists can *invoke* evidence the moment it is understood as evidence, within the context of a certain theory grasped by the

⁵⁷ See for a discussion thereon: L.J. Snyder, 'Is Evidence Historical?' in M. Curd and J.A. Cover (eds.), *Philosophy of Science. The Central Issues* (New York: W. W. Norton & Company 1998) at 460.

⁵⁸ M. Stenmark, *How to Relate Science and Religion. A Multidimensional Model* (Cambridge: Wm. B. Eerdmans Publishing Co. 2004). (Religion is referred to in the wider context as worldviews).

⁵⁹ M. Stenmark, *Rationality in Science, Religion, and Everyday Life. A Critical Evaluation of Four Models of Rationality* (Notre Dame, Indiana: University of Notre Dame Press 1995) at 136; see also: W.E. Jones, 'Explaining Our Own Beliefs: Non-Epistemic Believing and Doxastic Instability' (2002) 111 *Philosophical Studies* 217.

⁶⁰ W.H. Newton-Smith, *The Rationality of Science* (London, New York: Routledge 1981) at 75.

⁶¹ P. Godfrey-Smith, *Theory and Reality* (Chicago: University of Chicago Press 2003).

experts. Before that, evidence is still evidence yet simply not recognised as such.⁶²

With the *modern* use of science, risks can, and in fact are, assessed as a result of which public policies are constructed that add measurably to especially public health and safety.⁶³ This 20th century development came about within the context of the tremendous increase and diffusion of wealth, which boosted health unequivocally in not only Western world population.⁶⁴ With growing wealth and health came the institutions that, through science, tackled health and safety issues both on the short and long-term. The 20th century problems of poverty-induced undernourishment on account of economic depressions and war, for instance, proved to be powerful drivers for scientists to develop one of the first food standards – the RDAs (Recommended Daily Allowances) for vitamins and minerals – that improved overall 20th century public health decisively.⁶⁵

Then again, with the rise of *precautionary culture*, the role of science as a means to secure objective knowledge (as defined above) has noticeably changed. In modern Western societies, as material needs are met for most people, the logic of wealth distribution that has shaped the Western world, loses its immediate relevance,⁶⁶ subsequently assenting to the logic of risk distribution.⁶⁷ A society in which citizens are privileged to enjoy and to value their health, wealth, safety, security, and longevity paradoxically becomes gripped by the hazards and potential threats unleashed by the exponentially growing wealth-producing forces that mark the later stages of modernity.⁶⁸ Previously, during the early stages of modernity, these hazards were not prioritised because coping with and surmounting poverty, hunger, and disease

⁶² Snyder, above n. 57.

⁶³ R.C. Barnard, 'A New Approach to Risk Assessment Integrating Scientific Evaluation and Economic Assessment of Costs and Benefits' (1996) 24 *Regulatory Toxicology and Pharmacology* 121.

⁶⁴ J.M. Hollander, *The Real Environmental Crisis. Why Poverty, Not Affluence, Is the Environment's Number One Enemy* (Berkeley, Los Angeles, London: University of California Press 2003); J.M. Friedman, *The Moral Consequences of Economic Growth* (New York: Alfred A. Knopf 2005).

⁶⁵ I. Leitch, 'The Evolution of Dietary Standards' (1942) 11 *Nutrition Abstracts and Reviews* 509; A.E. Harper, 'Contributions of Women Scientists in the U.S. to the Development of Recommended Dietary Allowances' (2003) 133 *The Journal of Nutrition* 3698.

⁶⁶ U. Beck, *Risk Society: Towards a New Modernity* (London: Sage Publications 1992).

⁶⁷ J.C. Hanekamp, 'Precaution and Cholera: A Response to Tickner and Gouveia-Vigeant' (2006) 26 *Risk Analysis* 1013.

⁶⁸ A.P.J. Mol and G. Spaargaren, 'Environment, Modernity, and the Risk-society: The Apocalyptic Horizon of environmental Reform' (1993) 8 *International Sociology* 431.

were the overriding societal interests. As Beck asserts:

The driving force in the class society can be summarized in the phrase: *I am hungry!* The collective disposition of the risk society, on the other hand, is expressed in the statement: *I am afraid!*⁶⁹

Therefore, in contemporary *post-modern* society the goal of affluence yields to that of life-term (indeed inter-generational) safety.⁷⁰

Concomitantly, in economically and industrially highly developed societies, diverse regulation of a mainly precautionary nature⁷¹ has found its way into many areas.⁷² The shift of societies to a culture of precaution galvanises citizens' insistence on *advance proof* that activities and products pose no long-term risk to human and environmental health.⁷³ Scientific research and regulation caters for this 'risk management of everything'.⁷⁴ Lest we forget, there *is* a strong desire among mass-public citizens in the Western world to believe that they live in, and need to live in a world made predictable by science. There is an equally strong desire among elite citizens working in the media, business, and government to appear to be doing the right thing by ritualistically consulting *seemingly au fait* analysts and consultants (technocratic, scientific, religious or otherwise) from well-known institutes in order to 'grasp the future'.⁷⁵ Science as a result has become heavily politicised and commercialised. The increasing public and political focus on safety, security, and predictability propels scientific research in growing and disparate fields, initiating, for lack of a better term, the 'scientification' (or perhaps the objectification) of risk and uncertainty.⁷⁶

⁶⁹ Cited from: M.J. Cohen, 'Risk Society and Ecological Modernisation. Alternative Visions for Post-Industrial Nations' (1997) 29 *Futures* 105.

⁷⁰ See for a commentary thereon: G.B. Gori, 'Science, Imaginable Risks, and Public Policy: Anatomy of a Mirage' (1996) 23 *Regulatory Toxicology and Pharmacology* 304.

⁷¹ The precautionary *principle* has been incorporated in more than 50 multilateral agreements. A. Trouwborst, *Evolution and Status of the Precautionary Principle in International Law* (The Hague: Kluwer Law International 2002).

⁷² J. Stern and J.B. Wiener, 'Precaution Against Terrorism' (2006) *Harvard University Faculty Research Working Papers*, available at <<http://ssrn.com/abstract=902373>> (accessed 9 April 2008).

⁷³ A. Burgess, 'Flattering Consumption. Creating a Europe of the Consumer' (2001) 1 *Journal of Consumer Culture* 93.

⁷⁴ M. Power, *The Risk Management of Everything: Rethinking the Politics of Uncertainty* (London: Demos 2004).

⁷⁵ See for instance: P.E. Tetlock, *Expert Political Judgment: How Good Is It? How Can We Know?* (Princeton: Princeton University Press 2005).

⁷⁶ See for instance: I. Forrester and J.C. Hanekamp, 'Precaution, Science and Jurisprudence: a Test Case' (2006) 9 *Journal of Risk Research* 297; see further: U. Beck, 'The Anthropological Shock: Chernobyl and the Contours of the Risk

Still, scientists are quite aware of the limitations of scientific knowledge. As mentioned, verification within science is beyond our capabilities. Indeed, examples abound in which science comes up with surprising new insights that overturn old ideas and concepts. In the celebrated BBC documentary *The Ascent of Man*, Jacob Bronowski memorably assessed what science in fact is:

... Science is a very human form of knowledge. We are always at the brink of the known; we always feel forward for what is to be hoped. Every judgement in science stands on the edge of error and is personal. Science is a tribute to what we can know, although we are fallible. In the end, the words were said by Oliver Cromwell: 'I beseech you, in the bowels of Christ, think it possible you may be mistaken'.

When we expand our demands for safety, as precautionary culture does, into a by definition *unknown* distant future, the confines of even our best scientific knowledge will surface progressively more poignantly. Here we enter the realm of uncertainty, and cross over from modernity to post-modernity:

Because we don't drop dead [because of the implementation of a technology; *authors*], we allow ourselves to draw our boundaries of consideration much narrower than they should be. *Boundaries over space and time* are nearly always much narrower than the boundaries that include the cause. When the boundaries are made appropriately larger, they embrace more of our ignorance and more ambiguity⁷⁷

Those who entertain seriously the conviction that science ('the boundaries of consideration') should transgress its fundamental confines of space and time in order to address the many perceived long-term risks, need quite a robust belief in what science *can* and *must* deliver. On the one hand, they can find obvious support in the fact that citizens of the Western world *have* experienced increasing wealth, safety, security, and longevity *because of* science and technology. On the other hand, however, a high level of confidence regarding what science is supposed to deliver is offset by a high level of scepticism with regard to what science cannot and should not do. In modern society, scepticism about science's capacity to secure objective knowledge, illustrated by the erosion of the idea or ideal of autonomous knowledge and autonomous law,⁷⁸

Society' (1987) 32 *Berkeley Journal of Sociology: A Critical Review* 153; J. Bourke, *Fear. A Cultural History* (London: Virago Press Ltd. 2005).

⁷⁷ C. Raffensperger and J. Tickner (eds.), *Protecting Public Health and the Environment: Implementing the Precautionary Principle* (Washington DC: Island Press 1999) at xvii, italics added.

⁷⁸ See for example R.M. Unger, *Knowledge & Politics* (New York: The Free Press 1975).

lent aid to the shift to the notion of *inter-subjective* knowledge.⁷⁹ It is merely a matter of degree to claim that all knowledge is related to interests and power.⁸⁰ 'Finding the truth' has throughout the 20th century been increasingly accompanied by 'winning the power struggle'.⁸¹ New knowledge always carries the potential risk that it will upset agreed-upon concepts, policies and power structures based on 'established' scientific knowledge. Science thus finds itself between Scylla and Charybdis. On the one hand it is looked at as the discerning field of authority and advice, and not without cause. On the other hand it is regarded as being the all-pervasive origin of many risks that might materialise in a distant future.

Part of the scientific community has sought to respond to this dilemma and thereby helped shape the approach of *acceptability*.⁸² Because of their likely positive social and environmental outcomes, for instance, particular directions in scientific and social inquiry should be favoured.⁸³ Put differently, scientific inquiry, at the same time, should be explanatory, normative, practical and self-reflexive. Ideally, the acceptability approach should empower people with capacities to reason critically and to assess sharply the conflicting (scientific) argumentations that play an important role in their lives.⁸⁴ The UK government's inquiry into the purported adverse health effects of mobile phones, concluded that in future 'non-peer reviewed papers and anecdotal evidence should be taken into account' as part of the process for reaching decisions on these matters.⁸⁵

The modern scientific effort to secure objective knowledge in precautionary culture is transformed into the post-modern goal of *acceptability* and strategies of, for instance, safety through governance, as it is thought that society is continually threatened by numerous unknown dangers. At this juncture science cannot secure objective knowledge as we are dealing with remote probabilities that might (or might not) materialise in a distant future. A

⁷⁹ M. Polanyi, *Personal Knowledge. Towards a Post-Critical Philosophy* (London: Routledge 1958).

⁸⁰ See on this discussion: J. Ravetz and S. Funtowicz, 'Post-Normal Science – an insight now maturing' (1999) 31 *Futures* 641; J.R. Ravetz 'What is Post-Normal Science' 1999 31 *Futures* 647.

⁸¹ B. Williams, *Truth & Truthfulness: An Essay in Genealogy*. (Princeton: Princeton University Press 2002); see also: M. Foucault, 'Truth and Power' in M.P. Lynch (ed.), *The Nature of Truth. Classic and Contemporary Perspectives* (Cambridge, Massachusetts: The MIT Press 2001).

⁸² G. Boger, 'Subordinating Truth-Is Acceptability Acceptable?' (2005) 19 *Argumentation* 187.

⁸³ M. Raskin, *Story Telling Time*, available at <http://www.zmag.org/Science_Wars/raskin.htm> (accessed 8 December 2008).

⁸⁴ Boger, above n. 82.

⁸⁵ Independent Expert Group on Mobile Phones, *Mobile Phones and Health* (Didcot: National Radiological Protection Board 2000) at 102.

culture of fear has emerged.⁸⁶ The modern approach centres on risks that can be assessed more or less confidently, and policies, which aim to prevent major health problems, will include the majority of the population, as the history of RDAs has shown.⁸⁷ Conversely, the more post-modern approach deals with health risks that are much more explicitly viewed as uncertain, as underlined by the latest WRR report, and are explicated in the examples we discussed above. Ewald emphasizes this with the notion that

[p]recaution starts when decisions must be made by reason of and in the context of scientific uncertainty. Decisions are therefore made not in a context of certainty, nor even available knowledge, but of doubt, suspicion, premonition, foreboding, challenge, mistrust, fear, and anxiety.⁸⁸

In what way then is precaution beneficial here? It seems that the deemed benefits lie in managing, or even perhaps containing, uncertainty. This was the aspect that disturbed Kahn the most in his attempts to frame the contours of nuclear war, and seems to be at the core of what we now call sustainability that is

the ability of humanity to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional changes are made consistent with future as well as present needs.⁸⁹

⁸⁶ F. Furedi, *Culture of Fear: Risk-Taking and the Morality of Low Expectations* (London: Continuum International Publishing Group 1997); see also Bourke, above n. 76.

⁸⁷ Hanekamp and Bast, above n. 55.

⁸⁸ Ewald, above n. 52, at 294.

