

Responsibility in Uncertain Times: An Institutional Perspective on Precaution

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Abstract

Precaution is a key issue in environmental governance. Various defined, intensively debated and introduced in many regulations, its meaning, scope and application remain problematic. The article argues that the controversy around precaution is a matter of culturally patterned expectations concerning the production and use of knowledge and the related social positions and responsibilities. The way uncertainty and its role in the policy process are understood is crucial. For some precaution is a flawed concept, to be accommodated to the current expert-based cooperative scheme. For others it is a major innovation requiring a rearrangement of the latter. Precautionary policies may evolve in different directions. They may either strengthen the role of means-ends rationality, increase people's dependence on expert knowledge and shrink the opportunity and scope of public debate or, on the contrary, enhance the role of value-commitments, leading to a decline in the legitimacy of established hierarchies and an intensification of intractable controversies.

Introduction

It has become almost commonplace to describe late modernity as an age of uncertainty. This sentiment depends on many aspects of contemporary living that foster a view of the future as unpredictable, un-decidable and un-controllable: the global disorder following the fall of the Berlin wall; economic deregulation and globalizing market dynamics; the weakening of interpersonal bonds and obligations; the malleability of the world conveyed by the image-industry; the increasing pace and pervasiveness of techno-scientific advancement with its wide-ranging, long-term and often unforeseen effects on social relations, human health and the environment.¹ The latter has become a field of intense trial and innovation in governance approaches: international agreements; command-and-control regulation; taxes, incentives and other market-based policies; “third generation” instruments based on voluntary agreements and self-regulation.² Social protests express at the same time an increasing demand for a global governance capable to address structural injustices and inequalities.³

The idea of precaution, or the precautionary principle (hereafter PP), seems to play in this context a major role. Its very emergence indicates the extent to which risk and responsibility has become a master frame of current society.⁴ More precisely, it confirms Hans Jonas'⁵ intuition about the broadening scope of human action and connected responsibilities. His famous case for replacing the principle of hope with the principle of responsibility, based on a “heuristic of fear,” implies recognition of the novel implications of uncertainty related to the need to govern large-scale environmental consequences of techno-scientific advancement.

“When 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

1. Beck 1992; and Bauman 1995.

2. Mason 2005; and Newell and Wheeler 2006.

3. Scholte 2005.

4. Strydom 1999.

5. Jonas 1979.

degradation.” This statement, drawn from the “Bergen Declaration”⁶ but similar to many others, seems to capture the essence of precaution: the need for policy action to focus not only on short-term predictable consequences of choices, but also on long-term possible ones. Yet the PP is a highly controversial issue. For some it represents a major innovation in environmental governance; others regard it as an inherently flawed concept—little more than a commonsense reply to uncertainty. Precaution has been discussed as a moral principle, a behavioral attitude or a regulatory approach. There is little doubt that it may be dealt with also from an institutional viewpoint. The latter is actually implied in most discussions, yet seldom explicitly addressed.

In this article we make a case for a considered institutional approach to precaution. We argue that the PP controversy is fuelled by contrasting and largely unexpressed institutional perspectives. Bringing them to the forefront helps grasp the grounds of contention—the challenge of uncertainty to what, following Allen Buchanan,⁷ may be called the dominant institutional infrastructure for productive interaction or, more simply, the dominant cooperative scheme (hereafter DCS) on the environment.

Our opening remarks, driving subsequent discussion, are about institutions and their regulative, normative and cognitive elements. We then elaborate on the current DCS, centered on technical skill and professional expertise, with reference to environmental governance. We argue that the idea of responsibility implied in this scheme is at odds with precaution, the rationale of which is captured by a different idea described by Iris Marion Young,⁸ where principled commitments gain relevance at the expense of factual beliefs. Building on this insight we address the PP controversy. A huge literature is available on the subject, making redundant a comprehensive review. We rather aim at pointing out its essential terms: the existence of different institutional viewpoints entailing dissimilar views of what the PP is about—roughly, from a regulative perspective it is a matter of problem-solving and adjustment of the DCS; from a normative-cognitive one it is a matter of problem-setting and replacement of the DCS. Moreover, we show that the difficult tractability of concrete environmental conflicts may depend on institutionally embedded differences in the approach to uncertainty; something that a regulative perspective is hardly able to capture.

For Buchanan, “at certain critical junctures in a society’s history, it may be possible to exercise some degree of choice over some important elements in the dominant cooperative scheme.”⁹ The PP controversy indicates that we may be at one of these critical junctures. We build on Max Weber’s typology of ethical orientations¹⁰ to argue that, contrary to common wisdom but consistent with Young’s notion of responsibility, uncertainty is likely to entail for precautionary policies a growing relevance of principled commitments at the expense of factual beliefs. In highly differentiated societies an increase in intractable controversies is therefore a pending possibility. The spread of inclusive deliberative arenas represents a tentative reply to those controversies that have already emerged. Yet the DCS may prove resilient. A growing adoption of precautionary norms may strengthen the division of labour between professional experts and “lay” actors, even within inclusive policy processes. The multifaceted implications of uncertainty leave our conclusion open to empirical investigation. Environmental governance may evolve in different directions, according to circumstances.

Dealing with Institutions

6. UNECE 1990.

7. Buchanan 1996.

8. Young 2006.

9. Buchanan 1996, 41.

10. Weber 1958.

Societies institutionalize the most relevant forms of action,¹¹ environmental governance being an example. Institutionalization of some areas of human behaviour means the emergence of relatively stable, reciprocal expectations between individuals, groups and organizations, concerning what is to be regarded as suitable models of action or relationship.¹² Institutions thus provide stability and meaning to social life. They compel action and actors but also empower and support them.

