

6 Regulating Risks

Regulation can be seen as being inherently about the control of risks, whether these relate to illnesses caused by the exposure to carcinogens, inadequate utility services, or losses caused by incompetent financial advice.¹ More formally, risk is usually defined as the probability of a particular event (or hazard) occurring and the consequent severity of the impact of that event. This notion of risk contrasts with the idea of uncertainty, a distinction provided by Frank Knight. The division drawn is between uncertainty—which is inherently impossible to measure—and risk, which is amenable to quantification.² To view regulation as concerned with the control of risk adds to our understanding of key regulatory debates across all dimensions of regulation, namely standard-setting, information-gathering, and behaviour-modification. At the same time, the regulation of risks (which needs to be separated from those discussions of ‘risk-based regulation’ that are dealt with in Chapter 13) points to a series of fundamental debates and worldviews. Risk regulation is centrally concerned with the highly contested management of Knightian risk and uncertainty, the challenges of dealing with uncertain popular responses to anticipated or realized risks, and the issues presented by communications about risks.³

Risk has been regarded as one of the key unifying themes that shape the contemporary social sciences. For the German sociologist Ulrich Beck, we are living in the age of the *risk society*.⁴ Risks are no longer imposed by exogenous factors and regarded as a matter of fate. Instead, risks have taken on a different quality—they are no more just a matter of destiny or of change: rather, contemporary risks are increasingly manufactured in that they are the result of human decisions and actions. This state of, what he calls, ‘advanced modernity’, requires specific expertise to identify and recognize these, often global, risks. The increased use of the language of risk further

¹ See generally J. Black, ‘The Role of Risk in Regulatory Processes’, in R. Baldwin, M. Cave, and M. Lodge (eds), *The Oxford Handbook of Regulation* (Oxford, 2010). On the consequences of framing the objects of regulation as risks, see H. Rothstein, M. Huber, and G. Gaskell, ‘A Theory of Risk Colonization’ (2006) 35(1) *Economy and Society* 91–112.

² F. Knight, *Risk, Uncertainty, and Profit* (Boston, 1921).

³ See also C. Hood, H. Rothstein, and R. Baldwin, *The Government of Risk* (Oxford, 2001); R. Kasperson and P. Stallen (eds), *Communicating Risks to the Public* (Dordrecht, 1991); B.M. Hutter (ed.), *Anticipating Risks and Organising Regulation* (Cambridge, 2010); B.M. Hutter and M. Power (eds), *Organizational Encounters with Risk* (Cambridge, 2005).

⁴ U. Beck, *The Risk Society* (London, 1992); A. Giddens, ‘Risk and Responsibility’ (1999) 62(1) *Modern Law Review* 1–10.

raises complications in that a decision about consuming particular goods becomes one of risk and uncertainty, rather than categorical certainties (as in 'safe versus unsafe'). Modern societies might have unprecedented expertise in evaluating the presence of risks through scientific means, but such knowledge generates greater levels of insecurity. The tools for coping with modern risks, moreover, are, at best, limited, especially since their applications are likely to have transboundary, if not global, implications.⁵ Indeed, implicit in these discussions is that contemporary risks differ in their quality to previous generations of risks in so far as the former may unintentionally generate greater (transboundary) unanticipated risks. This also implies that contemporary 'manufactured' risks also challenge class-understandings of politics,⁶ in that the wealthy are unable to reduce their exposure to risks on the basis of wealth: it is access to knowledge and expertise that allows individuals, at least to some extent, to avert exposure to particular risks. More generally, though, Beck argues that contemporary societies' attempts to anticipate risks are inherently futile, as these risks cannot be calculated.⁷ Indeed, according to this view, risk assessment exercises inherently underestimate real threats, as they rely on methodologies that legitimize individuals' exposures to incalculable risks.

Others also note that this age of required expertise goes hand in hand with an age that is increasingly distrustful of authority.⁸ Indeed, for Mary Douglas and Aaron Wildavsky, the rise of egalitarian and individualist worldviews triggered a growing concern (if not obsession) with danger and risk and consequent interest in blame.⁹ Others, too, have noted that the language of risk and attempts to verify 'safety' have reflected wider societal trends towards a greater distrustfulness towards expertise and authority—and these trends have at least to some extent motivated the move towards the 'regulatory state' (which is explored in more detail in Chapter 18).

Such a context points to a set of problems for regulation and regulators. Examples of debates about how to regulate risks are not difficult to find. They range from interests in acid rain, to concerns about the safety of large technical installations such as nuclear reactors, to the fears associated with mad cow disease (Bovine Spongiform Encephalopathy) and later worries about the safety of genetically modified foods. These debates also extend into

⁵ A. Boin 'The New World of Crises and Crisis Management' (2009) 26(4) *Review of Policy Research* 367–77; U. Beck, *World at Risk* (Cambridge, 2009).

⁶ See A. Giddens, *Beyond Left and Right* (Cambridge, 1994); M. Douglas and A. Wildavsky, *Divided We Stand* (Berkeley, 1982).

⁷ U. Beck, 'Living in the World Risk Society' (2006) 35(3) *Economy and Society* 329–45.

⁸ Also B. Wybbe, 'Scientific Knowledge and the Global Environment', in M. Redclift and T. Benton (eds), *Social Theory and the Global Environment* (London, 1994), 175–6.

⁹ M. Douglas, *Risk and Blame* (London, 1992); M. Douglas and A. Wildavsky, *Risk and Culture* (Berkeley, 1982).

discussions of terrorism, critical infrastructures, and vanishing bee colonies or fish stocks. More broadly, conflicts about the extent to which the *precautionary principle* should be applied within countries, within the EU, and in global trade further points to the political significance of risk in the world of national and international regulation.¹⁰

The literature on the regulation of risk is thus interested in the causes of disaster and failure. Beck, for example, notes that ‘Risk means the *anticipation* of catastrophe [...] Risks are always events that are threatening.’¹¹ Such scholarship seeks to distinguish between social, technological, and natural risks, but the boundaries between these different categories are fluid. Technologies, for example, are socially constructed and social choices have to be made in order to deal with natural risks. In relation to ‘failures’ to deal with risks, furthermore, a distinction needs to be drawn between those social sources of failure that involve intentional acts of obstruction and those that result from ‘unintended’ acts. For some, failure is inevitable, if only because of organizational processes that encourage ‘deviance’, and failure’s consequences are—under particular constellations—unpredictable, due to the inherent complexity of organizational processes. Accordingly, this position requires a differentiated approach towards the risk regulation of different technologies.¹² Similarly, issues arise concerning the relative importance of addressing high-impact but low-probability risks as opposed to those that are of low impact but of high probability. How risks are perceived and responded to often has more to do with subjective matters than with any form of objective risk profiling. Inconsistencies between regulated domains suggest that fears and anxieties, moral panics, and such like have considerable mileage in explaining why particular risks are regulated in a ‘heavy duty’ manner and other risks are tolerated in a much more reactive way.¹³

A further focus of risk regulation debates is the organizational dimension of risk control. In particular, this relates to issues of procedures for decision-making, the increasing pushing of responsibility for risk management into private organizations (for example, in the HACCP (Hazard Analysis and Critical Control Points) approach),¹⁴ the application of cost-benefit analysis,

¹⁰ See, e.g., G. Majone, ‘What Price Safety? The Precautionary Principle and its Policy Implications’ (2002) 40 *Journal of Common Market Studies* 89; V. Heyvaert, ‘Guidance Without Constraint: Assessing the Impact of the Precautionary Principle on the European Community’s Chemicals Policy’ (2006) 6 *Yearbook of European Environmental Law* 27–60.