⁸⁹ World Commission on Environment and Development (WCED), *Our Common Future* (Oxford: Oxford University Press 1987); Despite the popularity of the 'Brundtland definition' of sustainability, already in the 18th century Hans Carl von Carlowitz coined the term 'nachhaltige Entwicklung' (sustainable development) in relation to forestry (1713). A shortage of wood was becoming problematic in Germany and the rest of Europe because of increasing population and declining stocks of wood for heating and industrial energy production. Moreover, wood was a major construction material for houses, buildings and ships. Von Carlowitz therefore proposed that in the exploitation of forests, an equilibrium between production and consumption should be maintained as to the benefit of present and future generations(!). 'Nachhaltende Nutzung' – continuous exploitation – of forests could thereby be achieved; H. van Zon, *Geschiedenis en Duurzame Ontwikkeling. Duurzame ontwikkeling in historisch perspectief: enkele verkenningen* (Rotterdam: Netwerk Duurzaam Hoger Onderwijs 2002) [*History and Sustainable Development. Sustainable development in an historical perspective: selected studies*].

Perhaps, sustainability should best be understood as the attempt to end uncertainty about humanity's future in a world 'tainted' by human hands.

5 Sustainability or the 'end of uncertainty'

The precautionary principle seeks to advance the timing and to tighten the stringency of *ex ante* regulation. On these sliding scale dimensions, regulation is 'more precautionary' when it intercedes earlier and/or more rigorously in order to preclude uncertain future adverse consequences of particular human activities.⁹⁰ The axiom put forward in the precautionary principle is for a given human *activity* that may have a specified or unspecified *effect* on the environment and/or human health, the precautionary principle is supposed to designate *the remedy*.⁹¹ Precaution is viewed as the core principle for achieving a 'sustainable' (global) society where the risks and uncertainties, which ill-considered scientific and technological developments might present for contemporary and future generations, are contained. The hopes are that the precautionary principle will generate a new law system with universal girth that will protect the present and future generations against the environmental and health risks associated with the highly and technologically evolved production methods and consumption patterns. *Precaution therefore is regarded as the lodestar on the road to sustainability.*

The *Bergen Ministerial Declaration on Sustainable Development in the ECE Region* of 1990, for example, states that 'In order to achieve sustainable development, policies must be based on the precautionary principle. Environmental measures must anticipate, prevent and attack the causes of environmental degradation ...'.⁹² Prudence is required to prevent damage to the world's ecosystems, in order to ensure that the environment has a good future and that it should not be further shaken by recourse to technologies whose effects are controversial or uncertain. Technology that might be inimical to sustainable development should perhaps not be used at all, or used only moderately, or be subject to certain safeguards.

Now, sustainability is not an easy goal to define or indeed to comprehend. Many societies have been sustainable only by regular adaptation. In this context, the environmental historian McNeill notes that history offers many examples of apparently unsustainable societies that nevertheless endured

⁹⁰ J.B. Wiener, 'Precaution in a Multi-Risk World' (2001) *Duke Law School Public Law and Legal Theory Working Paper Series*, Working Paper No. 23.

⁹¹ N.A. Manson, 'Formulating the Precautionary Principle' (2002) 24 *Environmental Ethics* 263.

⁹² J. Peel, *The Precautionary Principle in Practice: Environmental Decision-Making and Scientific Uncertainty* (Annandale, Australia: The Federation Press 2005).

for long periods of time.⁹³ The *World Commission on Environment and Development*, named after its chairperson the then prime minister of Norway Gro Harlem Brundtland, has defined sustainability most famously (see above). However, many more definitions are in existence particularly adding to the complexity of the issue.⁹⁴

In the past, as is the common perspective, the impact of human societies on the physical world is regarded as relatively limited. The unprecedented scientific and technological developments of the last two centuries have made it possible for man to damage not only large areas of the globe we inhabit, but the globe itself.⁹⁵ However, the negative effects of these developments on human health or the environment are not always apparent at once. Few would have predicted a century ago what the motorcar has done to change the world, or that asbestos might have fatal effects on factory workers. When King James the Sixth of Scotland (and First of England) published his 'Counterblaste to Tobacco', his was probably a minority opinion. Nowadays, the medical profession worldwide, not to mention the WHO, would echo his condemnation of smoking as

a custome lothsome to the eye, hatefull to the Nose, harmefull to the braine, dangerous to the Lungs, and in the blacke stinking fume thereof, neerest resembling the horrible Stigian smoke of the pit that is bottomelesse.⁹⁶

Precaution and sustainability are closely related to each other. One could argue that they are both sides of the same coin. As such, the precautionary principle impresses upon us a moral obligation to take care of the environment, of

⁹³ J. McNeill, *Something New Under the Sun. An Environmental History of the Twentieth Century* (New York: W.W. Norton & Company 2001).

⁹⁴ S. Murcott, 'Appendix A: Definitions of Sustainable Development,' *AAAS Annual Conference, IASA 'Sustainability Indicators' Symposium* (Seattle: Massachusetts Institute of Technology 1997).

⁹⁵ The point has been made, however, that changing the face of the earth has been systematic and widespread throughout human history, not just in the past 200 years. For example, some 50,000 years ago hunter-gatherers arrived in Australia and fundamentally transformed its ecosystem with the use of fire. Some 11,000 years ago, hunter-gatherers' technology played an important, perhaps decisive, part in the extinction of most of the megafauna in the Americas. Moreover, 1,200 years ago the Maori landed in New Zealand and promptly killed off all the giant Moa and turned the eastern plain of the South Island from a forest into grassland. Were these hunters-gatherers 'systematic' in their effect on nature? Decidedly so. They burned fields and forests seasonally when dry but not too dry, and harvested animals in accordance with their predictable behaviours and migrations; see for further reading: R.D.E. MacPhee (ed.), *Extinctions in Near Time: Causes, Contexts, and Consequences* (New York: Kluwer Academic, Plenum Publishers 1999).

⁹⁶ See <<http://www.laits.utexas.edu/poltheory/james/blaste/>> (accessed 9 April 2009).

humankind, our children, and our children's children. Indeed, as stated by the European Commission:

The dimension of the precautionary principle goes beyond the problems associated with a short or medium-term approach to risks. It also concerns the longer run and the well-being of future generations.⁹⁷

Similarly, the World Commission states that 'hope for the future is conditional on decisive political action now to begin managing environmental resources to ensure both sustainable human progress and human survival'.⁹⁸

Thus, uncertainty about the future of us humans and the planet needs to be tackled in a manner that is sustainable. Precaution is the farsighted means to attain a level of certainty about our way of life and how to make adjustments in accordance with this sustainable perspective. Whether or not this is at all feasible hinges on the viability of the precautionary principle. This viability is the subject of the next paragraph.

6 Neither acceptable nor delimiting uncertainty – a critique of the logic of precaution

The justifications advanced by proponents of the precautionary principle for adopting its prescriptions revolve around the inevitable limitations in our ability to predict which activities will cause severe, irreversible harms.⁹⁹ Uncertainty

⁹⁷ Commission of the European Communities, *Communication from the Commission on the Precautionary Principle* (Brussels: Commission of the European Communities 2000).

⁹⁸ See the World Commission on Environment and Development, above n. 89, at 18.

⁹⁹ Although the literature critical of precaution is growing, the mainstream of legal and scientific literature is supportive of precaution. For an overview – though highly incomplete – from different fields of inquiry of the mainstream position on precaution see among others W.Th. Douma, 'The Precautionary Principle' (1996) 49 *Úlfjótur* 417; O. McIntyre and T. Mosedale, 'The Precautionary Principle as a Norm of Customary International Law' (1997) 9 *Journal of Environmental Law* 221; C. Raffensperger and P.L. deFur, 'Implementing the Precautionary Principle: Rigorous Science and Solid Ethics' (1999) 5 *Human and Ecological Risk Assessment* 933; S. Haller, 'A Prudential Argument for Precaution under Uncertainty and High Risk' (2000) 5 *Ethics and the Environment* 175; K.K. Jensen, 'The Moral Foundation of the Precautionary Principle' (2001) 15 *Journal of Agricultural and Environmental Ethics* 39; D. Kriebel and others, 'The precautionary principle in environmental science' (2001) 109 *Environmental Health Perspectives* 871; D. Vanderzwaag, 'The Precautionary Principle and Marine Environmental Protection: Slippery Shores, Rough Seas, and Rising Normative Tides' (2002) 33 *Ocean Development & International Law* 165; M. Faure and E. Vos, *Juridische afbakening van het voorzorgbeginsel: mogelijkheden en grenzen* Gezondheidsraad studie A03/03 (The

abounds when human activities are reviewing. Rolston remarks that

[w]ith ever higher technology, it seems that our power to produce changes overshoots increasingly our power to foresee all the consequences. ... In a way our ignorance outpaces our knowledge; thus, we are asking for trouble unless we slow down the introduction of potentially more potent novel changes *with adequate pretesting*. The unforeseen consequences outnumber the foreseen consequences, and the bad unforeseen consequences greatly outnumber the good unforeseen consequences. Serendipity is rare in high technology.¹⁰⁰

The logical difficulty of precaution is the fact that any true node in a decision tree *must at the very least have two branches*: we may either undertake a certain action or we may refrain from undertaking it.¹⁰¹ Each of these choices – action and inaction – entails consequences, both foreseen and unforeseen. Both carry uncertainties. However, it is crucial to remember that a decision *not* to undertake an action is as much an action as is the undertaking of it. As such, not acting opens us to the risks of sins of omission:

A legal parallel may be instructive here. In the context of sales transactions, a seller who fails to disclose to the buyer certain known and relevant information, but who has otherwise been truthful, harms the buyer. The seller has not misrepresented a material fact, there is no fraud in this transaction. Rather, the failure to disclose the information itself is the harm. The harm comes from an inaction on the part of the seller, not from a bad action. Inaction no less than action carries with it the potential for harm.¹⁰²

So we are confronted with a Catch-22. To which choice of the very simple two-option node in the decision tree should we apply precaution? Each branch, obviously, carries with it certain foreseen risks along with certain unforeseen risks. But as the unforeseen risks for each branch may well be devastating, how

Hague: Gezondheidsraad 2003) [*Legal contours of the precautionary principle: possibilities and limitations*]; J. Tickner and M. Martuzzi (eds.). *The precautionary principle: protecting public health, the environment and the future of our children*. Background document for the Fourth Ministerial Conference on Environment and Health, Budapest, Hungary, 23–25 June (Copenhagen: World Health Organization 2004); M. Deblonde and P. Du Jardin, ‘Deepening a Precautionary Policy’ (2005) 18 *Journal of Agricultural and Environmental Ethics* 319; World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), *The Precautionary Principle* (Paris: United Nations Educational, Scientific and Cultural Organization 2005).

¹⁰⁰ See above n. 11, at 319, italics added.

¹⁰¹ W.J. McKinney and H. Hammer Hill, ‘Of Sustainability and Precaution: The Logical, Epistemological, and Moral Problems of the Precautionary Principle and Their Implications for Sustainable Development’ (2000) 5 *Ethics and the Environment* 77.

¹⁰² *Id.*

can we decide which branch to take?¹⁰³ The precautionary principle therefore does not provide any guidance whatsoever. As Sunstein explains:

The real problem with the Precautionary Principle ... is that it is incoherent; it purports to give guidance, but it fails to do so, because it condemns the very steps that it requires. The regulation that the principle requires always gives rise to risks of its own – and hence the principle bans what it simultaneously mandates. I therefore aim to challenge the Precautionary Principle not because it leads in bad directions, but because read for all it is worth, it leads in no direction at all. The principle threatens to be paralyzing, forbidding regulation, inaction, and every step in between. It provides help only if we blind ourselves to many aspects of risk-related situations and focus on a narrow subset of what is at stake. That kind of self-blinding is what makes the principle seem to give guidance;¹⁰⁴

The precautionary principle therefore engenders an impossible arrangement, as risks are on *all* sides of the societal and regulatory equation. To ‘decide on a safe course’, in this case precautionary inaction, results in the formation of other and new (and most probably unforeseen) risks, which, by definition, evokes a secondary precautionary response, *ad infinitum*. In other words, even if an effect of human activity is catastrophic, that fact alone cannot rationally compel us to impose a precautionary remedy unless we *also* know that the remedy itself does not lead to catastrophic results. Obviously we do not know the effect of the precautionary remedy, since we do not know the effect against which precautionary regulation is targeted. It is one thing to be aware of a certain detrimental or destructive *phenomenon*; for example cancer; it is quite another thing to *know* this phenomenon to be an effect of, say, exposure to certain man-made chemicals.