Institutions consist of formal and informal rules of interaction. They may involve both material aspects (organization, personnel, budget etc.) and ideal aspects (values, beliefs, expectations, meanings, etc.). Three main elements are usually stressed in institutions: regulative, normative and cognitive.¹³ From a regulative viewpoint behavioural conformity is based on expediency, thus on instrumental rationality, and mechanisms are of a coercive type (regulations and sanctions). From a normative viewpoint conformity is based on social obligations, thus on values and principles; it follows logic of appropriateness and builds on moral prescriptions and proscriptions. From a cognitive viewpoint conformity depends on shared representations of reality and problems, thus on cultural frames; it follows a logic of orthodoxy and builds on imitation and routine. According to the relevance assigned to these elements, views of how institutions work vary considerably. The regulative perspective basically follows a rational choice approach. People have their own preferences and interests that they pursue with different degrees of proficiency in a given world –an objective reality within which institutional rules provide constraints and opportunities. From a normative and cognitive perspective what counts first and foremost is how reality, issues, identities, interests are defined and what kind of beliefs, understandings, expectations and obligations these definitions are based on; which means, for example, bringing to the forefront the role of cultural patterns in setting expectations about the production and use of environmental knowledge and the related social positions and responsibilities. As we shall see, this makes a major difference in the way precaution is addressed.

Moreover institutions work at different levels, from individuals to groups, from organizations to social systems.¹⁴ Finding the appropriate level of analysis may therefore be problematic. In the case of precaution this has actually puzzled many commentators: precautionary action (whatever the meaning assigned to the expression) can be set at any imaginable social level. For the sake of our argument, however, the core point is that, no matter who the agents taken into consideration are, precaution gains saliency as a social issue when it enters the field of public policies, that is to the extent that precautionary action impinges upon a polity, rather than merely on the parties involved in some transaction.

The Dominant Cooperative Scheme

According to Buchanan a DCS is a legitimized allocation of abilities and disabilities connected with socially relevant tasks or functions, with related distribution of material and immaterial goods, rights and duties, blame and reward. It entails forms of recognition and misrecognition dictating what is to count as a worthwhile contribution to a social issue and who is to be regarded as a “full” actor or a deficient one.¹⁵ A DCS institutionalizes expectations concerning competent actors, relevant knowledge, means and goals. A DCS, therefore, is grounded on and expresses specific values.

11. Meyer 2006.

12. Parsons 1954; and O’Dea 1963.

13. Scott 2001.

14. Scott 2001.

15. The notion of DCS is clearly related to those of division of labour and social solidarity. Cf. Durkheim 1984. Also Honneth 1996; and Fraser 2000.

The latter can be traced back to two basic types: “security” and “harmony” ones.¹⁶ The former refer to goals and action modes protecting the interests of individuals and their group. Think for example of economic competitiveness, technical skill or cognitive authority. Security values are antecedents of “exchange trust norms,” which refer to the giving and taking of comparable benefits. To endorse security values and exchange trust norms means to associate trust with the others’ ability to calculate risks and predict and control the outcomes of action; to value skill and expertise. Moreover security values and exchange trust norms frame relationships in adversarial terms. They work against newcomers or marginalized groups, whose very status suggests untrustworthiness. Harmony values, on the other hand, refer to openness, shared concerns, goals and identity as well as value congruence. They are antecedents of “communal trust norms,” which refer to mutual understanding and willingness to act on behalf of a group. To endorse harmony values and communal trust norms means to regard other persons as equal and the relationship with them as mutually reinforcing, inspired to benevolence (loyalty, empathy etc.). Status and skill, in this case, are not necessarily a clue to trustworthiness: trust is a by-product of social connectedness, mutual understanding, identity and resource sharing.

In theory the two types of values play a complementary role. Security values and exchange trust norms focus on competent elites, which may lead to the exclusion of relevant stakeholders and misrecognition of relevant claims. Harmony values and communal trust norms focus on shared concerns and group identity, to the possible detriment of policy effectiveness. Yet the rationalization of modern society—the growing relevance of instrumental, formal rationality, technical competence and practical efficiency in any aspect of social life¹⁷—has entailed a prioritization of security values, with consequent centrality accorded to corporate actors and expert bodies, with their focus on competitiveness, efficiency, professional capacity, hierarchical division of labour.¹⁸ This applies also to public policies, the legitimacy of which is grounded on legality (procedural correctness) and competence (practical ability to control the world).¹⁹ According to social psychological studies, moreover, people in high statuses—thus provided with the legitimate power, i.e. the authority, to take decisions and manage socially valuable resources—are the most inclined to endorse security values and exchange trust norms.²⁰ This suggests a mutual reinforcement of institutional and personal commitments towards expertise, hierarchy, and means-ends rationality, to the detriment of the ability to valorize and reconcile contradictory viewpoints and contrasting concerns.

If these are the features of the current DCS, environmental governance makes no exception: the boundary between ability and disability is based, to a major extent, on the acknowledgement of professional competence and technical skill at both the personal and organizational level. The basic structure of the DCS here can be described as follows: expert actors sanction the facts about environmental questions (distinguishing for example full-blown, quantifiable risks from hypothetical threats) and appropriate ways to address them, whereas lay people express their own interests and concerns, which policy-makers address and harmonize according to expert insight.

Responsibility under Uncertainty: From Liability to Social Connection

The idea of responsibility traditionally refers to imputability, that is the possibility to trace

16. We follow here Braithwaite 1998.

17. Weber 1958.

18. Ermann and Lundmann 1996; and Braithwaite 1998.

19. Weber 1958.

20. Braithwaite 1998.

back a situation or event to agents conceived as intentional, rational, autonomous and moral. Agents are moral when provided with an understanding of the good and the bad in their behaviour. As a consequence, they are legitimate addressees of praise and blame.²¹ Philosophers often insist that responsibility is only a property of individual human beings.²² Yet for many social scientists this is an unwarranted limitation. Emile Durkheim, for example, maintains there is no actual ground to regard morality as based on individuals, since it evolves within society.²³ For many sociologists it is indeed the social character of agents that makes groups, hierarchies and organizations a site of responsibility.²⁴ Extending duties and responsibilities to collective agents, by means of the notion of “legal person,” is also a long-established juridical tradition, while policy analysts and political scientists refer to a variety of non-individual carriers of responsibility, such as governments, nation states, social movements, policy networks, the media, and public opinion.