¹¹ Beck, ‘Living in the World Risk Society’, 332.

¹² C. Perrow, *Normal Accidents* (New York, 1999); D. Vaughan, ‘Organizational Rituals of Risk and Error’, in B.M. Hutter and M. Power (eds), *Organizational Encounters with Risk* (Oxford, 2005); M. Lodge, ‘The Public Management of Risk’ (2009) 26(4) *Review of Policy Research* 395–408.

¹³ See generally Hood, Rothstein, and Baldwin, *Government of Risk*.

¹⁴ This approach was formally endorsed by the World Health Organization in 1972, it was incorporated in the Codex Alimentarius in 1985, and became an international standard in 1994.

as well as how individuals and organizations operate within a context of bounded rationality and well-documented biases in decision-making.

This chapter concentrates on three central issues in the risk regulation debate, namely the problems of defining and assessing risks, the key regulatory challenges that are posed by risks, and four ways of organizing ‘approaches’ towards risk regulation. These approaches do not provide for ‘one best way’ to deal with the regulation of risks: rather, they emphasize that risk regulation is about choices that reflect fundamental assumptions about the vulnerability of particular social systems.

Defining and Assessing Risks

It seems uncontroversial to suggest that regulatory efforts should be devoted, as a first priority, to the reduction of the most severe risks that we face in society. A glance at the literature on risks reveals, however, that identifying and assessing risks is no simple matter.¹⁵ Indeed, a first issue is ‘what to look for’, given the existence of threshold or sleeper effects, or major discontinuities and ‘black swans’.¹⁶ These different effects challenge assumptions of linearity or normal distribution-shaped risk probabilities.¹⁷

As noted, risk has been widely defined as the probability that a particular adverse event will occur during a stated period of time, or result from a particular challenge.¹⁸ Important distinctions have, however, been drawn between different types of risk. Thus, probabilistic and unpredictable risks have been differentiated (thereby blurring the boundaries between uncertainty and risk).¹⁹ In the case of the former, assessments of probability can be based on available statistics concerning past incidents. With unpredictable

It was also incorporated in European law under 2003/53/EC. See D. Demortain, ‘Standardising through Concepts’, *CARR discussion paper 45* (London, 2007).

¹⁵ See Royal Society, *Risk: Analysis, Perception, Management* (London, 1992); S. Krimsky and D. Golding, *Social Theories of Risk* (Westport, 1992); B.M. Hutter, ‘Risk, Regulation, and Management’, in P. Taylor-Gooby and J. Zinn (eds), *Risk in Social Science* (Oxford, 2006); L. Sjöberg, ‘Rational Risk Perception’ (2006) 9(6) *Risk Research* 683–96.

¹⁶ H. Brooks, ‘The Typology of Surprises in Technology, Institutions and Development’, in W.C. Clark and R.E. Munn (eds), *Sustainable Development of the Biosphere* (Cambridge, 1986); N. M. Taleb, *Black Swans* (London, 2007).

¹⁷ ‘Threshold effects’ are defined as those where a particular tipping point leads to a cascading in the condition of a particular object; ‘sleeper effects’ refer to events where a previously dormant property emerges as a highly salient factor (‘dormant vulnerability’), and ‘black swans’ refer to events with high impact that represent extreme outliers in terms of probability.

¹⁸ See Royal Society, *Risk*, 2; B. Fischhoff, S. Watson, and C. Hope, ‘Defining Risk’, in T.S. Gluckman and M. Gough (eds), *Readings in Risk* (Washington, 1993); O. Renn, ‘Concepts of Risk: A Classification’, in Krimsky and Golding, *Social Theories of Risk*.

¹⁹ See, e.g., P. Sprent, *Taking Risks* (London, 1988), ch. 2.

risks, evidence of a causal connection between events may be weak and unquantifiable. Some events may be ‘one-off’, non-repeating risks, where probabilities cannot be estimated and subjective assessments must be made. A related distinction lies between ‘objective’ and ‘subjective’ risks. The former are seen as scientifically assessable by experts and probabilistic, the latter as non-expert perceptions by the lay public.²⁰

A further division can be drawn between *voluntarily undertaken* risks (e.g. from taking oral contraceptives or diet drinks) and *societally imposed* risks (e.g. from nuclear power stations), where citizens have little choice as to exposure. Again, *discrete* risks can be separated from *pervasive* risks, where the former are highly identifiable threats and events of a precise, bounded nature (e.g. earthquakes) and the latter are the risks borne as part of the ‘normal’ functioning of society—as, for example, presented by polluted air, water, and soil.²¹ Further distinctions can, moreover, be drawn between risks that are reversible after actualizing and those that are not and between risks of different natures—be these natural, physical, biological, or social-communicative.

A core concern of risk studies has been to explain how risks are, or should be, perceived, assessed, quantified, and responded to.²² Most of these approaches acknowledge that risk regulation is not merely about the ‘real’ consequences of a risk occurring and harm resulting, but also about the impact of mediating factors. A number of broad and varying approaches can be identified.²³

²⁰ For a critique of this distinction, see, e.g., B. Wynne, ‘Institutional Mythologies and Dual Societies in the Management of Risk’, in C. Kunreuther and E.V. Lay (eds), *Risk Analysis Controversy* (Berlin, 1982). On the way that regulatory bodies assess risks in the USA, see C.F. Cranor, *Regulating Toxic Substances* (New York, 1993), esp. ch. 4.

²¹ See M. Waterstone (ed), *Risk and Society: The Interaction of Science, Technology and Public Policy* (Dordrecht, 1991).

²² See generally Royal Society, *Risk*, and B. Fischhoff, P. Slovic, S. Lichtenstein, S. Reid, and B. Combs, ‘How Safe is Safe Enough?’ (1978) 9 *Policy Sciences* 127. See also O. Renn, *Risk Governance* (London, 2008), esp. 12–45.

²³ We do not focus here on those studies that explore whether national styles ‘matter’ in risk regulation. Different views exist, ranging from those that suggest that national styles exist, others that point to ‘flip-flop’ patterns in stringency of risk regulation between US and European approaches, and those that see no clear patterns across countries and sectors whatsoever. See W. Gormley and B.G. Peters, ‘National Styles of Regulation’ (1992) 25(4) *Policy Sciences* 381–99; M. Howlett, ‘Beyond Legalism? Policy Ideas, Implementation Styles and Emulation-based Convergence in Canadian and US Environmental Policy’ (2000) 20 *Journal of Public Policy* 305–29; S. Kelman, *Regulating America, Regulating Sweden: A Comparative Study of Occupational Safety and Health Policy* (Cambridge, 1981); R. Löfstedt and D. Vogel, ‘The Changing Character of Regulation’ (2002) 21(3) *Risk Analysis* 399–416; D. Vogel, ‘The Hare and Tortoise Revisited: The New Politics of Consumer and Environmental Regulation in Europe’ (2003) 33 *British Journal of Political Science* 557–80; J.B. Wiener, ‘Whose Precaution After All?’ (2003) 13 *Duke Journal of Comparative and International Law* 207–62; J.B. Wiener and M.D. Rodgers, ‘Comparing Precaution in the United States and Europe’ (2002) 5 (4) *Journal of Risk Research* 317–49.

