

CLI BACKGROUND PAPER NO. 13 (Executive Summary)

The Precautionary Principle in Environmental Decision-Making

by Carolyn Raffensperger*

The precautionary principle is a decision-making norm that couples ethics and epistemology. It encompasses a broad ethic of preventing harm to future generations and provides a mandate to act with legal as well as moral courage in the face of scientific uncertainty. It requires us to refocus our decisions from finding justifications for the damage we do to avoiding damage and continually searching for the best alternatives.

While there are numerous formulations of the precautionary principle, the best known is the 1992 Rio Declaration on Environment and Development,¹ which grew out of a growing tension between development and sustainability. Principle 15 of the Rio Declaration provides as follows:

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

While all definitions of the principle contain the same three elements of (1) scientific uncertainty, (2) threat of harm, and (3) precautionary action, the fact that the definition is not self-executing led to numerous criticisms and difficulty implementing precaution in a meaningful way.

Five implementation steps were worked out at the 1998 Wingspread Conference on the Precautionary Principle.² They are: (1) Heed early warnings; (2) Set goals; (3) Identify and choose the best alternative to help meet the goal; (4) Reverse the burden of proof; and (5) Expand democratic participation.

Since 1998 the precautionary principle has become law in numerous jurisdictions, from the international arena to places like San Francisco because increasing numbers of people recognize that waiting for scientific certainty and depending on cost-benefit analyses jeopardize the future. It needs urgently to be adopted and implemented by environmental decision-makers everywhere. We cannot wait. The threat of irreversible ecological harm from climate change is upon us. The precautionary principle compels action to prevent harm to present and especially future generations.

For more extended discussion, see unabridged CLI Background Paper No. 13, next in this Appendix A of the CLI Policy Paper.

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¹ Rio Declaration on Environment and Development, June 13, 1992, U.N. Doc. A/CONF.151/26 (vol I) (1992), *reprinted in* 31 I.L.M. 874 (1992) and 5 INTERNATIONAL LAW AND WORLD ORDER: BASIC DOCUMENTS V.B.16 (Burns H. Weston & Jonathan C. Carlson eds., 1994).

² See CAROLYN RAFFENSBERGER & JOEL TICKNER, PROTECTING PUBLIC HEALTH AND THE ENVIRONMENT: IMPLEMENTING THE PRECAUTIONARY PRINCIPLE 7–11 (1999).

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A threshold issue central to the effectuation of intergenerational ecological justice concerns the precautionary principle. As made clear in previous pages of this Green Paper, ecological decisions taken now will profoundly affect the welfare of future generations. They also are almost always made in the face of scientific uncertainty. The legal principle that lights the way for proactive decisions protective of the ecological interests of future generations is the precautionary principle. It embodies the idea that the present generation will practice the Golden Rule towards future generations; that we will take action in present time to prevent harm to generations to come; that we will pass on a legacy of a stable climate to future generations, as now we wish we had inherited it from our forebears.

The precautionary principle couples ethics and epistemology. It encompasses a broad ethic of preventing harm to future generations and provides a mandate to act with legal as well as moral courage in the face of scientific uncertainty. It requires us to refocus our decisions from finding justifications for the damage we do to avoiding damage and continually searching for the best alternatives. It values the observation of patterns and trends for what is happening to the planet as a whole, providing a crucial opportunity for leaving the planet in a livable form to the next generations.

Two formulations of the precautionary principle predominate in the United States. The first, embedded in the 1992 Rio Declaration on Environment and Development, grew out of a growing tension between development and sustainability. Predicated on a German approach (*Vorsorgeprinzip*, literally translated as “forecaring principle”), the concept was introduced first to Britain as the precautionary principle by the German scholar Konrad von Moltke. From there the principle gained traction in international agreements culminating in the Rio Declaration.¹ The second formulation, put forward by scientists and environmentalists in the United States, is known as the Wingspread Statement.

A. The Rio Declaration

Principle 15 of the Rio Declaration provides:

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation²

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¹ See CAROLYN RAFFENSBERGER AND JOEL TICKNER, PROTECTING PUBLIC HEALTH AND THE ENVIRONMENT: IMPLEMENTING THE PRECAUTIONARY PRINCIPLE, Appendix B, at 356–61 (1999). See *infra* note 2 for the Rio Declaration.