The basic feature of the traditional view of responsibility—we may call it, following Iris Marion Young, the “liability model”—is rather its being mainly backward-looking and based on factual beliefs about the causal chain connecting agents and events.²⁵ In this sense it is fully consistent with the DCS and its core values. Take for example the recent European Union’s directive on environmental liability. It seeks to “establish a framework of environmental liability based on the ‘polluter-pays’ principle, to prevent and remedy environmental damage”; yet this applies only “where it is possible to establish a causal link” between the activities of individual operators —understood as “any natural or legal, private or public person” —and the damage that results from such activities.²⁶

The liability model is pervasive. It represents a benchmark which to date has allowed few exceptions at the regulatory level. Remarkably, such exceptions are mostly related to the saliency of uncertainty. Strict liability, for example, extends responsibility beyond its traditional limits. It applies whenever social assignments of burden distribution prevail over considerations of individual fault. It applies, in other words, whenever it makes sense to hold liable those —for example entrepreneurs—who are able to anticipate, calculate and budget for the consequences of events independent of their own fault, but occurring within their organizational sphere. The damaged subjects would be otherwise required to prove causal connections that remain largely hidden behind the borders of such sphere.²⁷ On the other hand, an ascertained causal chain between behaviour and damage does not necessarily lead to liability. Lack of sufficient societal knowledge may work as an exonerating clause. The environmental liability directive, for example, states that operators avoid the cost of remedial actions if they demonstrate that their behaviour “was not considered likely to cause environmental damage according to the state of scientific and technical knowledge at the time when the emission was released or the activity took place.”²⁸

The liability model, therefore, is sensitive to uncertainty. What happens, then, if it becomes increasingly difficult to trace causal connections due to the intricacy of chains? If hybrid agents²⁹ play a major role? If the scope of action extends to future generations? Insight comes from the “social connection model” of responsibility outlined by Iris Marion Young.

21. Eshleman 2004.

22. Pettit 2007.

23. Durkheim 1984.

24. Barnes 2000.

25. Young 2006. Cf. also Jonas 1979.

26. EU 2004, articles 1, 2.6, 4.5.

27. Pellizzoni 2004.

28. EU 2004, article 8.4(b).

29. By hybrid agents we mean ensembles of heterogeneous elements from the social and natural world. Think for example of industrial production, with its intertwined chains of human labour, technological devices and material processes like chemical reactions. Cf. Perrow 1984; and Law 1991.

Her concern is for structural injustices, which obviously include many environmental and technological issues. By structural injustices Young means “social processes that put persons under a systematic threat of domination or deprivation of the means to develop and exercise their capacities, at the same time as these processes enable others to dominate or have a wide range of opportunities for developing and exercising their capacities.”³⁰ Structural injustices lie in the distribution of material resources and opportunities as well as in symbolic inequalities, such as disrespect, which prevent some people from a full participation in social life.³¹ Structural injustices depend on long and loose social connections embedded in a DCS. Therefore they cannot be suitably addressed by specifying personal liabilities. Often they are even difficult to recognise.

An obvious site of structural injustices is global trade. Customers are usually held neither legally, nor morally liable for worker exploitation or hazardous emissions occurring somewhere in the world, along intricate production chains. Yet, according to Young’s argument, since they play their role in the cooperative scheme enabling exploitation and hazard production, they should acknowledge and take up their own part of responsibility. They just cannot say “I didn’t know” or “I can’t do anything.” The problem, however, is what they *can* do, given their limited agency and insight. According to Young, a reply to structural uncertainties in the causal chains cannot lie in a search for efficient, effective and predictable courses of action, but rather in “carrying out activities in a morally appropriate way and aiming for certain outcomes.”³² In other words, if a detailed reconstruction of causal chains is impossible or extremely onerous, agents can be connected to events only by referring to the agency, remit and commitments of the former.

This, for the sake of our discussion, is the key insight of Young’s model. In conditions of deep uncertainty the issue-framing is relevant to the allocation of responsibility, rather than lying in the background as an unquestioned given. Reasons prompting to act (in-order-to motives) overcome as justificatory grounds the search for constraining causes (because-motives). Assessment of behavior is to a major extent forward-looking and value-based, rather than backward-looking and fact-based as the traditional liability model would ask for. As we have seen, this is to some extent already implied in strict liability. Yet strict liability is strongly rooted in a world of calculable uncertainty, being typically excluded if one proves the fortuitousness of an event or that all the possible measures for avoiding damage had been adopted. Thus strict liability is at arms-length distance from fault-based liability. Not by chance, in both cases insurance plays a major role in modern society as a means to accommodate typically contrasting interests: in strengthening liabilities for risks of growing number and scope, and in relaxing individual legal and moral burdens.³³ The European Union environmental liability directive is again a case in point, stating that “Member States shall take measures to encourage the development of financial security instruments and markets... with the aim of enabling operators to use financial guarantees to cover their responsibilities.”³⁴

Indeed insurance is possibly the main institutional translation of the idea of technical and financial control and suitable allocation of risks in society. Together with strict liability, it offers a major example of the consequences of social differentiation for responsibility. Once mostly rooted in interpersonal relationships, responsibility has been increasingly institutionalized. The PP may be understood as a further step in this process. Yet this step marks a break with the traditional notion of liability. No more is the issue one of addressing

30. Young 2006, 114.

31. Honneth 1996; and Fraser 2000.

32. Young 2006, 119.

33. Barnes 2000.

34. EU 2004, article 14.1.

in some socially acceptable way the consequences of predictable events, but rather one of warding off ill-predictable ones, with liability stemming, as a consequence, from the inadequate application of preventive measures. Moreover, the higher the saliency of social connections, the stronger the role of normative expectations and issue-framings in ascribing responsibilities, with special reference to the justification of inequalities—the rationale for distributing abilities and disabilities. Therefore the agents' technical skill and professional expertise—which according to the DCS are the main criteria for assigning and assessing responsibility for environmental measures—become delicate issues, a matter of potential contention. This is confirmed by the PP controversy.