Technical perspectives, as seen in actuarial approaches, look to the relative frequencies of events that are amenable to ‘objective’ observation (e.g. numbers of deaths) and which assess probabilities by extrapolating from statistics on past events. Similarly, in epidemiological studies, populations exposed to a risk are compared to control populations and attempts are made to quantify relationships between risks and harms. Engineering approaches attempt to assess the probabilities of failures in complex systems even where there is insufficient data on the given system as a whole. Fault-tree or event-tree analyses are used and the failure probabilities for each component in the tree are evaluated before all such probabilities are sought to be synthesized.

Technical approaches, in general, seek to anticipate physical harms, average events over time and space, and use relative frequencies to specify probabilities. They are associated with the view that decisions on risks can be made on the basis of objective evidence that can be treated mathematically to produce a numerical result. This perspective has been used to assess not merely the quantum of risks but also their social acceptability. This latter application has, however, been much criticized by social scientists²⁴ on the grounds that what persons perceive as undesirable depends on their values and preferences and that technical strategies tend to undervalue objectives such as equity, fairness, public participation, and resilience.²⁵ Objectors have also contended that judgements are involved in selecting, defining, and structuring the ‘risk problem’ and that these influence subsequent conclusions.²⁶ Thus, these approaches are seen as potentially biased, requiring not just the existence of data, but also a belief in the possibility of technical analysis in dealing with risks. Such criticisms have eroded not only the idea of objectivity in risk assessment but also the presumed difference between expert and lay public views of risk—the critics of technical approaches hold that both technical and lay assessments of risks involve human interpretation, judgement, and subjectivity.²⁷ This, we will see below, has implications for those seeking to legitimate different regulatory approaches to risk. Nevertheless, it can be argued that technical assessments have a role to play, but their contribution has to be seen in the context of their inherent limitations.

²⁴ See, e.g., M. Douglas, *Risk: Acceptability According to the Social Sciences* (London, 1985); Renn, ‘Concepts of Risk’; A. Mazur, ‘Bias in Risk-Benefit Analysis’ (1985) 7 *Technology in Society* 25; Beck, *Risk Society*; L. Clarke, *Acceptable Risk* (Berkeley, 1989).

²⁵ J.F. Short, ‘The Social Fabric at Risk: Towards the Social Transformation of Risk Analysis’ (1984) 49 *American Sociological Review* 711. For official acceptance that risk regulation ‘cannot be reduced to a set of rules based on universal formulae for quantifying and valuing costs and benefits’ but involves ethical and perceptual problems, see HM Treasury, *The Setting of Safety Standards* (London, 1996).

²⁶ See C.J.H. Vlek and P.J.M. Stollen, ‘Rational and Personal Aspects of Risk’ (1980) 45 *Acta Psychologica* 273; Cranor, *Regulating Toxic Substances*, 10.

²⁷ Royal Society, *Risk*, 97; B. Fischhoff, *Risk: A Guide to Controversy* (Washington, DC, 1989).

The *economic perspective* on risk transforms undesired effects into subjective utilities so that comparisons between different risks and benefits can be made using the currency of personal satisfaction. This provides a means of integrating risk analyses into decision processes in which various costs and benefits are assessed in pursuit of the allocation of resources in a way that maximizes their utility for society. This perspective has proven increasingly influential in court cases concerning compensation payments towards victims exposed to involuntary risks.²⁸

Central difficulties for the economic approach²⁹ are how individuals' subjective utilities can be aggregated; how costs imposed on parties beyond the immediate transaction can be taken on board; how future risks are accounted for; how monetary units can be placed on risks of health losses or deaths; and how utilitarian, wealth-maximization, or contractarian ethics can be justified. The economic approach thus begs serious distributional questions (especially regarding third parties), and makes contestable assumptions both about the rationality of market decisions and concerning the freedom of choice and quality of information encountered in the marketplace. It is said to involve a range of judgements and modelling assumptions (such as the nature of utility maximization) and be highly prone to manipulation.³⁰ Moreover, it involves a bias towards the wealthy, since all methods of placing a monetary value on life (e.g. making reference to willingness to pay, insurance calculations, or court awards) are in some way based on the wealth of the victim and impliedly encourage saving the lives of the wealthy and imposing risks on the poor.³¹

The *psychological approach* to the definition and measurement of risk focuses upon individual cognition and such questions as how probabilities are perceived; how preferences relating to risks can be accounted for and how contexts shape individuals' risk estimations and evaluations. Individual risk perceptions are therefore placed in the foreground of analysis. Thus, several factors have been said to impinge on perceptions of seriousness of risks.³² These include:

²⁸ See Renn, *Risk Governance*, 17–18.

²⁹ See, e.g., P. Slovic, B. Fischhoff, and S. Lichtenstein, 'Rating the Risks' (1979) *Environment* 4; M.S. Baram, 'Cost-Benefit Analysis: An Inadequate Basis for Health, Safety and Environmental Regulatory Decisionmaking' (1980) 8 *Ecology LQ* 463.

³⁰ See P. Self, *Econocrats and the Policy Process: The Politics and Philosophy of Cost-Benefit Analysis* (Basingstoke, 1975).

³¹ See H. Otway, 'Public Wisdom, Expert Fallibility: Towards a Contextual Theory of Risk', in Krimsky and Golding, *Social Theories of Risk*.

³² See Royal Society, *Risk*, ch. 5; Renn, 'Concepts of Risk'; P. Slovic, B. Fischhoff, and S. Lichtenstein, 'Perceived Risks, Psychological Factors and Social Implications' (1981) 376 *Proceedings of the Royal Society of London* 17; L. Gould et al., *Perceptions of Technological Risks and Benefits* (New York, 1988); C. Kam and E. Simas, 'Risk Orientation and Policy Frames' (2010) 72 *Journal of Politics* 381–96.

- catastrophic potential;
- degree of personal control over the size or probability of the risk;
- familiarity with the risk;
- degree of perceived equity in sharing risks and benefits;
- visibility of the benefits of risk-taking;
- potential to impose blame on risk creators;
- delay in the manifestation of harm;
- voluntariness with which the risk is undertaken.