² Rio Declaration on Environment and Development, June 13, 1992. U.N. Doc. A/CONF.151/26 (Vol. I) (Annex 1, princ. 15) (June 14, 1992), reprinted in 31 I.L.M. 874, 879 (1992) and 5 INTERNATIONAL LAW AND WORLD ORDER; BASIC DOCUMENTS V.B.16 (Burns H. Weston & Jonathan C. Carlson eds., 1994–) [hereinafter “Weston & Carlson”].

Another key principle is Principle 3, and it should be read in conjunction with Principle 15:

The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.

As seen, the Rio Declaration refers to the "precautionary approach," a direct response to United States unwillingness at the time of drafting to acknowledge a legal obligation to act with precaution.³ In the Declaration's post-signature years, however, and with the help of the Declaration's own embrace of the "precautionary approach" as a declared "principle," the precautionary "approach" has become widely if not universally accepted as "principle." As a partial result, the Declaration's precautionary formulation is now the standard in international law and the point of reference for subsequent treaty instruments.⁴ While early treaties put the principle into preambles, clearly expressing acceptance of precaution in the face of scientific uncertainty as a matter of policy,⁵ later treaties—*e.g.*, the Stockholm Convention on Persistent Organic Pollutants⁶ and the Cartagena Protocol on Biosafety⁷—put the Rio Declaration definition of precaution into the body of the agreements as a matter of law. The precautionary principle as formulated in the Rio Declaration is, thus, the normative ground on which we strive to guarantee that the actions of present generations hurt neither present nor future generations.⁸

³ Jutta Brunnée, *The United States and International Environmental Law: Living with an Elephant*, 15 EUR. J. INT'L L. 617–49 (2004)

⁴ Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, Aug. 4, 1995, *reprinted in* 34 I.L.M. 1542 (1995) and 5 INTERNATIONAL LAW AND WORLD ORDER; BASIC DOCUMENTS V.H. 24 (Burns H. Weston & Jonathan C. Carlson eds., 1994—) (hereinafter "Weston & Carlson"); Convention on Biological Diversity, June 5, 1992, *reprinted in* 31 I.L.M. 818 (1992) and 5 Weston & Carlson at V.H.22; 1996 Protocol to the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter art. 3, ¶ 1, Nov. 7, 1996 *reprinted in* 36 I.L.M. 1 (1996) and 5 Weston & Carlson at V.E.30b-1; United Nations Framework Convention on Climate Change, May 9, 1992, *reprinted in* 31 I.L.M. 849 (1992) and 5 Weston & Carlson at V.E.19; Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, *reprinted in* 37 I.L.M. 22 (1998) and 5 Weston & Carlson at V.E.20d; Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution on Heavy Metals, June 24, 1998, U.N. Doc. E/ECE/EB.AIR/1998/1, *reprinted in* 5 Weston & Carlson V.E.20f; Protocol to the 1979 Convention on Long-Range Transboundary and Ground-Level Ozone, Nov. 30, 1999, U.N. Doc. E/EB.AIR/1999/1, *reprinted in* 5 Weston & Carlson V.E.20g; Draft Protocol to the Convention on Long-Range Transboundary Air Pollution on Persistent Organic Pollutants, U.N. Economic Commission for Europe Mar. 31, 1998, *reprinted in* 37 I.L.M. 505 (1998); Stockholm Convention on Persistent Organic Pollutants, May 22, 2001, *reprinted in* 40 I.L.M. 278 (2001) and 5 Weston & Carlson V.I.14c.

⁵ See *supra* note 1.

⁶ May 22, 2001, U.N. Doc. UNEP/POPS/CONF.2, S. Treaty Doc. 107–5, *reprinted in* 40 I.L.M. 278 (2001) and 5 Weston & Carlson V.I.14c.

⁷ Cartagena Protocol on Biosafety to the Convention on Biological Diversity, Jan. 29, 2000, 2226 U.N.T.S. 208, *reprinted in* 5 Weston & Carlson V.H.26.

⁸ Simply referring to the precautionary approach as a "principle" or the principle as an "approach" does not affect its legal status since precaution, regardless of the noun, is not self-executing. Here and elsewhere over the past ten years of analysis and advocacy of a broader precautionary basis for policies, we refer to the precautionary principle with a set of implementation steps (goal setting, alternatives analysis, reversing the burden of proof, democratic decision-making and heeding early warnings) as the *definitive normative guide* on the subject and use "precautionary approach" as a synonym for the precautionary principle.