The Controversy about Precaution

The history of the PP is well documented.³⁵ First appearing in Germany, it entered the global scene in the 1980s enjoying a growing success at different scales: international agreements (like the Rio Declaration and the Cartagena Biosafety Protocol); regional governance (such as the Maastricht and Amsterdam EC Treaties and various directives); and national regulations (for example the Italian 2001 Framework Law on electromagnetic fields).

However the policy record of precaution is controversial, or plainly blurred. The US is often depicted as having been stricter than Europe in many areas (e.g. chemical regulation, automotive emission standards, environmental impact assessment), though at least since the mid 1980s, the opposite is arguably the case (hormone-treated beef and milk, genetically modified (GM) crops and foods, eco-labelling, automobile and electronic recycling, packaging wastes, etc.). That the Americans lean towards quantitative risk-benefits analysis vis-à-vis the European interest in precaution is ascribed to many reasons, from the European record of regulatory failures to differences in the American and European cultures and institutional set-ups³⁶. Wiener and Rogers warn, however, that “the notion of a great transatlantic struggle over risk and precaution is misleading.”³⁷ One should rather talk of “iterative exchange of legal ideas, tools and approaches.”³⁸ Regulatory solutions differ according to the issue, the place, the moment, the public, and the legal system, though contextual constraints (from right-to-know legislation to corporate pressure to regulatory harmonization; from the experts' endorsement of similar beliefs and approaches to the mimicking of successful regulatory models) may foster institutional isomorphism³⁹. The application of the PP, in any case, has raised heated conflicts, like the US-EU dispute on hormone-treated beef or the European “Pfizer case” about the banning of an antibiotic as an animal growth promoter.⁴⁰ The US has never formally adopted the PP, public discussion there being depicted as “several years behind that in Europe.”⁴¹ The policy currency of the PP might have already peaked even in Europe: A growing stress on competitiveness and efficiency indicates that “there is little consensus to further use of the precautionary principle in its strictest form, that is reversed burden of proof and regulating based on harm rather than risk. Costs on those regulated (e.g. industry) may simply be too high.”⁴²

The controversial policy record on the PP is complemented by theoretical disagreement. As an intuitive idea, precaution invites us to strengthen our concern for the

35. Cf. e.g. O' Riordan et al. 2001; and Tickner 2003.

36. Vogel 2003; Löfsted 2004; and Wiener 2004.

37. Wiener and Rogers 2002, 319.

38. Wiener 2004, 79.

39. Wiener and Rogers 2002; and Halffman 2005.

40. Majone 2002; and Van Asselt and Vos 2006.

41. Tickner and Raffensperger 2001, 183.

42. Löfsted 2004, 251.

reliability of decisions based on limited evidence, taking appropriate countermeasures. The growing scope of action, with related uncertainties, means that we can go wrong more easily, and this “wrong” can be bigger in its consequences than it used to be. Yet divergences on what is to be drawn from such remarks start early. Comparing two famous definitions, the Rio Declaration and the Wingspread Statement,⁴³ we find for example that the former refers to cost-effectiveness of preventive measures, while the latter does not; the former talks of threats of serious or irreversible damage, the latter of any threat to human health or the environment; the latter asks for a reversal of the burden of proof (that is, issues of relative safety, harm prevention and alternative examination are to be addressed by the proponents of a technology rather than, as usual, by government authorities or end users) while the former does not.

Already at a definitional level, therefore, precaution raises two major questions: what balance between risk taking and risk avoidance is to be achieved, and who is supposed to provide evidence of the soundness of such balance. With regard to the latter, supporters of the PP remark that a reversal of the burden of proof is already implied in those regulations which require prior approval of product marketing. The PP extends this approach to situations where no prior approval is required. It fills a blank area between strict liability and fault-based liability by extending the notion of fault to insufficient consideration of early warnings and preventive measures. Critics, however, remark that a reversal of the burden of proof is theoretically flawed (you cannot provide proof of a negative fact) and in practical terms may be too demanding, hampering innovation. Not by chance is strict liability typically excluded with reference to the “development costs” of technology:⁴⁴ unpredictable effects of innovation could exceed any budget estimate. The same applies to fault-based liability: as we have seen, the environmental liability directive does not apply to operators who show that, at the relevant time, there was no evidence of any damage stemming from their behaviour. The EC Communication on the PP⁴⁵ seeks to find a compromise between the two positions: a reversal of the burden of proof is required on a case by case basis, not as a general principle, so as to promote advancement in scientific knowledge rather than the innovators’ retreat.

The balance between risk taking and risk avoidance is even more controversial. Criticism focuses on the perverse effects of precautionary measures. “Risks are often on all sides of a social situation, and risk reduction itself produces risks.”⁴⁶ Substitutes for a toxic substance, for example, have their own problems and “many toxic agents that are harmful at high levels are actually beneficial at low levels.”⁴⁷ In other words, addressing a target risk may result in the increase of a countervailing risk. “Regulations causing risk-risk tradeoffs pit some life and health interests against other life and health interests,”⁴⁸ while “the search for higher and higher levels of safety [...] imposes high costs without achieving significant additional safety benefits.”⁴⁹ On the contrary, “adopting precautionary regulations can incur the cost of financial losses, restricted freedoms, and the foregone health and environmental benefits of restricted technologies.”⁵⁰ “Overreaction” to risks would depend on “cognitive mechanisms” allegedly affecting first and foremost lay people: loss aversion, belief that nature is less dangerous than technology, cognitive availability of some risks to the detriment of others, a focus on harms rather than benefits, or misperception of the costs of precaution.⁵¹