These approaches suggest that individuals display biases in their behaviour when faced with different risks; for example, individuals display ‘dread’, have limited interest (or comprehension) in the language of probabilities, show both risk aversion and optimism-bias in their decisions, and rather place an emphasis on trust. Individuals, for instance, are more likely to purchase earthquake insurance in the immediate aftermath of an earthquake than during periods of ‘build-up’ (when the likelihood of the ‘big one’ striking is somewhat higher); or car drivers drive more cautiously in the immediate aftermath of viewing a car crash. In other words, risk perception studies are interested in seeking to understand better the individual biases that explain responses to risk.³³

Risk, within such an approach, is seen as a multi-dimensional concept that cannot be reduced to a mere product of probability and consequences. Such a focus on the individual is, however, said to underplay the extent to which perceptions are affected by group, social, institutional, and cultural factors.³⁴

Sociologists have addressed this under-emphasis by attending to social relations and institutions as influences on risk perception and by examining the ways that moral positions and valuations affect responses to risk. They have tended to stress the limitations of technical approaches and to argue that expert knowledge is not value-free, but conditioned by social contexts. They have emphasized that public attitudes to risk are affected by a wide range of variables and that public tolerance of risk is a political issue in which the degree of public involvement in risk management processes may play an important role.³⁵ Students of organizations have pointed to the particular ‘man-made’ processes that accentuate risk within the setting of inter-organizational production processes. For example, Diane Vaughan has suggested that error is introduced through organizational processes that she terms ‘the normalization of deviance’, in that small deviations from the ‘norm’ that appear not to have any major consequences are tolerated and over time

³³ See also P. Slovic, M. Finucane, E. Peters, and D. MacGregor, ‘Risk Analysis and Risk as Feelings’ (2004) 24(2) *Risk Analysis* 311–22.

³⁴ See Royal Society, *Risk*, 11, 108; A. Plough and S. Krimsky, ‘The Emergence of Risk Communication Studies: Social and Political Context’ (1987) 12 *Science, Technology and Human Values* 4.

³⁵ See Krimsky and Golding, *Social Theories of Risk*, 356; Giddens, *Beyond Left and Right*.

become 'accepted'. Others have also noted that failure is inevitable, and that, therefore, risks associated with particular technologies are 'unmanageable'.³⁶ Indeed, students of security risks point to the problems identified in the 9/11 Commission report which cited organizational coordination problems and a 'failure of imagination' as among the causes for the failure to identify the potential terrorist threat.³⁷ The challenge is said to be that of developing political processes that will come to grips with these new risk-related issues.

Cultural theorists, in turn, have contended that attitudes to risk vary according to cultural biases—attitudes and beliefs shared by a group—and that risk is a plastic concept allowing the development of no single measure by which different cultural biases towards risk can be compared.³⁸ The four worldviews of cultural theory (as noted in Chapter 4) have different perspectives, and these produce their own explanations of variations in individual risk perceptions. Insightful initial work on risk perceptions has received mixed responses but, more recently, authors have sought to develop a 'cultural cognition' perspective regarding risk and have noted that individuals should be viewed as 'cultural evaluators'. Risk perceptions, on this approach, are a reflection of individuals' expressive appraisals of risky activities. Such differences, according to this view, should be recognized through deliberative fora, rather than be treated as ill-informed and requiring 'help' through the decision-making of experts.³⁹

³⁶ B. Turner, *Man-Made Disasters* (London, 1978); D. Vaughan, 'Organizational Rituals of Risk and Error', in B.M. Hutter and M. Power (eds), *Organizational Encounters with Risk* (Cambridge, 2005); Perrow, *Normal Accidents*.

³⁷ 9/11 Commission, *Final Report of the National Commission on Terrorist Attacks Upon the United States* (2004), www.gpoaccess.gov/911/index.html

³⁸ The social construction of nature is therefore a partial representation of 'nature' with different worldviews seeing the vulnerability of nature in their particular perspective: for fatalists, nature is 'capricious' (requiring adaptation to unpredictable events), for hierarchists, nature is 'perverse and tolerant' (i.e. manageable within limits), for individualists, nature is 'benign' (always returning to equilibrium), and for egalitarians, nature is 'ephemeral' (highly vulnerable, causing egalitarians to be alarmed). See M. Thompson, R. Ellis, and A. Wildavsky, *Cultural Theory* (Boulder, 1990), 27; Douglas, *Risk and Blame*; Douglas and Wildavsky, *Risk and Culture*; M. Schwarz and M. Thompson, *Divided We Stand: Redefining Politics, Technology and Social Choice* (Hemel Hempstead, 1990); V. Mamadough, 'Grid-Group Cultural Theory: An Introduction' (1999) 47 *GeoJournal* 395–409; K. Dake, 'Orienting Dispositions in the Perception of Risk' (1991) 22 *Journal of Cross-Cultural Psychology* 61–82; C. Morris, I. Lanford, and T. O'Riordan, 'A Quantitative Test of the Cultural Theory of Risk Perceptions' (1998) 18(5) *Risk Analysis* 635–47. A more critical view is provided by S. Rayner, 'Culture Theory and Risk Analysis', in Krinsky and Golding, *Social Theories of Risk*. See also the collection of writings in A. Wildavsky, *Cultural Analysis* (New Brunswick, 2006).

³⁹ D. Kahan, 'Cultural Cognition as a Conception of the Cultural Theory of Risk' (2008) *Harvard Law School Program on Risk Regulation Research paper*, no. 08-20 (<http://ssrn.com/abstract=1123807>); D.M. Kahan, 'Two Conceptions of Emotion in Risk Regulation' (2008) 156 *University of Pennsylvania Law Review* 740–66; H. Jenkins-Smith and K. Herron, 'Rock and Hard Place' (2009) 37(5) *Politics and Policy* 1095–129; L. Sjöberg, 'Worldviews, Political Attitudes and Risk Perception' (1998) 9 *Risk* 137–52.

Such cultural approaches to risk have been linked with psychological and sociological treatments in the work of ‘social amplification theorists’ who suggest that signals concerning risks are filtered through social amplification stations (e.g. groups of scientists; the media; pressure groups; and politicians) and that this filtering intensifies or minimizes certain aspects of risks.⁴⁰ In other words, the risk itself is attenuated or intensified through social interactions, which in themselves have further, secondary consequences. These consequences themselves lead to further amplification or attenuation effects. Thus, risk, according to these analyses, is an objective property, but it is also a social construction. These accounts also draw heavily on those findings that have focused on individual perceptions of risk, pointing to the different decision-making heuristics that characterize human decision-making (risk aversion, optimism bias, dread, and so on).⁴¹ Similarly, the interaction between societal risk and the institutional risks organizations face when accepting to deal with societal risks has also pointed to the often unintended effects of organizational responses.⁴² Other social scientists have focused on risk communication and have attended to the ways that messages about risks are conveyed; the politics of such message passing, and the institutional and cultural contexts under which risk messages are formulated and conveyed.⁴³

To summarize, a host of different approaches to the definition and measurement of risks can be taken. These very differences raise issues about regulatory responses to risks and the ways in which risk regulation regimes can be justified or legitimated. Thus, high confidence in technical approaches to risk might be expected to lead to an emphasis on leaving risk regulation to experts and to establishing regulatory priorities with reference to technical evaluations. In contrast, a strong belief that risks are socially constructed might be taken to suggest that regulatory priorities and policies cannot be

⁴⁰ See, e.g., R. Kasperson, O. Renn, P. Slovic, H. Brown, J. Emel, R. Goble, J. Kasperson, and S. Ratick, ‘The Social Amplification of Risk: A Conceptual Framework’ (1988) 8 *Risk Analysis* 177–87; J. Kasperson, R. Kasperson, N. Pidgeon, and P. Slovic, ‘The Social Amplification of Risk: Assessing Fifteen Years of Research and Theory’, in N. Pidgeon, R. Kasperson, and P. Slovic (eds), *The Social Amplification of Risk* (Cambridge, 2003); P. Slovic, ‘Trust, Emotion, Sex, Politics and Science’ (1999) 19 (4) *Risk Analysis* 689–701; P. Slovic, *The Perception of Risk* (London, 2000).