Thus, even if we grant that the phenomenon of low-level exposures to these chemicals could potentially result in, for instance, the horrifying prospect of human extinction (as we are all exposed to, say, numerous reprotoxic phthalates, which in the long run could impair our reproductive capabilities), it does not follow that we must impose a precautionary remedy, much less that we should disregard the *probability* that the dreaded *effect* actually could materialise. Why? Because it could be that the remedy will bring about an outcome that also leads to human extinction:

Consider a wild story. The Kyoto Treaty is ratified by the U.S. Senate and signed into law by President Bush. All signatories to the treaty abide strictly to its demands. A global economic depression results. Massive social unrest ensues. Totalitarian dictatorships arise in Russia and the United States. War starts and nuclear weapons are launched by both sides. The predictions of the nuclear winter model prove to be

¹⁰³ *Id.*

¹⁰⁴ C.R. Sunstein, *Laws of Fear: Beyond the Precautionary Principle* (Cambridge: Cambridge University Press 2005) at 14.

perfectly accurate. Within five years, cockroaches rule the planet. The moral? We had better not do anything about greenhouse gas emissions.¹⁰⁵

Obviously, this line of reasoning and the subsequent conclusion seem absurd. As it stands, however, the precautionary principle does not exclude this scenario or any other apocalypse, *as it fails to prohibit any catastrophic possibilities from its realm of application*. To reiterate Ewald's point: '... all that can be excluded is that anything should be excluded.' The implementation of the precautionary principle only requires the mere possibility of catastrophe (as proposed in the strong versions of the precautionary principle), and since mere possibilities are easy to construct and limited only by the imagination, any application of the precautionary principle will be confronted with a fatal problem: the reasoning it employs can be used to generate a demand for a contradictory course of action. To reiterate the point made in *The Final Declaration of the First European 'Seas at Risk' Conference Annex I* (see above):

... If the "worst case scenario" for a certain activity is serious enough then even a small amount of doubt as to safety of that activity is sufficient to stop it taking place.

The precautionary principle speaks as though it is an exogenous panacea for environmental and social ills. But precautionary regulation is not an exogenous solution; it is itself an endogenous (i.e. societal embedded) and fallible human activity. Indeed, it is a form of technology, and as such it can create risks, and ones risks that are as real as the risks it is targeted against. The overall problem is flawed human institutions (whether economic, bureaucratic, or otherwise), perhaps most adequately referring to the fundamental (biblical) notion that humans are sinful creatures and are incapable of truly overseeing (or wanting to see) all consequences of their actions.¹⁰⁶ Indeed, '... no one can know beforehand the exact consequences of any portfolio of policy measures, ...' as Prins and Rayner observe in relation to the Kyoto Protocol.¹⁰⁷ And they are both by no means skeptics when considering climate change; far from it.

Indeed, according to the burden of proof approach, advocates of precautionary regulation would be required to demonstrate the absence of counterproductive (catastrophic) effects resulting from the effects of the

¹⁰⁵ Manson, above n. 91.

¹⁰⁶ M. Westphal, 'Taking St. Paul Seriously: Sin as an Epistemological Category' in T.P. Flint (ed.), *Christian Philosophy* (Notre Dame, Indiana: University of Notre Dame Press) at 200.

¹⁰⁷ G. Prins and S. Rayner, 'Time to Ditch Kyoto' (2007) 449 *Nature* 973; See further: G. Prins and S. Rayner, 'The Wrong Trousers: Radically Rethinking Climate Policy' (2007) *Joint Discussion Paper of the James Martin Institute for Science and Civilization, University of Oxford and the MacKinder Centre for the Study of Long-Wave Events, London School of Economics*.

precautionary regulation itself. The practical consequences of regulation are quite uncertain and could well be catastrophic. Advocates of precaution typically could not meet this burden. The precautionary principle would preclude further regulation or, as stated above, would require a subsequent precautionary response and so on and so forth.¹⁰⁸ Therefore, the precautionary principle is self-defeating.

With precaution we enter a vicious circle of (scientific) uncertainty. The uncertainty of harm requires a precautionary curtailment or ban of a certain activity, which in future might be resolved by scientific research. But the possibility of scientific certainty is precisely the thing that is here under dispute: what level of 'certainty' is required to satisfy the precautionary requirements? As the European Commission states in its communication on precaution:

Hence, ... measures adopted in application of a precautionary principle when the scientific data are inadequate, are provisional and imply that efforts be undertaken to elicit or generate the necessary scientific data. It is important to stress that the provisional nature is *not bound up with a time limit but with the development of scientific knowledge*.¹⁰⁹

Thus, a precautionary ban will most likely have an 'enduring temporality'.

In all this lies the fundamental epistemological problem facing those proposing to use the precautionary principle: it *appears to commit* us to taking the branch of inaction ('When in doubt, don't.'). Despite the obvious associated problems, which we have explained above. As the example of Manson shows, there is absolutely no reason to believe that the branch of inaction will be any less destructive than the branch of action. Recognising this, we find ourselves paralysed into inaction by indecision, and thus into the acceptance of unknown, unforeseen, and potentially unacceptable risks. 'The precautionary principle's prescription for quietism actually ends up committing us to a nonrational, and probably irrational, embracing of unforeseen risks. Surely this cannot be right'.¹¹⁰

The hidden value underneath the debate on risk, uncertainty, and precaution seems to be 'preferring inaction' through, say, a Principle of Preferring Inaction (PPI).¹¹¹ Ultimately, with precaution, the search for *safety in stasis* is expounded.¹¹² The PPI is an additional assumption, in no way entailed by precaution itself and may actually result in violations thereof should inaction turn out to be more damaging than action. Proponents of the value of

¹⁰⁸ F.B. Cross, 'Paradoxical Perils of the Precautionary Principle' (1996) 53 *Washington and Lee Law Review* 851.

¹⁰⁹ See above n. 97.

¹¹⁰ Mckinney, above n. 101.

¹¹¹ *Id.*

¹¹² A. Bramwell, *The Fading of the Greens: The Decline of Environmental Politics in the West* (New Haven, London: Yale University Press 1994) at 86.

precaution have yet to adopt clearly or defend at all the PPI. In view of its hidden character, this is unlikely to happen. Adherence to the so-called ‘cultural ecological critique’ of green thinking seems to underscore the PPI.¹¹³ The generally acceptable ‘green’ perspective generates the ideological milieu in which the precautionary principle operates and thrives. As Mckinney and Hammer Hill note:

... Assuming a smoothly functioning and balanced ecosystem, preferring inaction to action may make sense. At that first node on a decision tree, standing in the Garden, we may well counsel Adam and Eve not to eat. However, the significant environmental problems which tend to be the focus of current sustainability debates are problems of highly industrialized or newly industrializing societies. In fact, it is precisely the industrialization of a society that tends to generate these problems. We have a long, and often less than sterling, history of environmental actions, and we cannot reasonably act as if we faced an environmental tabula rasa.

Using the notion of environmental equilibrium to support the application of the PPI to current issues in environmental ethics commits, from a phenomenological point of view, a fundamental error – it ignores the facticity of Dasein. One of Heidegger’s (1962) fundamental insights into the nature of human being is that people find themselves in situations that often are not of their own making, but which serve as inescapable frameworks for their actions. This is the facticity, or the thrownness, of Dasein into the world. The situations into which Dasein is thrown, whether or not Dasein bears any responsibility for the creation of them, both open and foreclose certain courses of action as realistic possibilities for Dasein’s being in the world. And each situation has its own history, its own background, against which the horizon of possibilities opens up. But for a full appreciation of possibilities that are present to hand in a situation, Dasein must recognize and understand the historical basis of the situation. In the context of environmental actions, we cannot ignore the historical roots of the decision tree between whose branches we today must choose¹¹⁴

The epistemologically compelling and ultimately essential ethical question still remains to be resolved: ‘How are we to act in the face of uncertainty?’ Are we then to return to the flawed positivistic concept of evidentialism as e.g. Bertrand Russell, for instance, would have it?

We ought to give to every proposition which we consider as nearly as possible that degree of credence which is warranted by the probability it acquires from the evidence known to us.¹¹⁵

or as William Clifford stated in his ‘Ethics of Belief’: ‘To sum up: it is wrong always, everywhere, and for anyone, to believe anything upon insufficient

¹¹³ Hanekamp and others, above n. 19.

¹¹⁴ Mckinney, above n. 101.

¹¹⁵ B. Russell, ‘Pragmatism’ in B. Russell, *Philosophical Essays* (London: George Allen & Unwin 1966 [rev. ed. from 1910]) 79, esp. at 86.

evidence'.¹¹⁶ Surely not. This would bring us nowhere: that is, in neither direction when considering the two-node decision tree. In light of evidentialism, we will always have insufficient evidence, for either node.¹¹⁷ Evidentialism will not illuminate our uncertainty nor will it increase our knowledge of the world we live in. It will only spawn some form of scientism, that is the defective notion (we cannot explore here) that science alone is deemed to be capable of elucidating and resolving genuine human problems (poverty, social inequity, global warming, pollution, food safety, and etceteras) whereby all human affairs can be reduced to science.¹¹⁸ Nevertheless,

[c]hemicals, unlike persons, are not innocent until proven guilty but suspect until proven innocent. So the burden of proof shifts, and it is now up to the industrialists to dispatch it. ...¹¹⁹

Such an approach as proposed by Rolston, and embraced by most proponents of precaution, would inadvertently and paradoxically spawn some form of precautionary evidentialism, which indeed underscores *too* high a level of confidence regarding what science is supposed to deliver. The precautionary evidentialist challenge would now *not* be to prove the *presence* of some form of risk, to which proponents of precaution rightfully protested, but to prove the *absence* of any and all risks! Precautionary quietism subsequently develops, as science can never rise to the occasion of precautionary evidentialism. Proving a negative is a *probatio diabolica* that is impossible. Science and technology cannot be concerned with testing every possible consequences of a given action. The WRR's proposition to maximise the assessment and management of uncertainty in relation to human activities is not only untenable but in fact unacceptable. Science is limited, and can only deal with plausible consequences: 'It localizes its predictions by conjoining the generalization with a set of auxiliary assumptions (A)'.¹²⁰ Rolston remarks that businesses must '... not use complexity to dodge responsibility. Environmental causal links are multiple, incremental and long term. Their discovery is slow'.¹²¹

The proposed solution to complexity and 'the lack of vision in framing the set A' is to assume the *worst* case and subsequently seek to avoid it. Unfortunately, this takes us no closer to safe and accurate decision-making than does assuming the *best* case. If policy-makers are to prescribe action,

¹¹⁶ See <<http://ajburger.homestead.com/files/book.htm#will>> (accessed 9 April 2009).

¹¹⁷ Stenmark, above n. 59.

¹¹⁸ For a thorough critique thereof see M. Stenmark, *Scientism. Science, Ethics and Religion* (Aldershot: Ashgate Publishing Limited 2001).

¹¹⁹ Rolston III, above n. 111.

¹²⁰ Mckinney, above n. 101.

¹²¹ Rolston III, above n. 11, at 315.

sustainable development policies require the precautionary principle in order to prescribe sustainable actions; then the precautionary principle renders policy-makers helpless, bearing in mind the infinite number of unforeseen detrimental outcomes. In view of this epistemological conundrum, to 'err on the side of safety' is impossible. It is neither acceptable nor will it reduce uncertainty with regard to our actions. With the sustainable perspective and its precautionary implementation, a history of humankind, however flawed and faltering, is denied, for the benefit of present and future generations. The tabula rasa of Utopia lures, although this discussion is for another time and another place.¹²² What is left then is to tie the different strands of the debate together.

7 Some concluding remarks

Different threads in the precautionary tale have been woven together in this contribution. We first showed that the latest take of the WRR on precaution, although labelled as novel, could easily (sic) be traced to the work of Herman Kahn some half a century ago. Together with the 'extension' of *The Limits to Growth*, the precautionary tale started to grow in the Western world in which uncertainty was one of the core determinants.¹²³ The role of science in society changed therewith from a means of securing objective knowledge (in the impartial sense) to producing acceptable results.¹²⁴ Precaution, with the aid of science thus understood, is regarded as the way out of this conundrum en route to a sustainable future.

Therefore, the precautionary principle, as the core tenet of sustainable development, must have a solid and intelligible logical and epistemic foundation upon which to build. This foundation is problematic, to say the least. Thereby, the concept of sustainable development is problematic. If the moral obligation to avoid the potential harm of acting now and especially in the future leads us into inaction, clearly, there will also be those situations where the obligation to avoid harm from inaction must lead us into action. In both cases, the means by which we assess the consequences of our 'actions' (broadly construed as action and inaction) are the same. Are we to act in order to avoid the harmful consequences of inaction? Are we to refrain from action in order to avoid the harmful consequences of action? Methodologically speaking, the decisions are equally problematic, given the nature of inductive inference and the historical essence of science and technology. As a result, sustainable

¹²² This contribution is part of my thesis in the field of theology and philosophy on the problematical Utopian perspective of precautionary culture.

¹²³ Hanekamp and others, above n. 19.

¹²⁴ See for example A.F. Chalmers, *What is this thing called Science?* (Queensland: University of Queensland, 1999, 3rd ed.); A.F. Chalmers *Science and Its Fabrication* (Minneapolis: University of Minnesota Press 1990).

development and its carrying principle of precaution, become highly problematic, and quite possibly unfeasible, in the face of these logical, epistemological and historical difficulties.

Science does not supply direction in terms of precautionary conduct. Precautionary policies in relation to banned veterinary medication brought forth, in the light of growing scientific and technological capabilities, the potential to detect in the range of parts per billion, which are to be regarded as toxicological insignificant. Yet from a precautionary perspective the involved risks cannot be excluded, as it fails to prohibit any catastrophic possibilities from its realm of its application. Only when Annex IV substances are completely absent from food (at zero concentration) the risks are deemed, obviously, completely absent. Technological analytical innovation had become the driver of zero tolerance policies and subsequently and not surprisingly generated a serious regulatory impasse.¹²⁵ Phthalates, in use for more than 50 years, have never been known for their toxicity, despite extensive scientific reviewing. The 1999-ban of a number of phthalates was inspired by precautionary sentiments, predictably in the face of scientific uncertainty regarding the potential risks. Although ambiguity in relation to reprotoxic risks of exposure remains, the mutagenic and carcinogenic nature of phthalates have been dismissed, for the present (in light of our current knowledge). However, as the protagonists of precaution like to stress: *absence of proof is not proof of absence*, whereby the vicious precautionary circle is institutionalised.