43. UN 1992; and Wingspread 1998

44. Pellizzoni 2004.

45. EC 2000.

46. Sunstein 2005, 366.

47. Sunstein 2003, 1026.

48. Wiener 2004, 90.

49. Majone 2002, 105.

50. Wiener and Rogers 2002, 321.

51. Sunstein 2003; and 2005.

Indeed, the whole idea of precaution may be inconsistent: “If we insist that we are ‘completely ignorant’ as to which of the events $E_1 \dots E_n$ will occur, it is hard to escape the conclusion that all the events are equally likely to occur.”⁵² If there are no reliable estimates of risks, the same applies to precautionary measures as well. Precaution may simply be a way to justify “protectionism, or to reclaim national autonomy in politically sensitive areas of public policy.”⁵³ At best, it may be nothing more than a cost-benefit analysis with a “margin of safety” added whenever dangers produce special concern because of their catastrophic potential outcomes and the impossibility of assigning probabilities.⁵⁴ This applies, at least, “when the costs of reducing those dangers are not huge and when incurring those costs does not divert resources from more pressing problems.”⁵⁵

As one may see, core points on the critical side on precaution are that uncertainty is a transitory status of unpredictability and that innovation is beneficial to everybody, including those who suffer from unpredictable (thus inevitable) damage. These assumptions are seldom, if ever, discussed in this literature, most efforts being devoted instead to elaborating on rational choice under conditions of relevant uncertainty and the implications of the different rational capacities of expert and non-expert social actors. Yet that normative and cognitive assumptions play a major role is highlighted by critics’ own disagreement about the distributional effects of precautionary policies. For some they are too beneficial to wealthier people and countries; for others too onerous. Some maintain they lead to understatement of risks; others that they lead to overstatements.⁵⁶ Contrasting assessments clearly depend on different “other things being equal” clauses: about the relevant information and stakes, the allocable resources, the legitimate decision-makers, and so on. Each clause represents a peculiar, questionable description of the world, yet it is usually taken for granted.

The normative and cognitive bases of the critical assessments of precaution, therefore, remain largely unexamined. The perspective implicitly adopted is mostly regulative. The DCS provides the obvious structure for social interaction. Problem-situations can be objectively defined, though with different degrees of precision. People pursue their own goals, though with different degrees of rationality. The issue, in this way, is reduced to the foreseeable effects of different regulatory solutions.

Defence of precautionary policies, on the contrary, often brings to the forefront the cultural patterns underlying the problem-settings and the structure of social interaction, questioning in this way the underlying DCS. For example, it is argued that framing any environmental issue in terms of risk is misleading, since people are often concerned with the governance of innovation, its impacts and justifications, rather than with the governance of risk.⁵⁷ Or that critics advance unwarranted empirical statements, there being plenty of evidence on the contrary, from car emissions standards to the emerging “digital divide,” that restrictive regulations may promote innovation or that the latter does not always entail generalized benefits. Moreover, it is unclear why the utilitarian policy framework usually adopted by experts and regulatory agencies—who seek to elicit the option offering the best trade-offs between various criteria—would be more rational or morally respectable than a social justice framework, for which consideration of the distribution of costs and benefits overrules consideration of their overall balance, so that “expensive avoidance policies [may be] warranted on the basis of a few credible scientists suspecting a small risk that violates the

52. Majone 2002, 103.

53. Majone 2002, 89-90.

54. Posner 2004.

55. Sunstein 2005, 383.

56. Cf e.g. Sunstein 2003; and Wiener 2004.

57. Felt and Wynne 2007.

rights of even a small group of people.”⁵⁸ It is also unclear why assuming that human interventions are less dangerous than nature would be more rational than assuming the opposite, and why—if no evidence of harm does not correspond to evidence of no harm—risk aversion would not be a sensible attitude. And if the portrait of an American lean towards individualism and technological optimism vis-à-vis the Europeans’ stronger commitment to environmental and social concerns may be oversimplified, the relevance of cultural frames in setting the priority between well-defined short-term risks and indeterminate long-term ones can hardly be dismissed⁵⁹.

The Meaning of Uncertainty

Ultimately, the case for or against precaution depends on how scientific uncertainty and its consequences on the cooperative scheme are conceived. It is not so much the recognition of deep uncertainties that is crucial. If the latter are depicted as transitory, to be fixed by means of further insight, investment and time, such recognition can be used to enhance the role of scientists and expert organizations.⁶⁰ Behind many criticisms of the PP one may easily detect a long-established narrative of science and society. According to such narrative sound science is always premised on sound policy-making⁶¹. More precisely, science provides a reservoir of knowledge for answering social needs. Fundamental research leads to applied research, and applied research to concrete social benefits⁶². The downside of this narrative is that it inevitably leads to a growing politicization of science. If policy presupposes science then scientific debates become political debates, the conclusions of the former entailing answers to the latter.⁶³ Growing public concern about this contradiction has fostered a different narrative, by which a sharp distinction is made between a science-based risk assessment and a risk management where scientific evidence is applied according to social and political considerations. Precaution then pertains to risk management, “when scientific uncertainty precludes a full assessment of the risk” and “until all the necessary scientific knowledge is available.”⁶⁴ According to the most recent variant of this narrative, “non-scientific considerations play a distinctive up-stream role setting the framing assumptions that shape the ways in which risk assessments are constructed and conducted.”⁶⁵ The interplay between risk assessment and risk management is therefore explicitly recognized. Yet the experts’ task remains to bring out objective elements for evaluation; that is, to shed light on policy alternatives, distinguishing those compatible from those incompatible with data. Scientific questions may be framed by political ones, yet within a given political frame policy options are independent of political opinions.⁶⁶ In this way the basic structure of the DCS remains unaltered: experts are still entitled to deal with the “objective facts,” which dictate the appropriate ways to address environmental problems.