⁴¹ D. Kahneman and A. Tversky, ‘Availability: A Heuristic for Judging Frequency and Probability’, in D. Kahneman, P. Slovic, and A. Tversky (eds), *Judging under Uncertainty* (Cambridge, 1982).

⁴² H. Rothstein, M. Huber, and G. Gaskell, ‘A Theory of Risk Colonization’ (2006) 35(1) *Economy and Society* 91–112. See also C. Hood, ‘What Happens when Transparency Meets Blame-Avoidance’ (2007) 9(2) *Public Management Review* 191–210.

⁴³ See Royal Society, *Risk*, ch. 5; H.J. Otway and B. Wynne, ‘Risk Communication: Paradigm and Paradox’ (1989) 9 *Risk Analysis* 141; S. Krimsky and A. Plough, *Environmental Hazards: Communicating Risks as a Social Process* (Dover, MA, 1988). Evidence points to the limited effect of risk communication strategies in low trust environments, see R.F. Durant and J. Legge, ‘Public Opinion, Risk Perceptions, and Genetically-Modified Food Regulatory Policy’ (2005) 6(2) *European Union Politics* 181–200.

left to the 'objective' evaluations of experts, but have to emerge from democratically legitimate processes of debate and consultation.

Risks: The Regulatory Challenges

A number of core challenges lie at the heart of any regulatory decision on the handling of risk.⁴⁴ The first challenge is the identification of risks and questions about participation in decision-making. To some extent, such issues are of a technical nature and involve calculations regarding the probability of an event occurring and its impact. However, as numerous of the approaches considered above highlight, risk identification is also about public approval. Problems may arise from the tension between 'technical', 'rational', or 'expert' approaches and the perceptions of the public. The priorities that the public might establish will tend to appear irrational to experts, since citizens' perceptions of risk will be distorted by the range of factors noted above (e.g. the degree of personal control, familiarity, etc.) and will not correspond to figures based on products of probability and magnitude of harm. Not only will members of the public respond 'irrationally' to risks, but democratic processes may have limited potential to cope with information about risks.⁴⁵ Questions thus arise concerning the role of the public in decision-making on risks; on whether (and how) people should be informed of the risks they face; and the means by which decisions regarding risks can be legitimated in the eyes of the public.⁴⁶ One strand of the risk literature explores models of decision-making that aim to reduce conflicts about risk assessment and focuses on the potential of adversarial processes, administrative rules, and judicial review to legitimize risk regulation.⁴⁷ More general concerns are the extent and quality of information relating to risks; the reasons why there may be informational inadequacies when decisions on risks are taken; and the costs of risk-related information.⁴⁸ One view sees differences in public and expert perceptions of risk as a key element in the 'vicious circle' of factors that diminishes public trust in regulatory institutions, inhibits more rational regulation, and

⁴⁴ See J. Black and R. Baldwin, 'Really Responsive Risk-based Regulation' (2010), 32 *Law and Policy* 181–213; C. Hood and D. Jones (eds), *Accident and Design* (London, 1996).

⁴⁵ S.G. Hadden, *A Citizen's Right to Know: Risk Communication and Public Policy* (Boulder, 1989); D.J. Fiorino, 'Citizen Participation and Environmental Risk: A Survey of Institutional Mechanisms' (1990) 15 *Science Technology and Human Values* 226; J. Handman and E.C. Penning-Rowsell (eds), *Hazards and the Communication of Risks* (Aldershot, 1990).

⁴⁶ H. Margolis, *Dealing with Risk* (Chicago, 1996).

⁴⁷ See S. Janasoff, 'The Misrule of Law at OSHA', in D. Nelkin (ed.), *The Language of Risk* (Beverly Hills, 1985).

⁴⁸ See K.R. MacCrimmon and D.A. Wehrung, *Taking Risks* (New York, 1982), 15–17.

contributes to random selection of regulatory priorities as well as inconsistencies of regulatory approach.⁴⁹

A second regulatory challenge is whether an emphasis should be placed on *anticipation* or on *resilience*. The emphasis of anticipative approaches is therefore on identifying risks, and the minimization of the production of risks. A resilience-based strategy, in contrast, emphasizes the importance of mitigating the effects of hazards (such as informing citizens about risks and allowing them to make their informed choices), and ensuring that systems ‘bounce back’ from interruption. The stage at which intervention should take place is therefore a central issue. Risk management may involve the adoption of strategies to minimize the *production* of risks or it may be concerned with mitigating the adverse *effects* of hazards through implementing such measures as warning procedures, safety mechanisms, and contingency plans. Thus, a distinction is to be drawn between instruments that are active (which seek to modify the source of the risk—for example, by dynamiting the avalanche slope) and those which are passive and lessen undesirable effects (e.g. by evacuating populations within the potential avalanche path). This question of whether risk managers and regulators should anticipate and prevent, or should promote resilience and the capacity to withstand harms, is a recurring issue in the risk management literature.⁵⁰

The debate about anticipative strategies links to the widely known *precautionary principle*. The basic idea of ‘better safe than sorry’ is potentially non-controversial. More formally, the precautionary principle suggests that in those cases in which there is a suspected, but not proven, risk of harm to the public or the environment, the burden of proof is on the producer of the risk to prove the lack of harmfulness. The German *Vorsorgeprinzip*, which later was incorporated within EU law, represented this approach, as did Principle 15 of the 1992 Rio Declaration, which suggested that states should apply the precautionary principle to apply ‘cost-effective measures’ to deal with potential threats of irreversible damage or the lack of scientific evidence.⁵¹ Similarly, the European Commission defined its approach towards the precautionary principle in areas where ‘scientific evidence is insufficient, inconclusive or uncertain’ and where initial scientific evidence raised ‘reasonable grounds for concern.’⁵²

⁴⁹ See S. Breyer, *Breaking the Vicious Circle: Toward Effective Risk Regulation* (Cambridge, MA, 1993) (discussed further below).

⁵⁰ See e.g. Turner, *Man-Made Disasters*; H. D. Foster, *Disaster Planning* (New York, 1979); A. Wildavsky, *Trial without Error: Anticipation Versus Resilience as Strategies for Risk Reduction* (Sydney, 1985).

⁵¹ United Nations ‘Conference on Environment and Development’, declaration; <http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm> (last accessed 29 November 2010).

⁵² European Commission, *Communication on the Precautionary Principle* COM (2000)1. See also V. Heyvaert, ‘Guidance Without Constraint: Assessing the Impact of the Precautionary Principle on the European Community’s Chemicals Policy’ (2006) 6 *Yearbook of European Environmental Law* 27–60.

Much discussion about the application of the precautionary principle centres around the potential irreversibility of particular innovations should they be adopted.