Thus scientific ambiguity and the purported acceptability requisite have proven to be ideal a priori tenets to shape industrial and societal development to political needs, paradoxically with the help of a precautionary shaped evidentialism.¹²⁶ However:

... no single all-purpose number ... expresses 'acceptable risk' for a society. Values and uncertainties are an integral part of every acceptable problem. As a result, there are no value-free processes for choosing between risky alternatives. The search for an 'objective method' is doomed to failure and may blind the searchers to the value-laden assumptions they are making Not only does each approach fail to give a definitive answer, but it is predisposed to representing particular interests and recommending particular solutions. Hence, choice of a method is a political decision with a distinct message about who should rule and what should matter.¹²⁷

The 'scientification' of risk and uncertainty, therefore, is a feeble disguise for the fact that precaution empowers bureaucracy.

¹²⁵ J.C. Hanekamp, 'Veterinary residues and new European legislation: a new hope?' (2005) 1 *Environmental Liability* 52.

¹²⁶ Hanekamp and others, above n. 19.

¹²⁷ B. Fischhoff, S. Lichtenstein and P. Slovic, *Approaches to Acceptable Risk: A Critical Guide* (Oak Ridge, TN: Oak Ridge National Laboratory and U.S. Nuclear Regulatory Commission 1980).

Raising the acceptability benchmark in the context of guaranteeing safety subverts the aim to secure objective knowledge. It is always possible to assume that a particular risk exists and subsequently project more stringent policies, yet *impossible* to prove or assume that any and all possible risks are *absent*. As a case in point for the latter, Weinberg pointed out that a study designed to detect an increased mutation frequency of about 0.5% following low dose radiation (at a 95% confidence level) would involve an experiment requiring 8 billion mice.¹²⁸ Thus, the search for *acceptable* levels of exposure related to a high level of safety results in regulatory itineraries that persistently drive ever-increasing scientific input and output and additional and more stringent regulation. This development, in my view, fuels ‘doubt beyond reasonable proof’ licensing open-ended policy structures and thereby raising the spectre of relativism. ‘... then we fall prey to the vicissitudes of popularity ..., primarily in the form of *ad populum* arguments’.¹²⁹

Science is tentative, exploratory, questioning, largely learned by doing. One of the world’s leading physicists was famous for opening his introductory classes by saying that it doesn’t matter what we cover, but what we discover, maybe something that will challenge prevailing beliefs if we are fortunate.¹³⁰

Incontrovertibly then, the most critical and most volatile problems cannot be solved without the effective marshalling of expert scientific knowledge and judgment. Securing objective knowledge about safety, health, and the like, despite the inherent and attendant value judgments, pre-eminently remains a scientific task, and a challenge for and to the precautionary future. This is attainable only if the scientific community is perceptive of its own values and frames, and is not aligned to a particular worldview, including the precautionary worldview. In light thereof, *abandoning the accepted idea of assessing and managing uncertainty is the only option*, as Ghamari-Tabrizi concluded on her work of Herman Kahn:

... the human will is not the author of the universe The living world is no modular tool or resource for extraction. The error is just here. ... The nonhuman world, that alarmingly uncivil reality, is not molded by wishes, may yet be uncoercible, may yet stand fast against resolve. ... Slighting this, Kahn lunged into a body of fog, winning victory from no resistance at all. This is kitsch, a stroke against nothing.¹³¹

¹²⁸ A.M. Weinberg, ‘Science and Trans - Science’ (1972) 10 *Minerva* 209.

¹²⁹ Boger, above n. 82.

¹³⁰ N. Chomsky, ‘Rationality/Science’ (1995) *Z Magazine*, available at <<http://www.chomsky.info/articles/1995---02.htm>> (accessed 8 December 2008).

¹³¹ See above n. 13, at 312.

PRECAUTIONARY LOGIC AND A POLICY OF MODERATION

*Tobias Arnoldussen**

Abstract

The term 'precautionary logic' denotes a kind of argumentation that urges us to take far-reaching preventative measures. This form of argumentation appeals to a number of presuppositions about society, the environment, and human behaviour. Precautionary logic appeals to a sense of fragility of humankind and the environment, the uncertainty of scientific knowledge, the destructive tendencies of technology, the responsibility we have toward each other and towards future generations, and to the possibility of averting environmental catastrophe by adopting the wisdom of precaution as a guide. In its outlook, precautionary logic shares assumptions with early and mediaeval Christian thought. It argues for a restoration and maintenance of harmony between humankind and that which sustains it. In mediaeval times, this sustaining power was God; in secular times, it is nature itself, or the ecosystem. Adoption of this paradigm of harmony and precaution leads to a politics of moderation in which all behaviour seen as excessive, immodest, or risky should be curtailed.

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1 Precautionary logic and a politics of moderation

Multiple authors use the term ‘precautionary logic’ to characterise a way of thinking they see gaining ground in various domains of late modern culture. For the French thinker François Ewald, precautionary logic indicates a paradigm shift regarding the use of science in risk regulation.¹ The term is used by Ewald for a kind of reasoning that urges us to look for doubt instead of certainty. According to precautionary logic, Ewald claims, we should always consider that an unseen threat may always lie in wait. We should use science not only to learn how to master perceived threats but also to uncover those we cannot perceive. I must act ‘... as if Descartes’ malicious demon could have slipped into the folds of an apparently innocent enterprise’.² For Ewald, precautionary logic concerns a way of using scientific knowledge in order to cast doubt on its own advances and to instil a mistrusting mentality within society.

Prominent criminologist Richard Ericson considers that precautionary logic is applicable to the domain of security and crime.³ He quotes Ewald extensively but examines the importance of precautionary logic for security politics.

Both authors argue that a kind of reasoning is gaining ground that urges us to take preventative measures to avoid the potentially catastrophic consequences of technological and security risks. In the field security policy, precautionary arguments were used to justify the US-led war on terror. According to Ericson, political rhetoric was used to ‘make precautionary logic a part of everyday life’. The public was prepared for a precautionary war by then Secretary of State, Condoleeza Rice. She declared that extraordinary military mobilisation against terrorism was needed before ‘The smoking gun becomes a mushroom cloud’.⁴ A more elaborate argument in favour of the precautionary invasion in Iraq in order to prevent Saddam’s regime from keeping or acquiring weapons of mass destruction is given by Slaughter and Feinstein:

The unprecedented threat posed by terrorists and rogue states armed with weapons of mass destruction cannot be handled by an outdated and poorly enforced nonproliferation regime. The international community has a duty to prevent security

¹ F. Ewald, ‘The return of Descartes’s Malicious Demon: An Outline of a Philosophy of Precaution’ in T. Baker and J. Simon (eds.) *Embracing Risk, the Changing Culture of Insurance and responsibility* (Chicago: The University of Chicago Press 2002) at 273.

² *Id.*, at 286.

³ R.V. Ericson, *Crime in an Insecure World* (Cambridge: Polity Press 2007) at 21.

⁴ *Id.*, at 38.

disasters as well as humanitarian ones – even at the price of violating sovereignty.⁵

In the domain of environmental risk regulation, precautionary logic may be even more firmly entrenched than in security policy. In this domain it has been legally sanctioned by the precautionary principle. This principle holds that when there is a threat of serious and irreversible damage, lack of full scientific evidence may not be used as a reason not to take preventative measures. This principle has gained a key status in environmental law and is listed in the EC Treaty, among others. According to some scholars, the principle has the status of customary international environmental law.⁶ Concrete examples of precautionary reasoning in the domain of environmental and public safety can be found in recent policy documents as well as in the literature. For example, the Dutch Scientific council for Government Policy wrote in a recent report on physical security that they consider the precautionary principle implies that ‘the vulnerability of people, society, and the natural environment demands a proactive engagement with insecurity’.⁷

In the literature regarding technological risk, a new way of dealing with these risks is sometimes advocated in strong terms. Paul van Loon writes:

If we are to avoid a full-blown and catastrophic apocalypse, we have to engage with technology differently. Faith in reason is not a good starting point, reason in faith might be.⁸

A similar albeit less extreme point was made by Poul Harremoës in his report *Late lessons from early warnings*. This report was written as a defence for a precautionary approach by listing a number of scientific ‘advances’ that turned out to be harmful to the environment or to public health. He writes:

Knowing enough and acting wisely enough, across the full range of environmental and related health issues seems daunting. The interconnections between issues, the pace of technological change, our limited understanding and the ‘time to harm and then to heal’ of the ecological and biological systems that can be perturbed over decades by our

⁵ L. Feinsein and A.M. Slaughter, ‘A duty to prevent’ (2004) 83 *Foreign affairs*, summary available at <<http://www.foreignaffairs.org/20040101faessay83113/lee-feinsein-anne-marie-slaughter/a-duty-to-prevent.html>> (accessed 2 February 2009).

⁶ A. Trouwborst, *Precautionary rights and Duties of States* (Utrecht: Brill Academic Publishers, Incorporated 2006) at 12.

⁷ WRR, *Onzekere Veiligheid, verantwoordelijkheden rond fysieke veiligheid* (Amsterdam: Amsterdam University Press 2008) at 18. The import of this statement will be analysed on page 263 below.

⁸ J. van Loon, *Risk and Technological Culture: Towards a Sociology of Virulence* (London, New York: Routledge 2002) at 205.

technologies together present an unforgiving context.⁹

The examples above are all instances of precautionary arguments. They defend taking far-reaching preventative measures in order to curb an environmental or security threat of which we know little, but of which the consequences are portrayed as grave, often apocalyptic in scope. As will be elaborated further here, the curbing of these threats is often seen as demanding from us a thorough revision of our existing political, scientific, and institutional arrangements. Our current understanding is seen as too limited and often even portrayed as an accomplice to environmental degradation.

Inspired by Ewald's suggestion that these kinds of precautionary arguments indicate a paradigm shift in our dealing with risk, I wish to conduct a conceptual investigation into the notion of precautionary logic. By examining this notion, I aim to excavate assumptions that are implied in this kind of reasoning with regard to humans, their life-world, and the value of human knowledge. I will first review what the term 'precautionary logic' means. In what way can we speak of a 'logic' underlying the notion of precaution? I will then review a number of characteristic arguments put forth by advocates of precaution. These arguments are analysed to show what implicit and explicit presuppositions about ourselves and about nature lie at their base. In the final paragraphs of this article, I will conclude that precautionary logic as a paradigm of thought shares motives with an earlier religious paradigm. The paradigm of precaution uses language closely linked to the themes of apocalypse and salvation found in early millenarian Christianity.

These motives are most tellingly displayed by Al Gore in his Address to the Climate Conference in Bali in 2007. In this speech, Gore rhetorically offers us two alternatives: one is to live in a world beset by floods and droughts, while the other is to be among the chosen few who have managed to inspire humankind to see itself as a 'single global civilisation'. Gore presents two scenarios. In the first, we are confronted by our offspring who accuse us of having looked the other way and ignored the droughts and floods caused by global warming. With the necessary pathos, a picture is painted of crops drying up, ice caps melting, and deserts growing. In the second, our offspring look up to us admiringly because we have managed to organise ourselves and to fight hand-in-hand for a common cause. He does not hesitate to imply that this is a role to be played by only a chosen few who will influence the destiny of us all:

I want you to tell them that you saw it as a privilege to be alive at a moment when a relatively small group of people could control the destiny of all generations to come.¹⁰

⁹ P. Harremoës and others, *Late Lessons from Early Warnings: the Precautionary Principle 1896- 2000* (Copenhagen: EEA 2001) at 4.

¹⁰ <<http://www.irregulartimes.com/gorebalispeech.html>> (accessed 1 December 2008).

I consider this existential choice Gore presents us to be the most emblematic articulation of the ecological and precautionary worldview. This view envisions humankind as doomed to self-destruction unless it finds a new way to live in harmony with nature and with each other. The Christian 'covenant with God' has been replaced with a covenant with nature. To reach a harmonious relationship with nature, humans need to live moderate lives and also to moderate the ecosystems they are a part of, using the wisdom of precaution. To conclude, I will indicate how the advance of precautionary logic in various domains might influence policies relating to the environment, to safety, and to lifestyle choices. The religious elements in precautionary logic will lead to a policy in which there will be a stronger role for moralism and modesty. I refer to this kind of politics as a politics of moderation.

2 Precautionary logic as an economy of truth

This issue of *Erasmus Law Review* is devoted to precautionary logic. This implies that there must be at least a common understanding of what precautionary logic means. It is, however, not immediately obvious in what sense the term 'logic' is being used here. The same question may arise in regard to the logic of capitalism or ecological logic, for instance.¹¹ In what sense do we use 'logic' in these terms?

When logic is mentioned, it is usually in the context of formal logic, which concerns the principles of valid inference.¹² In other words, logic is about the form of arguments and not about their content. This brings us no further with regard to the question of what makes precautionary logic a type of logic. Precautionary logic certainly is not about the form of arguments, but about the content.