The “risk assessment/risk management” and the “politics/policy” variants are often proposed as a way to settle the dispute on precaution.⁶⁷ Yet for a growing number of scholars a thorough rethinking of governance approaches, based on a different view of uncertainty, is mandatory. Such a view recognizes uncertainty as a pervasive, permanent trait of many major

58. Neutra et al. 2002, 2.

59. Jasanoff 2002 ; Vogel 2003; and Christoforou 2004.

60. Zehr 2000.

61. Forrester and Hanekamp 2006.

62. Pielke 2007.

63. Pielke 2007.

64. EC 2000, 12 and 7.

65. Millstone et al. 2004, 7.

66. Sarewitz 2004; and Pielke 2007.

67. EC 2000; and Pielke 2007.

issues. Uncertainty takes, for example, the shape of complexity (emergent systems properties not derivable from their elements), indeterminacy (open-ended causal chains, outcomes depending on unspecified or unpredictable intervening variables), ignorance (unknown unknowns: we do not know if we are asking the right questions), disagreement (different criteria of selection of variables, different methods of analysis), or ambiguity (different possible issue-framings).⁶⁸ Examples are plenty. Think of climate change. Its complexity is testified by labour-intensive yet persistently unsatisfactory modelling. Technological innovation, with its potentially crucial yet hard to anticipate role in reducing anthropogenic impacts, is a source of indeterminacy. The specific factors triggering irreversible change are surrounded by sheer ignorance. Experts, moreover, disagree on the relative importance of atmospheric and marine dynamics. Finally, the whole policy issue is framed in contrasting ways: Is it, for example, a matter of mitigation or adaptation? Should one focus on modifying individual behaviours or institutional and organizational set ups?

The changing character of scientific questions has been stressed in many ways. Weinberg⁶⁹ labels as “trans-science” those issues to which the classic experimental method (laboratory-confined trial and error) cannot be applied because of the size of the phenomena, the implied decision-stakes and, frequently, the urgency of decisions. Funtowicz and Ravetz⁷⁰ talk of “post-normal” science with reference to similar issues. Others remark that “uncertainty in environmental controversies is a manifestation of scientific disunity (excess of objectivity; disciplinary diversity) and political conflict. [...] Uncertainty estimates are in part a measure of the psychological state of those making the estimates, which is in turn influenced by the political context.”⁷¹ In other words, uncertainty and decision stakes are intimately connected.⁷² The social and the natural orders are co-produced. “The ways in which we know and represent the world (both nature and society) are inseparable from the ways we choose to live in it.”⁷³ Scientific uncertainty is thus connected with the deepness of political controversies on environmental issues. The latter fuels the former. Politicians may call for urgent additional research, yet this expands uncertainty rather than reducing it. Climate change and other issues show that we never know *enough* (for our purposes): uncertainty grows not despite, but *because* of, the increase in knowledge. This paradox is related to the modern growing expectations of control of nature (and society) by a social actor conceived as the centre of decisions of broadening scope.⁷⁴

The typical outcome of such a line of defence of precaution is a plea for a substantial revision of the DCS: “The presence of irreducible uncertainty in environmental and technological policy issues necessitates alternative problem-solving approaches and interfaces between science and policy, in which uncertainty is acknowledged and science is consciously democratized.”⁷⁵ This means broadening the review of policy-relevant evidence from experts and representatives of organized interests to all the affected people, and extending the range of usable knowledge from scientifically certified facts to informal, lay and local insight.⁷⁶

Environmental Conflicts and Institutionalized Orientations towards Uncertainty

68. Wynne 1992; and Funtowicz and Ravetz 1993.

69. Weinberg 1972.

70. Funtowicz and Ravetz 1993.

71. Sarewitz 2004, 393.

72. Wynne 1992.

73. Jasanoff 2004, 2.

74. Pellizzoni 2004.

75. Funtowicz and Strand 2007, 265.

76. Wynne 1992; and Funtowicz and Ravetz 1993.

If an institutional approach provides valuable insight into the grounds of the PP controversy— different institutional perspectives being a result of, and a means for, advancing divergent considerations on the implications of uncertainty for the DCS—an institutional approach may also help understand why concrete conflicts may be difficult to manage.

Any non trivial environmental issue is confronted with significant levels of uncertainty. In deciding what to do we can make two basic types of errors: false positives (Type I errors, as statisticians call them) and false negatives (Type II errors).

False positives occur when an initial finding of (unacceptable) harm later turns out to have been incorrect. False positives are risked by presuming “guilty until proven innocent”. [...] False negatives occur when an initial finding of no (or acceptable) harm later turns out to have been incorrect. False negatives are risked by presuming “innocent until proven guilty.”⁷⁷

One can reduce the probability of Type I errors (the risk of rejecting the null hypothesis, for example, that genetically modified organisms (GMOs) have no harmful environmental effects) only at the cost of increasing the probability of Type II errors (the risk of rejecting the opposite hypothesis). The choice of different levels of significance of errors (that is different burdens of proof) is conventional.⁷⁸ It therefore depends on assumptions about the relevance of one or the other error, usually related to some (implicit or explicit) notion of the common good. If, for example, we are concerned with the increase in environmental degradation we will lean towards reducing false negatives in trials; if we are instead concerned with an over-restrictive regulatory system we will lean towards reducing false positives.

To get the point we must go beyond the statistical lexicon and its focus on probability. The point is that, be they calculable or not, we may incur two different types of errors whenever we feel a situation is open to decision rather than constrained (for example by fate or natural forces): rejecting something that we should have accepted or vice versa. These possibilities cannot be reduced at the same time, and there are no objective criteria for balancing them. Our previous discussion shows that false positives are more of concern for those who believe that being too worried about uncertainty means giving up what a stronger control of the world may offer. False negatives are more of a concern for those who believe that the traditional scope of regulatory control misses many sources of environmental risk.