Opponents of the precautionary principle attack its potential to be exploited by political and economic interests.⁵³ In other words, the contestation of a supposed lack of ‘scientific certainty’ is utilized by powerful groups to shape regulation to their favour by exploiting popular fears and anxieties. Others, such as Wildavsky, point to the high opportunity costs that a strategy of anticipation involves: the search as well as the development of solutions to all risks is costly and consumes resources.⁵⁴ Similarly, the prohibition of progress by banning particular practices or products is seen by Wildavsky as overly restrictive—indeed, it might in fact encourage the acceptance of greater risks by restricting the consumption on products or substances that were adopted before the passing of precautionary principle-based safety rules. Critics therefore suggest that advocates of the precautionary principle wrongly believe that the default option (i.e. ‘doing nothing’) is in itself ‘risk-free’. In contrast, Wildavsky argues in favour of a resilience-based strategy that emphasizes the importance of systems being able to recover and rebound, therefore emphasizing processes such as trial-and-error processes. The key bone of contention in this debate is usually, however, one of degree, with opponents of the precautionary principle opposing the unsettled methodology and a ‘strong’ definition of the principle (which would be defined by automatic prohibitions). A ‘weaker’ definition would allow, rather than require, the application of the precautionary principle in cases of doubt.

A related, and fundamental, regulatory question is, therefore, whether regulators should err on the side of rejecting a true hypothesis, and thereby potentially under-regulate a risk, or whether regulation should be biased towards the accepting of false hypotheses and therefore to potentially ‘over’-regulating. This means that decisions have to be taken as to the kinds of risks that should be treated as exceptional, if there is not to be more revision of the general principle that persons and products should be regarded as innocent, rather than as guilty until proven innocent.⁵⁵

⁵³ G. Majone, ‘What Price Safety? The Precautionary Principle and its Policy Implications’ (2002) 40(1) *Journal of Common Market Studies* 89–109. A collection of criticisms is provided in J. Morris (ed.), *Rethinking Risk and the Precautionary Principle* (Oxford, 2000); J. Morris, ‘The Relationship between Risk Analysis and the Precautionary Principle’ (2002) 181(2) *Toxicology* 127–30; C. Sunstein, *Laws of Fear: Beyond the Precautionary Principle* (Cambridge, 2005).

⁵⁴ A. Wildavsky, *Searching for Safety* (New Brunswick, 1988).

⁵⁵ See also G. Brennan, ‘Civil Disaster Management: An Economist’s View’ (1991) 64 *Canberra Bulletin of Public Administration* 30; H.G. Frederickson and T.R. LaPorte, ‘Airport Security, High Reliability and the Problem of Rationality’ (2002) 62 *Public Administration Review* 33–43.

A further key risk regulatory challenge involves the use of particular regulatory instruments as ways of addressing the issues covered in the above debates. For some, the practice of using cost-benefit analysis and other kinds of risk assessments has the potential to ‘rationalize’ debates by offering structures and additional information.⁵⁶ Others argue the case against an over-reliance on quantitative methods. They criticize the potential susceptibility of quantitative risk assessment instruments to problems of value assumption, qualitative data, administrative difficulties, equity, public acceptability, the lack of a single risk decision framework, and effectiveness. Such critics suggest that procedures for bringing different views together offer more potential to inform and advance debates about risk regulation.⁵⁷ Somewhere in the middle of such debates are those that argue the case for ‘enlightened’ assessments where instruments such as cost-benefit analyses are used to inform wider public debates about risk regulation.⁵⁸

Another important concern is the design of institutions and techniques for managing risk. Involved here is the fundamental question of when risks should be seen as matters of public concern, rather than left for private handling.⁵⁹ Issues considered in the literature include the role of insurance mechanisms in shaping responses to risks and how insurance interacts with legal and regulatory structures relevant to risk-taking. Particular interests are the effects of insurance on the incentives created by liability rules and the problems of moral hazard and adverse selection within the insurance mechanism. When the regulation of risks is seen as primarily a matter for private organizations (as in a system of enforced self-regulation), this raises issues about the kind of obligations regulators impose on private organizations. Indeed, as the literature on *high reliability organizations* suggests, regulatory strategies are required that provide for organizational incentives to place resources into an error-intolerant and ‘heedful’ organizational culture that reduces the potential for man-made disasters.⁶⁰ Such organizations require the capacity and the

⁵⁶ K. Arrow, M. Cropper, G. Eads, R. Hahn, L. Lave, R. Noll, P. Portney, M. Russell, R. Schmalensee, V.K. Smith, and R. Stavins, ‘Is there a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?’ (1996) 272 *Science* 221–2.

⁵⁷ J. Adams and M. Thompson, *Risk Review* (London, 1991) and A. Gorz, *Critique of Economic Reason* (London, 1989).

⁵⁸ C. Sunstein, *Risk and Reason* (Cambridge, 2002).

⁵⁹ See M.T. Katzman, ‘Pollution Liability Insurance and Catastrophic Environmental Risk’ (1988) *Journal of Risk and Insurance* 75.

⁶⁰ K. Weick, ‘Organizational Culture as a Source of High Reliability’ (1987) 29 *Californian Management Review* 1–27; K. Weick and K.H. Roberts, ‘Collective Mind in Organizations’ (1993) 38 *Administrative Science Quarterly* 57–81; T.R. LaPorte and P. Consolini, ‘Working in Practice but Not in Theory: Theoretical Challenges of “High Reliability Organizations”’ (1991) 1 *Journal of Public Administration Research and Theory* 19–47; for a critical discussion of redundancy in this context, see J. Downer, ‘Anatomy of a Disaster’, *CARR discussion paper 61* (London, 2010).

resources to allow for back-up facilities, should the primary systems fail. However, studies of technologies and organizations suggest that redundancy can itself become a source of risk and failure, as it adds another layer of complexity to already highly complex organizational processes.⁶¹

A further issue of technique is whether risk management or regulation should be 'blame-oriented'—with precise allocation of liability and resultant incentives to take care—or whether a greater focus should be placed on collective or corporate design, rather than individual blame.⁶² Indeed, it might be argued that a 'blame-free' institutional setup is likely to encourage learning and openness about problems in the handling of risky activities. This contrasts with the potential for risk-averse behaviour and gaming, if not manipulation in the case of systems that place a high emphasis on placing 'blame' and responsibility on any particular individual or organization.

A fourth question is whether a basis of knowledge can be generated that is adequate to found effective institutional designs for risk management. On the one hand, it is asserted that principles of good institutional design can be set down⁶³ but, on the other, sceptics point to current limitations in knowledge about the handling of risks in organizations. A fifth issue concerns the extent to which reductions in risks have to be traded off against other basic goals or alternative risk reductions. Some commentators, however, contest the view that trade-offs always have to be made and point to instances where actions designed to reduce risks have positive rather than negative effects on such matters as productivity and efficiency.⁶⁴

The final issue to be noted returns to the theme of democratic acceptability and concerns the degree of participation in risk management decisions that is appropriate. One approach stresses the need for broad access to risk management processes and thereby accountability.⁶⁵ Further, it is argued that where scientific evidence about risks is inconclusive, there is a specially strong case for incorporating an 'extended peer community' of experts into risk management decisions.⁶⁶ The alternative view, however, doubts the benefits of broad participation, stresses the dangers of giving weight to 'unfounded public

⁶¹ The most prominent exponent of this view is Perrow, *Normal Accidents*.