In antiquity and in the Middle Ages, next to formal logic another branch of logic was widely studied. It was called material logic or major logic. The French philosopher Jacques Maritain gave the following definition:

Major logic (or material logic) studies the material conditions of the science, and analyzes or resolves reasoning into the principles on which they depend for their material or in other words their content; it shows to which conditions the materials of the reasoning should respond such that it has a conclusion certain at every point, not

¹¹ The term 'ecological logic' was coined by Anna Bramwell when discussing the work of a number of vanguard ecologists. A. Bramwell, *The Fading of the Greens: the Decline of Environmental Politics in the West* (New Haven, London: Yale University Press 1994). The logic of capitalism is also a phrase routinely used: for instance, in the title of the book *The Nature and Logic of Capitalism* by Robert L. Heilbroner (London, New York: Norton 1986).

¹² W. Kneale and M. Kneale, *The Development of Logic* (Oxford: Clarendon press 1984) at 1.

only from form, but also from the material - that is, a certain and true conclusion.¹³

This does point us in the right direction. Precautionary logic is a logic in this material sense. It is a set of principles that lead to arguments accepted as valid in the domains in which precautionary logic has established itself.

Nevertheless, though precautionary logic is a logic in a material sense because it deals with content, there are also differences. In antiquity and in the Middle Ages, the luminaries studying material logic tried to incorporate principles that were universally valid. Material logic tried to provide true premises that would be valid for all time and could hence serve as a base for reasoning. Today, philosophy has largely given up on this enterprise. Especially in the social sciences it is now commonly held that even principles we consider true are restricted to a certain time place and are tied to the institutions and practices of society. To take these cultural horizons of even our most cherished concepts into consideration, Foucault coined the term 'economy of truth'.

The political economy of truth determines what kind of discourses are considered true, what the mechanisms and sanctions are to distinguish true from false, the techniques for acquiring truth and the status of those who are empowered to say what is true.¹⁴

In Foucauldian terms, precautionary logic is part of an economy of truth. It is the part that determines which discourses are considered true within a certain domain.¹⁵ By this I mean that precautionary logic has a number of criteria or presuppositions that determine the validity and truth of an argument advanced in the domain of environmental risk regulation. In other words, statements are considered true within precautionary logic because they appeal to certain presuppositions that are implicitly considered true by proponents of precautionary thinking. I use the term 'presuppositions' in the same way the British philosopher R.G. Collingwood uses 'absolute presuppositions'. According to Collingwood, absolute presuppositions are ones in a certain domain that are considered true and not put into question: 'an absolute presupposition functions as a presupposition of all questions it is related to, but never as an answer'. Hence the idea of verifiability is not applicable here: not because we would not like to verify these presuppositions but simply because they are not put into question. They are presupposed to be true and function as such in the domain in question. They function as a set of mutually interrelating

¹³ J. Maritain, *An Introduction to Philosophy* (London: Sheed & Ward 1944).

¹⁴ L. Shiner, 'Reading Foucault: Anti-Method and the Genealogy of Power-Knowledge' (1982) 21 *History and Theory* 382, available at <www.humboldt.edu/~mc92/pdfs/gradgroup/Shiner-Reading-Foucault.pdf> (accessed 8 December 2008).

¹⁵ M. Foucault, *Power/knowledge: Selected Interviews and Other Writings, 1972 - 1977* (New York: Prentice Hall 1980) at 131.

presuppositions, underpinning certain arguments made within that domain.

The question is to what axioms and presuppositions should arguments appeal in order to be considered valid in precautionary logic. Since they are the presuppositions on which precautionary arguments are based, it must be possible to uncover them in precautionary reasoning, regardless of the specific context of the argument. According to Collingwood, a metaphysical analysis should unearth these kinds of presuppositions. I conduct here a similar analysis regarding the presuppositions made in precautionary logic.¹⁶

To that end, I will examine a number of precautionary arguments in order to question what presuppositions concerning human nature, our life-world, and our ability to make judgments about it are implicitly or explicitly stated to make those arguments convincing.

3 The precautionary economy of truth: vulnerability and uncertainty

For our analysis, it is important to examine precautionary logic in the domain in which its dominance is least contested. Since precautionary logic is most strongly established in our dealing with technological and environmental risk, it seems prudent to start our investigation of key-concepts and presuppositions of precautionary logic there. The imperative associated with the precautionary principle is a *prima facie* plausible candidate to start. The precautionary principle is the most visible political exponent of precautionary logic, because it has been taken up in international environmental law.¹⁷ Furthermore, Ewald also takes the precautionary principle as his point of departure when discussing the paradigm shift of risk regulation.¹⁸

The precautionary principle is itself not an absolute presupposition, but is a policy based on such presuppositions. The precautionary principle is the legal translation of the maxim that prevention is better than curing afterwards.¹⁹ Or, as Pieterman phrases it, the moral imperative of the precautionary culture is 'first do no harm'.²⁰

Perhaps the most well-known definition of the Precautionary Principle is found in article 15 of the Rio Declaration. It states:

¹⁶ R.G. Collingwood, *An essay concerning metaphysics- part 1* (Oxford: Clarendon Press 1940) translated as: "*Over metaphysica*" by G. Vanheeswijck (Kampen: Kok Agora 1996) at 16. Collingwood's conception of metaphysics is very different from a classical conception of the term. He considers metaphysics to be the science that reveals the absolute presuppositions buried within arguments.

¹⁷ Trouwborst, above n. 6, at 286.

¹⁸ Ewald, above n. 1, at 274.

¹⁹ R. Pieterman, *De voorzorgcultuur, streven naar veiligheid in een wereld vol risico en onzekerheid* (Den Haag: Boom Juridische Uitgevers 2008) at 15.

²⁰ *Id.*, at 64.

Where there are threats of serious or irreversible damage to the environment, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation

(Climate Convention Rio de Janeiro 1992). The precautionary principle is a guideline for what to do in the case of uncertainty. This makes our relation to uncertainty a crucial component in the economy of truth in precautionary logic. We see a fearful position in regard to uncertainty. The underlying message of the precautionary principle is that protective measures should be taken, because we are vulnerable in the face of disaster and we have no sure way of predicting whether one will occur.

An analysis of the precautionary principle reveals two assumptions at the core of precautionary logic. Firstly, it emphasises the ease with which things can go wrong. Humankind is vulnerable because there is a great potential for catastrophe.

If one believes that catastrophic events are highly unlikely, we would not need this principle. It is because we do fear catastrophe and we believe we are vulnerable that we have such a broad public consensus to implement the precautionary principle. At least in Europe we seem to have this consensus.²¹ In the Netherlands, an influential think-tank has recently argued its strong support for this principle. The Dutch Scientific Council for Governmental Policy (WRR) pleaded in their report to embrace the precautionary principle in administrative legislation, in the Civil Code and in the Constitution. The motivation of the Council was summarised in the statement: 'The vulnerability of people, society and the natural environment demands a proactive engagement with insecurity'.²² This statement is paradigmatic for the line of argumentation employed in the report.²³ It is deemed true by proponents of precaution, but demands assent to a number of presuppositions, two of which are explicitly stated here: vulnerability and insecurity. These presuppositions are part and parcel of the truth economy of precautionary logic.

The WRR speaks about the vulnerability of people, society, and the natural environment. That vulnerability is the implied rationale for the precautionary principle. We, our institutions, and the world at large are

²¹ Internationally there is no consensus as yet on the precautionary principle. David Vogel shows that a shift has taken place from US to Europe in regard to precautionary legislation. The US tended to be more precautionary in the 1970s and 1980s, whereas from the 1990s onward the EU has been more precautionary. D. Vogel, 'The Hare and the Tortoise Revisited: The New Politics of Consumer and Environmental Regulation in Europe' (2003) 33 *British Journal of Political Science* at 557.

²² WRR, above n. 6, at 18.

²³ Both components, – intrinsic vulnerability and intrinsic uncertainty –, are for instance reiterated on page 116 in conjunction with the need to arrive at a paradigm shift considering risk policy. In the report they are mentioned numerous times.

vulnerable. This vulnerability is itself never contested, it is simply presupposed. It has to be presupposed, because if we consider ourselves, our ecosystems, and the earth on which we dwell to be robust, and correspondingly the chance of catastrophe extremely small, we would not need this principle. In pleas for precaution, our limited resources in the face of disaster are always stressed.²⁴

Arguments that we are indeed more vulnerable today in the face of technological catastrophe than we were in the face of natural dangers in the past are not given. They would also be very hard to give. How do we measure the increased risk of technological disaster versus the decreased risks of natural disaster? That no arguments are given and that questioning these presuppositions is often met with an angry response is an indication that we are dealing with absolute presuppositions.²⁵

Secondly, the analysis reveals the presumption that uncertainty is somehow on the rise. Proponents of precaution defend the idea that decisions made today are much more plagued by uncertainty than were decisions in the past. In fact, 'uncertainty' has become a buzz word in our dealing with risk. The idea is that in a globalised and highly technological world, uncertainty is evidently more present than in simple former societies. I do not find this notion self-evident, however, for two reasons. The first is that we know decisions in the past had far-reaching consequences for our current society: for instance, the decision to develop the steam engine and not take precautionary measures regarding its applications altered our culture profoundly.²⁶ The decision to develop the steam engine was at the time plagued by an equal amount of uncertainty just as the introduction of nanotechnology is today. The second reason is that even if it were granted that decisions today are taken in a more complex world, we still cannot conclude that their consequences are more uncertain and less easily predictable. The complexity of the world has increased, but so have our instruments for predicting possible consequences. Our scientific knowledge has increased dramatically. We might well argue that decisions taken in the past were plagued by much more uncertainty, since a ruler had to contend with the unpredictable will of the gods, the influence of the stars, and contradictory advice from various soothsayers. In short, the idea that the world today is more complex and that correspondingly our decisions are beset by more uncertainty than they were in the past is a presupposition. It is accepted and unquestioned. This acceptance makes precautionary arguments

²⁴ For instance in A. Arcuri, *Governing the risks of ultra hazardous activities* (Rotterdam: Erasmus University Rotterdam 2005). The same presupposition is made in ecological thinking, which is closely related to the rise of the precautionary principle; Pieterman, above n. 19, at 90.

²⁵ Collingwood, above n. 16, at 46.

²⁶ For a discussion of the way that past technological developments have changed our current society, see L. Marx, *The Machine in the Garden* (New York: Oxford University Press 2000, 2nd ed.).

plausible.

4 The precautionary economy of truth: science and the unknown

One reason the uncertainty assumption is readily accepted by advocates of precaution is that they would not yield to the aforementioned argument that we have many more instruments now to control complexity. In fact, one of the other axioms in precautionary logic is that science cannot be trusted to supply us with adequate answers in the domain of risk. As Jane Hunt states: 'Implicit in most interpretations of the precautionary principle is the recognition that science cannot adequately predict the potential environmental consequences of human activities'.²⁷ It remains implicit because it is presupposed that scientific answers are inadequate to provide proper management of risk. This presupposition does not seem to follow directly from the principle itself, but it is indeed implied. If it were easy to obtain scientific certainty, we could wait. It is the assumption that we cannot, at least not with regard to environmental questions, that makes the principal interesting for its proponents. In fact it is exactly for this reason that Joel Tickner and Carolyn Raffensperger embrace it. In their introduction *Protecting Public Health*, they put it as follows:

Modern day problems that cover vast expanses of time and space are difficult to assess with existing scientific tools. Accordingly, we can never know with certainty whether a particular activity will cause harm. ... With increasing knowledge about the complexities of ecosystems, the human body, and the impacts of various stressors, we have realized that we actually understand less than we thought we did about these systems.²⁸

We find this type of criticism of science all through environmental law, as Jean Marc Piret argues.²⁹

The role of science is not exclusively negative within the economy of truth of precautionary logic. It is in fact somewhat ambivalent. There is a mistrust of traditional science and what is seen as its Cartesian paradigm. It is presupposed that science cannot provide adequate answers due to the complexity of environmental questions. It is argued that we need a more holistic science. Yet even 'traditional' science is fine when it teaches us

²⁷ Jane Hunt, 'The Social Construction of Precaution' in T. O' Riordan and J. Cameron (eds.), *Interpreting the Precautionary Principle* (London: Earthscan 1994) at 117.

²⁸ J. Raffensperger and C. Tickner, 'To foresee and to forestall' in J. Raffensperger and C. Tickner (eds.), *Protecting Public Health and the Environment: Implementing the Precautionary Principle* (Washington D.C.: Island Press 1999) at 1.