These orientations are not so much a matter of individual preferences as of institutionalized roles and related biases. Again, this can be grasped only by overcoming a merely regulative perspective on environmental governance. For example, it is entirely logical for entrepreneurs to be more concerned with Type I errors, because these errors impinge on the profitability of their investments, prompting to address fictitious problems. Such would be the case if a company had to rearrange electric power lines in response to misleading epidemiological or experimental evidence of harm caused by electromagnetic fields. False positives are also usually of greater concern for scientists. To mistakenly find out something that does not actually exist may hamper research progress, while if something that really exists has not been detected yet, it can still be captured by future enquiry. On the other hand it is sensible for health and environmental agencies or technology end users to be more concerned with false negatives, often being more favourable to precaution than industry and scientists. When research is used for environmental or health purposes, such as designing procedures to identify toxic substances, the implications of false negatives are more important than missing or slowing down innovation. Asbestos, BSE (Bovine Spongiform

77. Wiener and Rogers 2002, 321.

78. Van den Belt and Gremmen 2002.

Encephalopathy) and other regulatory failures can indeed be traced back to an institutionalized predominance of a concern for reducing Type I errors, with consequent dismissal of early warnings.⁷⁹

Principled orientations towards uncertainty are also embedded in specific disciplines. It is probably not by chance that geneticists and molecular biologists are overrepresented among those who stress the benefits of GMOs, while ecologists, biologists of populations, agronomists are overrepresented among those who stress their potential risks. The former are used to thinking in terms of direct cause-effect relations; the others in terms of complex, ill-controllable interactions. Similarly, being used to thinking of human history as scarcity overcome through innovation, economists are often more optimistic than ecologists about technological answers to environmental problems.⁸⁰

Uncertainty and Responsibility

More generally, in modern society, the problem of how to deal with uncertainty takes the shape of a dilemma between two types of ethical commitments, which Max Weber labels “ethics of principles” (*Gesinnungsethik*) and “ethics of responsibility” (*Verantwortungsethik*).⁸¹ The former is based on value-rationality; the latter on means-ends rationality. We follow an ethics of principles when we believe in the unconditional value of a behavior regardless of its undesirable consequences. We do not regard ourselves as responsible for them. Rather, Weber says, we consider responsible the world itself, or the stupidity of humans, or God, who made humans stupid. We follow an ethics of responsibility when we take our expectations about the world or other humans as conditions or means for achieving a goal, endeavoring to assess the foreseeable consequences of our actions and regarding ourselves as answerable for them. Policy legitimacy, therefore, can be grounded on either principled beliefs (agreement on values) or factual beliefs (agreement on facts). Weber sees the ethics of responsibility as the rule in a rationalized society, the appeal to principles working only in exceptional circumstances, as a barrier to the drift towards pure political expediency (*Machtpolitik*). This has been, after Weber, the driving assumption about modern society. As a consequence precaution has usually been understood—Hans Jonas being the most famous example—as a further extension of the ethics of responsibility. But is this really the case? The social connection model implies, and the PP controversy suggests, the opposite. The point deserves further elaboration.

Let’s have a closer look at the two ethical orientations. The ethics of principles seems devoid of any reference to means-ends relationships. To follow it, Weber says, means to act irrationally from the viewpoint of the possible results. The meaning of action then resides in its exemplary value. Its purpose, however, cannot be to induce imitation, for example by calling forth emotions—it would in such case be a matter of means-ends rationality—as to testify to the principle. Yet for Weber rationality is the ability to control the world by means of information-processing.⁸² Thus a principled action cannot entail disregard for *any* connection between goals and means: it would be in this case an irrational, not a value-rational, one. There must be reasons to believe in the value of action. That is, there must be a rational view of the connection between action and a desired state of the world—a reasoned belief that, despite possible undesired effects, the desired one (the “good”) will eventually come true. Not by chance are values usually defined as shared and stable beliefs about the

79. EEA 2001.

80. Sarewitz 2004.

81. Weber 1958.

82. Schluchter 1979.

desirability of behaviours *and* goals (that is states of the world).⁸³ The difference between the two ethics, therefore, concerns the control of the consequences of action. If the ethics of responsibility requires predictability of consequences, the ethics of principles seems the only option when consequences are deemed unpredictable.⁸⁴

The two ethics, thus, entail contrasting assessments of uncertainty. If uncertainty is deemed controllable, then what is known is regarded as adequate for making reliable decisions (taking risks in a proper sense). Uncertainty does not affect expected results beyond a predictable and acceptable threshold. If uncertainty is deemed beyond control, then the unknown is considered to hamper reliable predictions. It may affect the outcomes of behaviour in unexpected ways. A principle then offers a clue to the world order. To apply the principle means to behave according to such an order, thus contributing to reproducing or (re)establishing it. One may not know (enough of) the causal chain, yet if action is consistent with the world order, then the unknown will ultimately operate according to such an order. The ethics of responsibility entails that purposeful action is regarded as intermingling with the unknown in such a way that the latter “bends” into the former, as part of a mechanism driven by the actor. The ethics of principles entails that action is regarded as intermingling with the unknown in such a way that the former “bends” into the latter, as part of a self-driven mechanism, a process led by exogenous forces.

This is of major relevance in the environmental field. For many issues the problem is not how *much* evidence is available but *how* evidence is evaluated—what counts as evidence and what such evidence tells us—and by *whom*. Assessments of the controllability of uncertainty and of actors’ competence, trustworthiness and responsibility intertwine and fuel controversies. Are previous successful predictions enough to talk of proper control of a process? Are the observed deviations negligible, or are they a clue to the insignificance of success? Who is entitled to address and settle these issues? Who is responsible if something goes wrong? In any non-trivial case the answer is debatable and ultimately related to value commitments. Defenders of GMOs, for example, maintain that gene technologies are just a follow-up of traditional biotechnologies; they only work more precisely and purposefully, because now we know more than we used to know. From this viewpoint, geneticists and molecular biologists are the most qualified policy advisers. Critics, however, are afraid that the unknown will bring surprises in a novel way. Traditional biotechnologies hybridize whole species, allowing in this way the unknown work “by itself” to sanction the success or failure (sterility etc.) of experiments. New biotechnologies transfer single genetic traits under the assumption that identified usable features can be isolated from their original task environment. The unknowns about the latter are deemed irrelevant to the purpose. For critics this is an unwarranted, possibly dangerous assumption. Additional insight is needed about systems interactions. From this perspective, ecologists, population biologists, agronomists and farmers become important policy advisers.