⁶² Compare R.A. Posner, *Economic Analysis of Law* (Boston, 1986), 147–51 and B. Fisse and J. Braithwaite, 'Accountability and the Control of Corporate Crime' in M. Findlay and R. Hogg (eds), *Understanding Crime and Criminal Justice* (Sydney, 1988); E. Bardach and R. Kagan, *Going by the Book: The Problem of Regulatory Unreasonableness* (Philadelphia, 1982).

⁶³ See T. Horlick-Jones, *Acts of God?* (London, 1990).

⁶⁴ See E. Tait and L. Levidov, 'Proactive and Reactive Approaches to Risk Regulation' (1992) *Futures* 219.

⁶⁵ See S. Beder, 'The Fallible Engineer' (1991) *New Scientist* 38.

⁶⁶ Royal Society, *Risk*, 164.

fears', and argues for rational decisions by small groups of well-informed experts.⁶⁷

In summary, seeing regulation in terms of risks highlights a series of challenges that confront regulators. Positions taken in relation to the issues discussed above will often link to the issue of confidence in forecasting and quantifying risks in an agreed manner. High confidence on these fronts will tend to favour anticipatory actions and the specification of outputs; low confidence will tend to favour emphasis on resilience, the specification of processes, and qualitative debates concerning uncertainties.

'Solutions' to Risk Regulation

Risk regulation, it is clear from the above, faces difficult problems in seeking legitimation, not least because of divergences in expert and lay perceptions of risk. What, then, can be done to improve the force of legitimating arguments? This section reviews four kinds of response. The first is based principally on an expertise rationale and the second on the accountability and due process rationales.

Stephen Breyer exemplifies the first approach in his book *Breaking the Vicious Circle: Towards Effective Risk Regulation*.⁶⁸ For Breyer, the regulation of small but significant health risks is plagued by three serious problems: *tunnel vision*—where there is over-regulation to the point that it brings about more harm than good; *random agenda selection*—where regulatory priorities are driven by issues coming to the public's attention rather than by rational appraisals of risks;⁶⁹ and *inconsistency*—where agencies use different methods to calculate the effects of regulation, and the values that regulators implicitly attach to the saving of a statistical life vary widely from one programme or agency to another.

The causes of these problems are said, again, to be threefold and to constitute a 'vicious circle' that diminishes trust in regulatory institutions and increasingly inhibits more rational regulation. The causes are: *public perceptions*—in which the public's evaluation of risk problems 'differs radically from any consensus of experts in the field' and does not reflect a 'rational' set of priorities;⁷⁰ *congressional action and reaction*—a tendency to respond to risks

⁶⁷ See R.S. Yalow, 'Radioactivity in the Service of Humanity' (1985) 60 *Thought* 517; Breyer, *Breaking the Vicious Circle*.

⁶⁸ Breyer, *Breaking the Vicious Circle*.

⁶⁹ N. Malhotra and A. Kuo, 'Attributing Blame: The Public's Response to Hurricane Katrina' (2008) 70(1) *Journal of Politics* 120–35.

⁷⁰ Breyer, *Breaking the Vicious Circle*, 33.

with detailed statutory directions that later experience shows to be inappropriate; and *uncertainties in the technical regulatory process*—the limitations of knowledge, data, and predictive power that afflict regulatory processes.

Breyer's solution involves institutional changes that reflect the view that a 'depoliticised regulatory process might produce better results'.⁷¹ His suggestion has two parts: first, that a new career path be established to provide a group of civil servants with experience in working with health and environmental agencies, Congress, and the Office of Management and Budget; second, that a small, centralized administrative group be formed from such civil servants, one with a mission of producing a coherent risk programme and a set of rational priorities covering risk regulatory programmes.⁷² The group would have jurisdiction over different agencies and would have a degree of political insulation to allow it to withstand various political pressures. It would have prestige, authority, and expertise, and would rationalize right across government. Its authority would flow from its outputs; 'insofar as a systematic solution produces technically better results, the decision will become somewhat more legitimate'.⁷³

The difficulty with Breyer's proposal is that it involves heavy emphasis on legitimation through expertise at the expense of legitimation through emphasis on democratic policymaking, accountability, and due process in the form of participation. Breyer suggests that the group's proposals, plans, and findings would be openly available for comment and criticism, but at root what is proposed is a level of insulation from politics such as will allow the 'rational' decisions of experts to establish priorities for risk regulation, rather than public perceptions and desires. This presupposes to a considerable degree that risk-prioritizing can be dealt with technically as a mere product of probability and extent of harm. As already noted, however, a number of commentators might be expected to object strongly that experts are no more 'rational' than lay persons, that in 'risk society' scientists and experts create as many uncertainties as they dispel,⁷⁴ and that risk priorities are perceptual, distributional, and political matters that must be negotiated through exchanges of views, rather than laid down from on high by experts making hidden value judgements.⁷⁵ It can, furthermore, be objected that striving for greater rationality in the form of increased scientific accuracy

⁷¹ *Ibid.*, 56. ⁷² *Ibid.* ⁷³ *Ibid.*, 63.

⁷⁴ See J. Durant, 'Once the Men in White Coats Held the Promise of a Better Future', in J. Franklin (ed.), *Politics of Risk Society* (Cambridge, 1998).

⁷⁵ See, e.g., Giddens, *Beyond Left and Right* and Beck, *Risk Society*. For a review of Breyer's thesis, see V.B. Flatt, 'Should the Circle be Unbroken?' (1994) 24 (4) *Environmental Law* 1707. Flatt contends, *inter alia*: 'many of the "problems" with inconsistent risk values are not problems at all but actual policy choices that reflect societal values other than the explicit reduction of risk to human life' (p. 1713); 'some of our regulatory choices are not value judgements about *what* we should pay for regulation but rather *who* should pay' (p. 1718).

concerning risks may, beyond a certain stage, involve costs, delays, legal challenges, and the creation of new uncertainties that are socially undesirable—that this may produce a tendency both to under-regulate and to introduce mistakes into regulatory processes.⁷⁶ The value of more detailed risk analysis can, thus, be said to depend on normative judgements about the chosen uses to be made of such information.⁷⁷

A contrasting approach to that of Breyer is offered by Shrader-Frechette, who points to certain strengths of risk-cost-benefit analyses (RCBA)—notably their systematic nature, clarity concerning social costs, and superiority to arbitrary, intuitive, and expert modes of decision-making.⁷⁸ Shrader-Frechette, nevertheless, seeks to remedy some of the weaknesses of RCBA by application of ‘scientific proceduralism’. This process seeks to improve RCBA by three devices. The first of these is *ethical weighting*. This involves imposing a negative weight to the imposition of certain particularly undesirable risks, and it is envisaged that the public or its representatives could be involved in deciding which weighting scheme best represents its values. The central idea is that ethical considerations, rather than the RCBA itself, should govern priorities.⁷⁹ The second device is the use of *alternative risk analyses and evaluations*. Several risk analyses can be commissioned or allowed in relation to a single risk issue and this, it is suggested, will reveal information and assumptions more clearly than is possible with a single analysis. It will also allow citizens, as opposed to experts, to have a greater role in determining risk choices—it will lead policymakers to rely on procedural and democratic, rather than merely scientific, methods of evaluating and managing risks.⁸⁰ Finally, *weighted expert opinions* can be used to give emphasis in policymaking

⁷⁶ Indeed, in certain situations, it may be rational to ‘economize’ on rationality, see C. Hood and M. Lodge, ‘Pavlovian Innovation, Pet Solutions and Economizing on Rationality’ in J. Black, M. Lodge, and M. Thatcher (eds), *Regulatory Innovation* (Cheltenham, 2005).