²⁹ J.V.A.G. Piret, 'Filosofische beschouwingen bij de grondslagen van het milieurecht' (1995) 21 *Recht en Kritiek* 335.

precaution. Raffensperger and Tickner denounce risk assessment as such, since it is tied in with the presuppositions of traditional science, but state:

Risk assessment can play a role in implementing the precautionary principle. Instead of using risk assessment to establish 'safe' levels of exposure, levels that are fundamentally unknowable, it can be used to better understand the hazards of an activity and to compare options for prevention.³⁰

The same has been signalled by François Ewald. He contends that in precautionary logic, science is urged to continuously question the many proofs that everyday life should not be the subject of permanent anxiety. 'In effect', he concludes, 'science interests us less by producing new knowledge than for introducing new doubts'.³¹ The same shift in the use of science has been emphasised by Frank Furedi in his article *Precautionary Culture and the Rise of Possibilistic Risk Assessment* for this issue of *Erasmus Law Review*. According to Furedi, environmentalist thinkers have been at the forefront of a movement to discredit probabilistic thinking about risk and to urge for possibilistic thinking, which invites speculation about all things that can possibly go wrong.³²

In practical public health and environmental politics, this trend that Ewald signals is already visible: for instance, in the valuation of air-pollution by particles. It is feared that tiny particles are a substantial cause of illness and even mortality. This category of pollutants is called particulate matter (PM) and is defined as every tiny particle or droplet that has a diameter of less than 10 micrometres. However, it is still unclear what chemical composition a particle must have in order to be dangerous. The trend is to fear that the smaller a particle is, the more dangerous it becomes. Since the 10-micrometre particle appears not to be very dangerous, the 2.5-microgram particle must be the dangerous one. However, our measurement systems are becoming increasingly sensitive and we may now identify particles with a diameter of 1 micrometre and even of 0.1 micrometre. The smaller the particle becomes, the more difficult it is to measure, but the more fear and suspicion it instils. Voices are raised currently that tell us to fear in particular the 1 and 0.1 PM.³³

³⁰ J. Raffensperger and C. Tickner, *The Precautionary Principle in Action: A Handbook*, written for the Science and Environmental Health Network (1999) at 15, available at <www.biotech-info.net/handbook.pdf> (accessed 12 December 2008).

³¹ Ewald, above n. 1, at 289.

³² F. Furedi, 'Precautionary Culture and the Rise of Possibilistic Risk Assessment' (2009) This issue of *Erasmus Law Review* at 197.

³³ For an illustration, see the paper of A. Schmidt-Ott, *Measurable Quantities in Ambient Particle Characterisation and Future Needs Beyond PM10 and PM2.5*, presented at Dustconf 2007, available at <[http://www.dustconf.com/INDEX700.HTM?cms\[categoryID\]=67&cms\[cm230\]\[contentID\]=73#s10](http://www.dustconf.com/INDEX700.HTM?cms[categoryID]=67&cms[cm230][contentID]=73#s10)> (accessed 15 November 2008).

Upon questioning this assumption, I was told that at a given moment the particle would be so utterly small that it would simply pass through all our cellular tissue without having any effect. I concluded that in that case the particle is reduced to nothing. It seems precaution stops when we are dealing with nothing, but even that is not quite true.

In view of precaution, we cannot stop at the immeasurable. A relatively new characteristic of precautionary logic is the consideration of ‘unknown unknowns’. This gained a kind of notoriety when it was introduced to justify another instance of precautionary politics: namely, the pre-emptive strike doctrine of then US President George W. Bush. The then US Defense Secretary Donald Rumsfeld used it to denote that risks abound about which we are not even aware. In fact, the introduction of the concept won Rumsfeld a prize for most nonsensical comment.³⁴ It is true that the concept of unknown unknowns is self-contradictory. It is a Catch-22-like concept, because we cannot know whether they are there, in what number, their relevance, or the extent to which they are indeed risky. In fact we cannot know anything about their existence and yet they are conceptualized. This is self-contradictory, because it is a concept conceptualising something that resists conceptualisation. There might be infinite unknown unknowns or none at all; they might be helpful or harmful unknown unknowns. It is of no consequence, because we cannot know either way. The comment might have won a prize and been ridiculed, but it has been picked up in ‘precaution speak’.³⁵

5 The precautionary economy of truth, time, space, responsibility, and wisdom

Precautionary logic has a chronological dimension, as risks are potentialities that might become actual. Costs are actual and are felt now. Precaution argues for sacrificing benefits now in order not to be harmed in the future, and the relation with the future is one of anxiety. Because precaution is often concerned

³⁴ <<http://news.bbc.co.uk/2/hi/americas/3254852.stm>> (accessed 14 November 2008). In effect, as Jaap Hanekamp shows in his article in this issue of *Erasmus Law Review*, Rumsfeld was not the first to coin the concept. It had been introduced by the American cold war analyst and nuclear strategist Herman Kahn. The concept of unknown unknowns has a history in Cold War nuclear strategy. Its cropping up now in ecological discourse presents an interesting case of discourse migration.

³⁵ N. de Sadeleer, ‘The Precautionary Principle in European Community Health and Environmental Law, Sword or Shield for the Nordic countries’ in N. de Sadeleer, *Implementing the Precautionary Principle: Approaches from the Nordic Countries, the EU and USA* (London: Earthscan 2007) at 25. De Sadeleer remarks that: ‘At least experts should point out the unknown unknowns’. Pointing out unknown unknowns, however, is a *contradictio in terminis*. We can never point out something about which we do not know that we do not know it.

with catastrophic damage that may potentially realise itself, it invites us to consider worst-case scenarios and to take into account even the smallest of risks.³⁶ This extension into the future is in principle limitless, and has been made clear in the climate change debate. The EU considers that the scope of its policy must be one hundred years. It is also clear in Veerman's analysis of the need for a new and very costly Delta plan for raising the Dutch dikes.³⁷ Worst-case scenarios are stacked together to argue for building precautionary dikes aimed at preventing a flood that might occur hundreds of years from now. I call this the '2 to 12 argument'. Precaution extends its scope well into the future, but the future is always considered one heartbeat away from being now. It is always '2 to 12' and so measures need to be taken now; they can never wait.

The farther that precaution is extended in time, the bigger the margin of uncertainty. Since precaution is applicable in instances of scientific uncertainty, these tendencies reinforce each other. Here the notion of uncertainty and the precautionary call for regulation of future events calls for precautionary politics on many terrains. This makes people, institutions, and policy-makers far more responsible. Not only are we responsible for our own well-being, which as we have seen is fragile enough, we are also made accountable for the well-being of future generations because of precaution's chronological dimension. In combination with the imperative to take into account worst-case scenarios and even unknown unknowns, we are faced with a daunting task. Ewald envisions that we should 'out of precaution, imagine the worst possible, the consequence that an infinitely deceptive malicious demon could have slipped in the folds of an apparently innocent enterprise'.³⁸

Since risks do not stop at the border, our responsibility to be cautious has also expanded in space. Ulrich Beck's 'Risk Society' has become a 'World Risk Society'. Globalisation and temporalisation have caused the scope of our actions to be wider and deeper, and coupled with that our responsibilities as well. The following is summarised nicely in K. Whitesides' notion of precaution. In his book *Precautionary Politics*, Whiteside writes:

Precautionary politics means that we must take responsibility for maintaining the robustness of the intricately interconnected ecological systems that sustain life on this planet – even when we are far from understanding all the conditions that make them thrive. Never before has so much wisdom been required of humanity's slowly advancing capacity for political association.³⁹

We are responsible even if we do not know. We must maintain the balance of

³⁶ Pieterman, above n. 19, at 4.

³⁷ J.K. Vrijling, 'Het Deltaplan 2008 kritisch geanalyseerd, een toekomstadvies of een donderpreek?' (2008) 5 *Spil* 15.

³⁸ Ewald, above n. 1, at 268.

³⁹ K. Whiteside, *Precautionary Politics Principle and Practice in Confronting Environmental Risk* (Cambridge Massachusetts: MIT Press 2006) at 154.

intricately woven systems against large odds. Wisdom is needed from us, whereas it is implied that this wisdom is something different from scientific knowledge.⁴⁰ What strikes me here especially is the juxtaposition of the ‘intricately interconnected ecological systems’ and ‘humanity’s slowly advancing capacity for political association’. While nature is portrayed as in itself an intricate and interconnected whole, humankind on the contrary is cumbersome and slow and we can only hope it will find wisdom.

This appeal to the wisdom of foresight that extends well into the future is a characteristic presupposition of precautionary logic. It is simply assumed we are able to do this in a meaningful way. This is questionable.⁴¹ We do not know whether our technological advances will hurt or help future generations. Yet in precautionary logic it is assumed that we somehow can know and that we can judge beforehand what risks are likely and which should be avoided. We will never know by using conventional science, but we can by using wisdom.⁴² Typically, risks that have to do with modern technology should be avoided, and that takes us to the following point: the bleak view of humankind and its endeavours.

6 The precautionary economy of truth, humans versus nature, humans versus humans

The examples given in the last paragraphs indicate yet another reason that we are responsible. It is because the dangers we are facing and the uncertainties we are subjected to are considered to be of our own making. Our institutional arrangements have led us to the risk society, in which we have polluted air and water and are agents of war and terrorism. Arguments for precaution are never arguments to intervene with nature, because of the horrible things nature is prone to do. Precautionary arguments are arguments to intervene in cultural arrangements. No one raises a precautionary alarm at the thought of creating a large natural reserve in the Dutch Oostvaarders Plassen, even though letting nature take its course may cause drastic changes to the environment. For the threat, it does not matter whether it is man-made, but for precautionary

⁴⁰ At a conference on 13 May 2009 – ‘De Grenzen van de Risicobenadering, hoe nu verder?’ – Professor Herman Cousy, Director of the Centre for Risk and Insurance Studies in Leuven, referred to the ‘paradigm of precaution’ as ‘nova prudentia.’

⁴¹ For an epistemological critique of the precautionary principle as a guide to decision-making, see W. J. McKinney and H. Hammer Hill, ‘Of sustainability and precaution: the logical, epistemological, and moral problems of the precautionary principle and their implications for sustainable development’ (2000) 5 *Ethics and the Environment* 77.

⁴² Wisdom is treated as a kind of knowledge that has the potency to transcend the bounds of science. Raffensperger and Tickner use the phrase ‘observation and good sense’ in a similar vein. On the use of both terms, see Pieterman, above n. 19, at 25.

argumentation it seems to be important. Whether global warming is man-made has no impact on its reality, yet it is emphasised time and again that it should be considered man-made. In the air-pollution debate centred on particulate matter, people point to the risk of man-made particles, taking for granted that natural particles will cause no harm.⁴³

Humankind is seen as a polluting, destructive force, while nature is considered far less dangerous.⁴⁴ Precautionary logic has a dualistic conception of humankind and nature: they are viewed as distinct entities. Arie Trouwborst's definition of the precautionary principle highlights this dualism. He states that the core of the principle is 'in dubio pro natura'.⁴⁵ It implies that our actions can be contra or pro nature, but are never themselves natural.

In the philosophies of thinkers such as Hobbes and Locke, a 'state of nature' still had an ominous ring to it. Nowadays nature is seen as benevolent, but things having to do with culture, or worse, 'technological culture', are received with anxiety. In Hobbes, the state of nature is the condition before the onset of law and the state. For ecologists, the state of nature is the state before the onset of technology. In Hobbes, the exploits of humans could lead them out of the state of nature and into a 'commonwealth'. For the ecologist, the onset of technology has corrupted nature, perhaps irreversibly. The term taken from Whiteside's work referred to above shows the same presupposed opposition between nature working like clockwork and humankind being cumbersome and brutish. The tendency to see humankind as inherently good, but the embrace of technology having led to a certain fall from grace, is current among many strands of ecogism, as Bramwell shows. In a thought-provoking study, Keith Thomas shows us how the advances of the industrial revolution triggered a kind of longing for the old pastoral 'natural' state.⁴⁶ Before the industrial revolution, nature had no such pristine place in the public imagination. Nowadays though we are forced to live with a sense of guilt about having destroyed what once was. It seems that the farther we are removed from a state of nature, the more it is forgotten that living in such a state was 'solitary, nasty, brutish and short'.

The responsibility that precautionary logic places upon us to curb risk

⁴³ This is evident from the regulation that, for instance, Sahara sand or sea salt is deductable from the total quantity of particles in the air. Of course it is possible that these particles do no harm, and that man-made particles do, but no one has ever raised the question.

⁴⁴ Here we find the parallel between precautionary thinking and ecological thinking. Pieterman, above n. 10, at 90; A. Bramwell, *Ecology in the 20th Century* (New Haven: Yale University Press 1994). Belief in the benevolence of nature is also noted by Cass Sunstein, *Risk and Reason* (Cambridge: Cambridge University Press 2002) at 36.

⁴⁵ Trouwborst, above n. 6, at 29.

⁴⁶ K. Thomas, *Man and the Natural World: Changing Attitudes in England 1500 - 1800* (Harmondsworth: Penguin 1983).

does not extend solely to the environmental domain. We also become responsible for keeping each other and our society safe. The formulation of the Dutch Scientific Council once more comes to mind. A proactive engagement with security is needed. Paul Frissen noted that this made us all responsible for our environment as well as for state security.⁴⁷ As the WRR formulates it:

... That society takes on the obligation to take insecurity seriously and that she creates the conditions under which multiple actors – politics and science - the administration as well as private parties – will be enabled to meet this obligation.

In this domain too we see the reversal of Hobbesian reasoning. Hobbes' solution was to place security squarely in the hands of the state, in order to escape from a state of nature. Here the opposite is being argued: civilians, corporations, and private parties should all be made responsible for security. At this juncture, the call is made to change present institutional arrangements. Here we leave precautionary logic and enter into precautionary politics.