In such conditions one may still talk of facts. Yet what is to be regarded as relevant facts and reliable predictions is affected by increasingly salient, debatable value commitments about growth, innovation, manipulability of nature, systems resilience and so on. The technicality of environmental issues has for a long time entailed that the plea for facts in the policy arena corresponds to a plea for an open line of credit towards experts. However, the growing saliency of uncertainty means growing public awareness of the deep normative commitments entailed in diverging assessments of the state of affairs and precautionary

83. Braithwaite 1998; and Lòpez and Scott 2000.

84. They can also be deemed irrelevant. Yet either this evaluation is based on affect or habit, or it must be grounded on a rational belief that prediction is impossible. If what I can see or predict contrasts with what should be, either there is no world order (thus no place for reason) or such order is too complex to be grasped by looking at the actual or foreseeable consequences of my behaviour.

action; awareness that the ethics of responsibility is, in many cases, nothing more than a disguised ethics of principles.

In highly differentiated societies characterized by what Weber⁸⁵ calls a “polytheism of values”—contrasting principled commitments, often embedded in social roles and institutional logics—such awareness means increasing difficulties in handling environmental issues. When the appeal to agreeable facts is hampered by the parties’ focus on different evidence, or by different interpretations of the same evidence, conflicts tend to become intractable.⁸⁶ There is plenty of evidence of this trend: think of climate change, GMOs, nuclear waste, electromagnetic fields, and nanotechnologies.

A tentative way forward lies in “democratizing” the production and use of social knowledge, as argued by many supporters of precaution, who look at inclusive deliberative arenas as a means for addressing and settling questions of values and goals before addressing and settling questions of facts and means. In recent years innovative experiments have been carried out both at local and national levels. Yet the DCS may prove more resilient than expected. Uncertainty means not only an increased questionableness of expert advice but also an increased need to rely on such advice. Scientists and policy-makers (and environmental activists as well) often interpret precaution as requiring more science, expertise, and organization. The consequence may be a broader gap between able and disabled people, a greater reliance on elites on the part of people lower in hierarchy,⁸⁷ and a decline in the scope of public debate. Indeed, participatory processes often reproduce the traditional social divide between abilities and disabilities, with public concerns being characterized in purely ethical terms, as if they were devoid of any cognitive content.⁸⁸ The UK’s more extensive experiment in public consultation so far, the *GM Nation?* debate on the commercial growing of GM crops, is a case in point. Analysts have pointed out, as its core features, the engagement of “innocent” citizens (rather than “activists,” that is people provided with their own views), a focus on consensus and trust building (rather than on the reasons for dissent and mistrust) and a sharp distinction between expert and lay opinions. According to one commentator, “in giving the appearance of democracy, such talk actually diverts from a more adequate onslaught on deeper institutional and epistemic commitments [...]. Little has changed: we are simply in the old nexus of technocratic aspirations with the public construed as an obstacle to progress.”⁸⁹

Conclusion

In this article we have described precaution as a field of controversy over the impact of uncertainty on the institutional set up for environmental governance. Such controversy finds on the one side forces committed to reaffirming the soundness of a cooperative scheme that assigns a central role to science, professional expertise, technical organizations, and on the other side forces that take the unforeseen, undesired “side effects” of this social order as an indicator of its inability to deal with the environmental challenges, and of the consequent need for major rearrangements towards more inclusive, equitable policy processes. Moreover, different views of precaution as an institution can be detected, some of which are unable to grasp, or are unwilling to acknowledge, the fact that behind many environmental issues lie different institutionally embedded commitments to the treatment of uncertainty.

Precaution is supported by environmentalists, citizen groups and parts of the

85. Weber 1958.

86. Schön and Rein 1994.

87. Ermann and Lundman 1996; and Honneth 1996.

88. Wynne 2001.

89. Irwin 2006, 316-317.

scientific, business and political world. It is present in regulations at different scales. Yet its challenge to the DCS inevitably entails a troublesome career, as testified by the controversies it has raised at all levels of governance, from the international trade disputes on GMOs, hormones and antibiotics to the local quarrels on mobile phone masts and waste disposal. Attempts to transfer the idea of precaution into concrete policy measures provide valuable insight and opportunities for social learning. However nothing conveys more clearly the present critical juncture of environmental governance than the combination of innovative dialogical designs and traditional roles one encounters in many participatory experiences. It is striking that today scientists, corporate actors and policy-makers often acknowledge that science offers no absolute certainties, yet they seldom draw the conclusion that—for this very reason—their own rationale of innovation is open to challenge.

Is there any emergent solution to the crisis of legitimacy and effectiveness of environmental governance? The answer is beyond the scope of this article, the aim of which was just to show the insight a considered institutional approach may provide on the issue of precaution. More empirical research is necessary to clarify the multifaceted implications of uncertainty. However, to speculate a bit, building on the discussion above, we think it unlikely that the DCS will face either a total recovery or a total collapse. Some compromise between old and new is the most likely outcome, according to the urgency of environmental challenges, the strength of institutional constraints, their margins of reform and the emergence of political forces committed to any such reforms. This does not necessarily mean, however, that any consistent institutional set up at any level of governance (let alone across them) is bound to materialize. We may instead be confronted with a fragmented geography of territorial and organizational kingdoms, some of which under expert guardianship, others centred on inclusive forums, and others torn by heated, sometimes dramatic, conflicts.

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