⁷⁷ See Cranor, *Regulating Toxic Substances*, 120 and 130, who argues that the ‘science-intensive’ approach to regulation is slow because of its concern to develop ‘perfect’ regulations.

⁷⁸ See K.S. Shrader-Frechette, *Risk and Rationality* (Berkeley, 1991). For a wider contribution on the debate regarding deliberation, see J. Cohen and C. Sabel, ‘Direct-Deliberative Polyarchy’ (1997) 3(4) *European Law Journal* 313–42; S. Jasanoff ‘Technology as Site and Object of Politics’ in R.E. Goodin and C. Tilly (eds), *The Oxford Handbook of Contextual Political Analysis* (Oxford, 2006).

⁷⁹ See also the Tolerability of Risk (TOR) approach noted in Chapter 14 below, and discussed in HM Treasury, *Setting of Safety Standards*, 8–9, which allows risk-cost-benefit only within equitably established boundaries. Cranor suggests in *Regulating Toxic Substances* that, in relation to such problems as those posed by carcinogens, scientific knowledge and data for risk estimates is inadequate and that this presents a choice: to desist from regulating or to make decisions on the basis of available evidence and non-scientific policy considerations. Allowing the science-intensive perspective to dominate would thus lead to under-protection of the public, increased regulatory costs, and decreased policy accountability. The way forward, he states, is via the use of explicitly made policy guidelines and the combination of policy and scientific judgements. ‘Once it is recognised that risk assessment (and regulation) is in part a function of policy considerations, public input, especially in a democratic form of government, becomes a relevant consideration to shape the process’ (p. 134).

⁸⁰ Shrader-Frechette, *Risk and Rationality*, 187.

processes to the forecasts of experts whose risk estimates have been ‘vindicated by past predictive success’—a process that comes to grips with the absence of any uncontroversially objective way to calculate risks in so far as it offers a checking system.

‘Scientific proceduralism’ thus rejects any assumption that risks can be estimated in a value-free way. It asserts the need to democratize RCBA and it stresses the value of open, pluralistic approaches in revealing realities. The technique, as set out by Shrader-Frechette, leaves open a number of unresolved issues—whether, for instance, weighting procedures oversimplify ethical considerations; whether democratic participation is better served by separating this from the RCBA than by weighting; how weighting processes can be combined with RCBA; whether policymaking in the real world allows the use of alternative and multiple RCBAs (and whether this will lead to confusion); and the extent to which expertise in one area of risk analysis can be transported to other areas. What is noteworthy for our purposes, however, is the proposed route to legitimation and the urging that risk analyses must be conducted within frameworks of greater participation and accountability—this contrasts quite starkly with Breyer’s emphasis on expertise.

Other accounts stress a variety of aspects. For some, risk handling should be treated as an insurance problem. The key regulatory solution, therefore, is to reduce the price distortion in the market and therefore let individuals face the ‘true’ costs of their action. For example, consumers will think differently about purchasing houses in flood plains should they face the ‘real’ costs of insuring their property against flooding.⁸¹ In other words, as in the case of crop failures, individuals should be exposed to the costs of their choices. In contrast to such individualist understandings of solutions to risk management, others would continue to emphasize the importance of enhancing the redundancy and resilience of private organizations, pointing to the literature on *high-reliability organizations*, as noted earlier. However, as noted, redundancy is costly and may be a cause of failure and risk in itself. Indeed, it may be true that the recipes for high reliability (redundancy, constant feedback, and a dedication to safety) are more applicable for some organizations and organizational fields than for others.⁸²

⁸¹ Of course, such insurance markets are also prone to perverse incentives; for a collection of essays on this theme, see R.K. Daniels, D. Kettle, and H. Kunreuther (eds), *Risk and Disaster* (Philadelphia, 2006); P. Freeman and H. Kunreuther, *Managing Environmental Risk Through Insurance* (Dordrecht, 1997); H. Kunreuther and E. Michel-Kerjan, ‘Market and Government Failure in Insuring and Mitigating Natural Catastrophes’, in J.R. Brown (ed.), *Public Insurance and Private Markets* (Washington, 2009).

⁸² For a private organisation’s system of ‘near miss’ reporting, see C. Macrae, ‘Analyzing near-miss events’ *CARR Discussion Paper 47* (London, 2007).

Conclusions

Focusing on the uncertainties involved in risk regulation serves to highlight a number of fundamental issues, ranging from the definition and identification of risks, critical debates about the principles inherent in any regulatory activity, to fundamental questions on the appropriate institutions for risk regulation. Issues arise relating to the perception of risk, the definition and classification of risks, and the construction of 'risk problems'. Particular concerns in the control of risks relate to divergences in lay and expert approaches; to the use of information in regulating uncertainties; and the susceptibility of risk control regimes to democratic and participatory mechanisms. As was seen in discussing the proposals of Breyer and Shrader-Frechette, very different approaches to 'rational' risk regulation can be taken, and the role of rationality in risk control is itself contentious. Inherent in any discussion about risk regulation is the dual nature of risk in regulation—on the one hand, regulating risks is about the 'objective' risk of things going wrong, often with tragic consequences. On the other hand, it is about dealing with the individual and social consequences and imaginations of risks. Indeed, how organizations seek to regulate risks also reflects on organizational cultures and levels of trust between different systems. As a result, how risk is perceived and what regulatory solutions are proposed is fundamentally shaped by underlying worldviews and understandings of cause–effect relationships. Risk regulation also raises the issue of whether some kinds of risks should be treated differently from others. Posner, for example, suggests that certain catastrophic risks need anticipative solutions because their impact would represent the eradication of humankind, despite the low probability of such events occurring.⁸³ He also calls for a fundamental transformation of (legal) education—with a much stronger emphasis on science and understandings of probabilities to advance the ability of legal and political systems to deal with risks.

Seeing regulation in terms of risks, and an awareness of the literature on risk control that is encountered in many disciplines, does add new dimensions to our understanding of regulation. It prompts new questions about perceptions of regulatory priorities, the construction and development of regulatory agendas, and the legitimation of both regulation and regulatory reviews. Reviewing the plurality of theoretical perspectives that offer models of risk regulation, how risks are being processed, and how risks should be regulated suggests that any attempt at regulating risks should involve the pluralization of analytical perspectives, rather than the reliance on any one analytical device alone.⁸⁴

⁸³ R.E. Posner *Catastrophe: Risk and Response* (Oxford, 2004).

⁸⁴ D. Cohen and C. Lindblom, *Usable Knowledge* (New Haven, 1979); G. Majone, *Evidence, Argument and Persuasion in the Policy Process* (New Haven, 1989).