7 Precautionary logic and the truth economy of the Enlightenment

Before venturing into politics, it would be constructive to review this outline of precautionary logic. I think the core has been mapped out. Precautionary arguments are considered true when they rest on the following basic assumptions: firstly, humankind and its environment are vulnerable. This is a given. Almost all precautionary arguments will display this presumption of vulnerability; secondly we are facing a world of intrinsic uncertainty. Science is unable to help us cope with the risks and does not make the weighing of risk possible. Science and technology are part of the problem and not part of its solution, unless they transform themselves, as Raffensperger and Tickner argue and Ewald signals; thirdly, human action is viewed with suspicion, since humans have a tendency to disrupt nature. Humankind and nature are viewed as distinct entities; fourthly, since humankind is destructive as well as fragile, we must take responsibility for each other and control disruptive people as well as disruptive things. A fifth characteristic of precautionary arguments is the implication that even though our current use of science and technology may well lead to disasters, we may avert them when we realise the necessity for wisdom. There is a way out, but it entails a significant alteration of our habits and our frame of mind. This new wisdom is the wisdom of precaution.

To counter the threats we have ourselves created, we should resort to the wisdom of foresight. We are responsible for future generations and for the well-being of the planet and its ecosystems. We have the capability to transform our short-sighted self-interest into a long term holistic vision by

⁴⁷ P. Frissen, 'Ik ben een burger niet een staatsdienaar' *NRC* (6 October 2008).

means of precaution. A new attitude of precaution and awareness of risk is seen as the light at the end of the tunnel.

Do these presuppositions really present a new way of thinking about ourselves, and if so do they have any practical political consequences? The first part of the question should be answered with yes and no. It does mark a break from the older enlightenment values embraced in industrial society, but it is not an economy of truth that is unprecedented in the history of thought.

The axioms of precautionary logic differ significantly from enlightenment values. A comparison of the axioms in both has already been undertaken by Roel Pieterman in his book on precautionary culture, and a part of it is covered in an article by Roel Pieterman and Tobias Arnoldussen.⁴⁸ The differences between precautionary logic and the economy of truth of the enlightenment concern primarily four different but interdependent notions: the view of the autonomous human subject changed; the view of the possibility of knowledge changed; the view of our world as a robust entity changed; and the ideas concerning moral and technological progress changed.

The Enlightenment faith in human progress has become a story of human degradation: instead of progress there is decline. Human history is portrayed as a process in which we increased insecurity and risk. Despite the fact that we live longer and lead healthier lives now than at any point in history, it is stated that risk, uncertainty, and insecurity have increased to unprecedented levels. The rationale behind it is that man-made catastrophes have become possible, and they have gradually become a focal point of our anxiety. Therefore, the idea of the human agent as a force of moral progress has been discarded. Furthermore, the autonomous subject of the enlightenment has been replaced by a fragile subject caught in the trappings of ecosystems. In fact, the whole idea of the autonomous human subject has lost its prominent place in thought. Precautionary logic takes a standpoint 'sub specie aeternitate', an absolute standpoint. The autonomous subject living in the here and now does not take the centre stage anymore, but the well-being of future generations does. Their well-being is bound up with that of of earth's ecosystems, from biodiversity to climate.

The narrative of progress is turned on its head. Even though humankind is bound to nature, it is also essentially alienated from it. Instead of being an agent of moral progress, humankind has strayed and this has brought it to the edge of a chasm into which it may fall sooner rather than later. Because of their short-sighted and destructive tendencies, humans should be watched by other humans and kept under surveillance. Autonomy is replaced by an emphasis on learning to be cautious. The Enlightenment faith in science has been replaced by a 'crisis of the sciences'. The earth is no longer seen as a

⁴⁸ R. Pieterman, above n. 19, and R. Pieterman and T. Arnoldussen, 'Het voorzorgbeginsel over ideologie en onzekerheid' (2008) 3 *Rechtstheorie en Rechtsfilosofie* 230.

potential to be domesticated and put to good use, but as a fragile balance that might easily shift the wrong way. The consequences of such a shift may well be disastrous for humanity.

Acceptance of this inversion of all values leads to a different worldview and with it to different tactics to combat uncertainty. Authors such as Ulrich Beck point out that this change does not mean a fundamental departure from modernity but a radicalisation of its tendencies. The faith in reason that constitutes the ideal of the Enlightenment also means that everything, including its own concepts, will be criticised by reason. This is a plausible explanation for the turning away from values that the Enlightenment represented.

The critical role that reason is supposed to play in the Enlightenment leads to a questioning of its own assumptions. Reason is granted the power of being the sole tribunal of knowledge and critique, and that trust in reason leads to its mistrust because criticism necessarily implies self-criticism. Indeed, we seem to have reached that reflective stage of self-criticism. Reason is granted absolute power of critique and the trust in its powers leads to despair.

The same conversion into its opposite we find in the conception of vulnerability. At first glance it is surprising that vulnerability becomes axiomatic in a time when we have achieved so much technological mastery of the earth. At the same time, this mastery teaches us that what we took to be an indomitable force is not: it can yield. Therefore the security that this mastery is supposed to give us leads to the insecurity of finitude. Our environment can be destroyed. We have such power. This breeds a sense of uprootedness and fearful responsibility and leads to calls for restoration of a harmony that was supposedly there in our past. The idealisation of science as a means to protect us from nature has given way to an idealisation of nature as it was before the onset of technology.

8 Precautionary logic and religion

Have the axioms of the enlightenment indeed been turned into their opposite? When we compare the economy of truth that precautionary logic offers, we see similarities to an economy of truth that was firmly entrenched in the Middle Ages, in the philosophy of the church fathers, and in Christianity. This was indeed the economy of truth that Enlightenment originally set out to criticise.

Whereas Enlightenment promised us a continuous era of progress, precautionary logic warns us that it is '2 to 12'. Since fragility is central to the self-understanding advanced by precautionary logic, every risk of disaster should be excluded. This is not possible, however. Therefore fragility combined with the other key notions of fundamental insecurity and mistrust of science results in an unsolvable anxiety. The set of presuppositions of precautionary logic fuels the idea that we are living in an end-time. We do not

live in a dawn of reason but in the end-time of technology. The 'carpe diem' of the Renaissance and the Enlightenment has been replaced by a new 'memento mori'. In his book *Black Mass*, John Gray describes a variety of political systems that ruled in the 20th and early 21st century as 'apocalyptic'.⁴⁹ Without glossing over important differences, this can be said to hold true for precautionary logic as well. Precautionary logic has an apocalyptic character. As we have seen, it obsesses about irreversible imbalances and human uncertainty in the face of catastrophe. The difference is that the apocalypse is not God's doing, but that of humans. It is a secularised apocalyptic and eschatological logic in which the destroyer God and the saviour God have been replaced by nature as both destroyer and nurturer.

Precautionary logic favours apocalyptic thinking, but it is also eschatological. Eschatology is the doctrine of salvation and this too is prominent in precautionary logic. We can be redeemed and we might be spared the catastrophe, but it does entail conversion. This conversion is constituted by embracing the demanded proactive engagement with insecurity. Even the language adopted is one of a call that needs to be answered, as in 'the obligation to take insecurity seriously', or 'never before has so much wisdom been required of humanity....'. The same religious imagery is invoked by the disasters lying in wait when we do not heed the call. We need to contend with rising water levels, a new deluge; depletion of the ozone layer means we will be burned by the sun; not being as cautious as necessary towards our fellow humans will result in war or terror. As mentioned in the introduction, one of the icons of precautionary thinking, Al Gore, uses the language of catastrophe and salvation in his Bali speech.

They'll look back, and either they will ask "What were you thinking? Didn't you hear the IPCC four times unanimously warning the world to act? Didn't you see the glaciers melting? Didn't you see the North Polar ice cap disappearing? Didn't you see the deserts growing, and the droughts deepening, and the crops drying up? Didn't you see the sea level rising? Didn't you see the floods? Didn't you pay attention to what was going on? Didn't you care? What were you thinking?"

Or they will ask a second question, one that I'd much prefer them to ask. I want them to look back on this time, and ask: 'How did you find the moral courage to successfully address a crisis that so many said was impossible to address? How were you able to start the process that unleashed the moral imagination of humankind to see ourselves as a single, global civilization?' And when they ask that question, I want you to tell them that you saw it as a privilege to be alive at a moment when a relatively small group of people could control the destiny of all generations to come.⁵⁰

⁴⁹ J. Gray, *Black Mass: Apocalyptic Religion and the Death of Utopia* (London: Allen Lane 2008).

⁵⁰ <<http://www.irregulartimes.com/gorebalispeech.html>> (accessed 1 December 2008)

The point of this speech is to offer an existential choice between a world beset by plagues of biblical proportions or graced with a hard-won salvation that will create a harmonious world in which we manage to balance risks using precaution and to restore the harmony of the earth's ecosystems. This harmony is most of all a vision for the future, and is one between humans and nature, but especially between humans and their offspring. The choice is one of discord between us and future generations, or of harmony. The kingdom of harmony that should be realised by us will be a kingdom come for future generations. It is the 'moral imagination of humankind to see ourselves as a single, global civilisation'. The biblical imagery is taken further by presenting the people fighting to address climate change as a small band of chosen ones. The destiny of the world lies in their hands. The 'conversion' to realise the change in the behaviour of humankind is not an easy one. It entails transforming our beliefs, our scientific methods, and our modes of production and consumption.⁵¹ It cannot be otherwise. We all carry the burden of the fall from grace, presented in precautionary logic as our wasteful and short-sighted, profit-minded human temperament.

In mediaeval philosophy, humankind is tainted with original sin. The expulsion from the Garden of Eden happened when humans ate from the forbidden fruit of knowledge. The same ambiguous stance towards knowledge is found in precautionary logic as it is in religious doctrine: human knowledge is not to be trusted, but it may be ultimately beneficial when we utilise it for the love of God or nature respectively.⁵²

The relationship between humankind and nature has parallels with the relationship St. Augustine envisions between God and humans. In the same way that St. Augustine views God, nature is seen as a powerful but ultimately benevolent force. It is we humans who, due to a corrupted will that causes disruptions in our relationship with nature, will cause ultimate harm. The following paragraphs from a book on Augustinian political theory summarise the views of the bishop of Hippo, but could easily be found in the pleas of a proponent of precaution.

Like all other created beings, man is good, but not incorruptibly, absolutely, or necessarily good. He is mutable and changeable, but as long as he acknowledges his dependence upon and his inferiority to God, his Creator and obeys his commands, he will be good and happy. Moreover man has been given the gift of free will, which no other earthly creature possesses, he can if he wishes to do so act in a manner contrary to

⁵¹ Communication from the Commission, *A sustainable Europe for a better world: a European Union strategy for sustainable development*, COM 2001 264 final, available at <http://ec.europa.eu/sustainable/sds2001/index_en.html> (accessed 8 December 2008).

⁵² G. Wieland, 'Happiness, the perfection of man' in N. Kretzmann, and others (eds.), *The Cambridge History of Late Medieval Philosophy* (Cambridge: Cambridge University Press 1982) at 676.

Gods command. He can choose to obey or disobey. If he disobeys he turns away from the source of his being, his life will be warped and stunted, the farther he removes himself from God, the more wretched, miserable and imperfect he will become.⁵³

From Carson to Gore, we see the same relationship between humans and their Creator as is envisioned here. The hallmark of precautionary logic is the belief that the more technological culture advances and the more humankind removes itself from nature, the more 'wretched and miserable' humankind and the environment will become. However, precautionary thinking is thoroughly secularised. The Creator does not live on another plane of existence. The dichotomy between creator and created is the same however. Here, nature is seen as the creator and humans and what is man-made are seen as having been created. Therefore it is less perfect, flawed, and dangerous. Nevertheless, if humankind uses its free will for the benefit of working with nature and not against it, a happy life may ensue.

Augustine sees life as fraught with danger and hardships and inherently flawed because of original sin. However, faith may be an indication that one belongs to the chosen ones on which God has bestowed grace. The same role that faith plays for Augustine, wisdom plays for the precautionary.

Human existence in this world is characterised by fragility and fragmentation. This fragility makes balance and harmony a necessary virtue, both within mediaeval thought and within precautionary logic. This harmony though is for the human of mediaeval times only to be found in the afterlife, where the multiplicity of things is made whole.

The multiplicity and fragility of earthly things admits of no perfect condition; there is happiness only in another world, in which the multiplicity is made one and the fragility is exchanged for permanence.⁵⁴

The precautionary thinker has a similar vision of a holistic science that will restore harmony between humans and nature. Unlike the Augustinians, humans see this harmony as a possibility to be realised on this earth, and not for the here and now, but for tomorrow. The idea that this harmony lies in the future lives on in the conceptualisation of 'future generations' Gore envisions this utopian vision as follows:

The greatest opportunity inherent in this climate crisis is not only to quickly deploy the new technologies that will facilitate sustainable development, and create the new jobs and to lift standards of living. The greatest opportunity is that in rising to meet the climate crisis, we in our generation will find the moral authority and capacity for long term vision to get our act together in this world and to take on these other crises, not

⁵³ H.A. Deane, *The Political and Social Ideas of St. Augustine* (New York: Columbia University Press 1963) at 15.

⁵⁴ Wieland, above n. 49, at 676.

political problems, and solve them. We are one people on one planet. We have one future, one destiny. We must pursue it together, and we can.

The picture of harmony painted by Gore resembles the harmony of the afterlife. Like the 'City of God', the future will be a time in which that which is fragmented and fraught with conflict becomes whole. The disruptions with which this world struggles will be solved and we will be re-united with each other and with the planet. Gore envisions the coming of an end-time in which our destiny is fulfilled.

It is clear that the outline sketched here is not subtle enough. There are many great differences in the views of different mediaeval philosophers, especially between Thomas and Augustine. However, they have things in common as well, and they are important here. The philosophies of the Middle Ages were based on a perspective of harmony. Excess, hubris, and immodesty are from the time of Aristotle onward seen as upsetting the balance. Aristotle's philosophy, on which Thomas' thinking is based, as well as the neo-Platonic philosophies that informed St. Augustine, were philosophies of mediation and moderation. Humankind took an in-between position. He was more perfect than the rest of creation, due to his ability to reason and his desire for truth, but he was far more flawed than God. In comparison, the pretentious truths of Enlightenment are thoroughly immodest. They represent the human subject, autonomous, reasonable, calculating, as the source and measure of good and evil. Legislation was a matter of the will of the people, not the will of God. It is not a philosophy of mediation, in which the subject is the medium between God and the animals, heaven and earth. In Enlightenment philosophy, the human subject has occupied an absolute position. The liberal perspective of self-realisation, either individually or collectively, could become dominant because of this prioritisation of the subject.

Augustine would consider this view to be ultimately sinful. Indeed, for him human pride led to the fall from grace. 'By craving to be more, man becomes less; and by aspiring to be self sufficing he fell away from Him that truly suffices him'.⁵⁵

The advocates of precaution could easily agree with the church father on this score. Precautionary logic represents a break with prideful Enlightenment philosophy. No longer can we calculate risks and judge which ones to take; we must be moderate in the face of uncertainty. The punishment for immodesty in this regard is catastrophe. Therefore we refer back to a role of medium. Now it is the ecosystem that sustains us and humankind is an imperfect beneficiary, though with the redeeming quality of foresight. This is our role in precautionary logic: becoming a happy medium, shepherd of ecosystems, keeper of sustainability, and living in harmony with ourselves,

⁵⁵ De Civitate Dei XII.

other human beings, and nature.⁵⁶

In short, the reflection of Enlightenment values has created a new despair and a new uncertainty. Enlightenment values became less convincing perhaps to radical moderns, because it is clear that we do not control our own destinies. We cannot calculate the dangers by using common sense; we need experts and expert systems. We do not know our ways about in the intricate systems of capital and management that we have created by ourselves. This uncertainty has caused a reappraisal of our own role within the greater scheme of things. The autonomous subject as such does not exist. Self-reflection has led us to the conclusion that we cannot take the place of the absolute subject and that we should once again resign ourselves to the role of medium.

In order not to become resigned to powerlessness, we refer back to an older paradigm in which we were not all-powerful but could gain favour by sacrifice and modest living. This is what precaution asks from us: the sacrifice of consumption and production, a new modesty in the face of risk, and the establishment of harmony between our development and the demands of nature. The role of humankind in religious logic is similar to its role in precautionary logic. It is not after autonomy but seeks to maintain a harmonious relationship. In mediaeval times, this relationship was our covenant with God. In present times, it is that between humans and their environment.⁵⁷ We should not disrupt the harmony between humans and nature.

9 Precautionary politics and precautionary law

What would the relevance of all of this be for politics in a risk society? It is known that politics is getting to be more risk averse, at least in Europe. It is also

⁵⁶ Schwarz and Thompson define this perspective as egalitarian. One defining quality of this perspective is its millenarian cultural bias. M. Schwarz and M. Thompson, *Divided we Stand: Redefining Politics, Technology and Social Choice* (Philadelphia: University of Pennsylvania Press 1990). Bramwell considers ecologism to be Manichean because it embraces the idea of a battle between good and evil represented by nature and humankind. Whereas that might be true of the more radical wing of ecologism, it is not deep ecology for more moderate visions. The type of ecologism that seems to dominate green thought now sees harmony of humans and nature as most important. This is captured best by the notion of sustainable development. M. Jacob, 'Sustainable development and deep ecology: an analysis of competing traditions' (1994) 18 *Environmental Management* 477.

⁵⁷ Douglas and Wildavsky also signal the sectarian nature of various environmental groups. However, they do not think the perspective they hold will attract any mainstream following. I contend here that precautionary logic has the same axiomatic underpinning, though is less radical in its aims. M. Douglas and C. Wildavsky, *Risk and Culture: an Essay on the Selection of Technological and Environmental Dangers* (London: University of California Press 1982) at 124.

known that green policy initiatives increasingly gain ground and are adopted by parties all across the political spectrum. However, risk aversion and even green politics might still be considered instrumental. If precautionary logic in fact displays a quasi-religious underpinning, risk aversion will be combined with other trends. Practical politics will display the ideals of harmony and moderation that follow from precautionary logic.

Here I will sketch a preliminary outline of political developments based on the assumption that precautionary logic is indicative of a paradigm shift in favour of a secularised religious perspective of harmony between creator and created. This proposal could function as a base for further research questions. Politics following from precautionary logic will reflect the presuppositions embedded in this line of reasoning. It will take into account vulnerability, insecurity, a shift in the aim of science from disinterested knowledge to knowledge in the service of love of nature, enlarged responsibility, and fear of an end-time, but – at the same time – hope for a harmonious future.

I would like to refer to the politics associated with this set of presuppositions as a politics of moderation. I use this term in the double meaning of the word ‘moderation’.⁵⁸ Firstly, I use it in the common sense meaning linked to frugality. We have to be moderate in regard to resource and energy use, moderate in regard to our lifestyles, and moderate in regard to our expectations from science. Immodesty would upset the balance of harmony that proponents of precautionary logic implicitly or explicitly view as the core of our existence.

Secondly, I will use the word in the sense of ‘avoiding extremes of behaviour or expression: observing reasonable limits’.⁵⁹ Administrations, but also groups of civilians, will adopt the role of moderator in order to harmonise the smooth interplay of relationships and negotiations that shape politics within society. People and ideas that cannot be filtered out of the discourse in this way will be banned to the fringes of society.⁶⁰ Moderation as a tool of politics amounts to tweaking unwanted elements in society. Moderation does not aim at rooting them out but at moderating their effects. Harmony is restored by targeted interventions, moderate in scope. Moderation in this view is the soft but definite and all-encompassing discipline that is used to force actors to be

⁵⁸ The word ‘moderation’ is also linked etymologically to the word ‘medium’. The stem ‘med’ or ‘mod’, means ‘measure’. A moderator also acts as a medium, taking an in-between position, guarding the balance.

⁵⁹ This meaning can be found in Merriam Webster’s online dictionary, under ‘moderate.’ <<http://www.merriam-webster.com/dictionary/moderate>> (accessed 8 December 2008).

⁶⁰ M. Schuilenburg, ‘Een politiek van versplintering. Over eilandjes, denizens en margizens’ in H. Boutellier and R. van Steden (eds.), *Veiligheid en burgerschap in een netwerksamenleving* (Den Haag: Boom Juridische Uitgevers 2008).

moderate in their own life styles, their demands, and their use of resources. Moderation thus understood is coherent with the presuppositions of precautionary logic. Extremes threaten the harmony of the whole. This harmony is fragile and so a constant wariness of disruptions is in order. We do not know the effects of our measurements and so the best policy is to exclude possible forces of disruption. These forces may be excessive sexuality, excessive eating, anti-social behaviour, or product and process innovations, all the consequences of which we can not yet foresee. The morality of moderation is enforced by moderation as a policy instrument, a subtle exclusionary disciplining.

What would this mean in concrete terms? It would entail a curbing of individual freedoms to increase the strength of the collective. It would also give more space to specifically moral policy initiatives. The diminishing importance of specific Enlightenment ideals of untrammelled subjectivity would give way to holistic, communitarian ethics. The collective is seen as fragile, however. Therefore the new initiatives would be idealistic, but with a certain conservative and cautious bend. Political initiatives would be aimed at reducing what is seen as disturbances of any kind. This would extend to the environmental domain. Here we would see a more restrictive approach to innovations in research and production. Standards of safety would be tightened, which would make innovations more costly to develop. This approach would lead to a more static society, with the exception perhaps of the development of technologies seen as being friendly to the environment. Investing money in 'sustainable' funds would become interesting and would create opportunities for 'green' investors.

The conservative, religious, green mix of societal aims would also lead to a new moderation or 'new temperance'.⁶¹ In the fields of consumption and life style, politics frugality would be stimulated and perhaps even demanded. This new moderation is seen in our worries for resource depletion, but also in the gradual restraining of activities such as smoking, drinking, and sex.

It is my expectation that due to the egalitarian nature of the presuppositions that underpin precautionary logic, the administration would, where possible, refrain from using hard law. It would instead resort to providing incentives to acquire the behaviour it desires from the public. Incentives would be the carrot and uncertainty and belief in human frailty might be the stick. By this I mean that the government would actively point out the fragile nature of our bodies and our ecosystems and the insecurity that accompanies our day-to-day living in order to have people refrain from behaviour that is considered risky.

John Gray points out that millenarian political systems – like Marxism and Nazism – are always prone to violence. I have argued thus far that

⁶¹ This phrase was coined by David Wagner; D. Wagner, *The New Temperance* (Boulder Colorado: Westview Press 1997).

precautionary logic is a set of presuppositions that points towards similar millenarian green politics. Yet, I do not think it would be associated with such crude violence as Gray shows is inherent in fascism or communism. The political system precautionary logic favours would be ecologism, in which wholesale violence threatens to upset the natural balance, be it violence against nature or against humans. That does not mean that this politics might not be repressive. It would use moderation as repression, a gentle tweaking of our daily activities via warning systems, labels, consumer awareness through science, education constant monitoring and identification, and instilling a forward-looking attitude in humans. It would be a non-liberal policy, because we no longer tolerate allowing the preferences of the few to dominate the many.

What follows is a reresponsabilisation of ordinary people. We see this reflected in the obesity debate for instance and in the illusion that our activities will mean something for our environment as a whole.⁶² In criminal politics it can be foreseen that considerably more behaviour will be criminalised, but that the sanction will have the same moderating character. This will entail a reduction in generic prison sentences but an increase in measures that impinge upon the lives of the convicted: for instance, by using restraining orders or by means of tailored prohibitions that are designed to stop the target from displaying unwanted behaviour.

Our policies will also become more forward looking. There will be more scope to make early interventions in processes without much need for scientific justification. Instead, policy will revolve around ethics. This ethos will be one of harmony in which there will be little room to deviate from the norm. Deviations will not necessarily be punished, but moderated. They will be filtered out, tweaked, and blunted by early intervention, education in the spirit of harmony, tailor-made orders, and the mobilisation of public consciousness and awareness.

10 Conclusion

Precautionary logic is a stronger term than, say, precautionary discourse. A logic system implies that a certain way of reasoning has become fixed. It has found its place and can now act as an arbiter of truth. When precautionary logic is dominant in a certain domain, arguments for precautionary measures are considered valid herein.

Precautionary logic concerns not the form of an argument but the content. The content of the argument is made plausible by a set of absolute presuppositions implied in the argument. These presuppositions are axioms that

⁶² I consider the slogan ‘a better environment starts with yourself’ as a forerunner to this trend. The slogan was used in the Netherlands in the 1990s.

are considered true and do not need to become the subject of further questioning or research. In this article, a number of such presuppositions have been mapped out.

Firstly, humans and their environment are vulnerable. This is a given. Almost all precautionary arguments will display this presumption of vulnerability. Secondly, we are faced with a world of uncertainty. Science cannot help us cope with the risks and does not make weighing risk possible. Science and technology are part of the problem and not of its solution. The actions of humankind in general should be viewed with suspicion, since they may already have caused a disharmony in our ecosystems that might lead to catastrophe. At this point though, sometimes referred to as the time of reflexive modernisation, humankind has come to realise the wisdom of foresight.⁶³ If science, production, and consumption were to transform in the spirit of foresight, we might achieve a harmonious society, especially in the interest of generations to come. Vulnerability, uncertainty, limited science, imminent catastrophe, and salvation by foresight and a perspective of harmony are absolute presuppositions of precautionary logic. In domains where precautionary logic is a dominant line of reasoning, only discourses that affirm these presuppositions would be condoned. Other discourses would be marginalised.

These presuppositions represent a turn from traditional Enlightenment notions such as the autonomous subject, the benefits of culture over nature, and an era of progress under the aegis of science. However, they do not represent a turn from Western thought in general. They hearken back to an older set of presuppositions current in early Christian and mediaeval philosophy and theology. These presuppositions underpin an apocalyptic and eschatological vision that represents a secularised religion in which nature has taken over at least some of the duties of God. This new religious fervour will have consequences for politics, which may see the rise of a new ethical revival. This politics will not treat the individual subject as its main locus of concern. Instead it will focus on fostering harmonious relations within the collective.

It is ironic that a thinker who informed a great deal of ecological thinking, Martin Heidegger, lamented in the 1970s that 'only a God could save us'.⁶⁴ Perhaps his prophecy will be fulfilled.

⁶³ U. Beck, A. Giddens, and S. Lash, *Reflexive Modernization: Politics, Tradition and Aesthetics in the Modern Social Order* (Cambridge: Polity Press 1994).

⁶⁴ M. Heidegger, interview (1966) *Der Spiegel* (published 31 May 1976).