B. Post-Rio Responses: Yeas and Nays

The Rio Declaration's language was not without problems, however. The difficulty with the precautionary principle in the post-Rio 1990s was that it looked like a card trick, making science disappear. The regulatory apparatus in the U.S. at the time claimed that if a decision wasn't predicated on "sound science"—meaning scientific certainty established through risk assessment⁹—it left room for decisions that appeared to be arbitrary and capricious.¹⁰

Another problem in the post-Rio 1990s was a tendency to use the precautionary principle as a flashpoint in trade between the U.S. and the European Union. European precautionary decisions—primarily about novel technologies—were seen by the United States as protectionist limits on free trade. The U.S. government found restrictions especially problematic when the science on the probability of harm was contested. Two trade issues—hormones in beef, and genetically modified organisms (GMOs)¹¹—highlighted the difference between Europe's precautionary approach and the U.S. risk assessment view. The U.S. position was that unless clear harm had been demonstrated, a product had to be freely traded. But Europe had experience with nasty surprises (Mad Cow disease, for instance), and this led to a more cautious regulatory regime than the United States' science and risk-based approach.

Early international work on the precautionary principle tried to establish clear trade rules and reduce barriers to trade. A great deal of effort went into narrowing and constricting the use of the principle by the United States, the World Trade Organization, and to some extent the European Union.¹²

But not without considerable argument. Precautionary principle opponents often claimed that there were numerous definitions of the principle and that those definitions were conflicting or led to unclear legal obligations. This is not true, however. The definitions all share the same bedrock features: taking *action* to prevent *harm* in the face of *uncertainty*. Various definitions have been tailored to specific treaties and harms and have included adjectives and other modifiers. But all the definitions contain the three universal features of scientific uncertainty, the likelihood of harm, and anticipatory, preventive action.

Furthermore, the definitional arguments have obscured the fact that the precautionary principle is not self-executing.¹³ None of the definitions describe the actions that will prevent harm in the face of uncertainty. As such, the precautionary principle is under-determined and applicable to any environmental and public health situation that requires preventive action to forestall damage.

So the question remained: how could the principle be applied in ways that were not arbitrary or obstructive of economically desirable actions—particularly trade—yet still prevent harm?

⁹ This is the U.S.'s definition of sound science-risk assessment. See RAFFENSPERGER & TICKNER, *supra* note 1, at 2.

¹⁰ See Lisa Heinzerling & Rena I. Steinzor, *A Perfect Storm: Mercury and the Bush Administration* 34 ENVTL. L. REP. 10297, 10300 (2004) (describing that one of the conservative stakeholder's battle cry against regulation is that they must be based on "sound science").

¹¹ Poul Harremoës *et al.*, eds. *Late lessons from early warnings: the precautionary principle 1896–2000*, EUROPEAN ENV'T AGENCY ENVTL. ISSUE REP. NO 22, 12 (2001).

¹² See the European Communication on the Precautionary Principle, which said a goal of the communication was to "avoid unwarranted recourse to the precautionary principle, as a disguised form of protectionism. Available at <http://www.gdrc.org/u-gov/precaution4.html>.

¹³ An accepted definition of "self-executing" is: "The basic guide, or test, in determining whether a constitutional provision should be construed to be self-executing, or not self-executing, is whether or not the provision lays down a sufficient rule by means of which the right or purpose which it gives or is intended to accomplish may be determined, enjoyed, or protected without the aid of legislative enactment." Constitutional Amendment, Everglades Water Pollution, Op. Fla. Att'y Gen. AGO 96-92 (1996).

C. The European Union's Approach

As observed, the United States and the European Union developed different answers to the question of how the precautionary principle could or should be applied. The U.S. outright opposed it and claimed that risk assessment was precautionary enough to protect the environment and public health. The E.U. sought to apply it narrowly by taking precautionary actions at the end of a risk assessment process.

In 2000, the E.U. released a communication on the precautionary principle that explained its view of the scope of precaution and the implementation framework.¹⁴ As stated by the European Commission, the precautionary measures must be:

proportional to the chosen level of protection,¹⁵ non-discriminatory in their application,¹⁶ consistent with similar measures already taken,¹⁷ based on an examination of the potential benefits and costs of action or lack of action (including, where appropriate and feasible, an economic cost/benefit analysis),¹⁸ subject to review in the light of new scientific data, and capable of assigning responsibility for producing the scientific evidence necessary for a more comprehensive risk assessment.¹⁹

This approach to the precautionary principle was really risk assessment and risk management with bells and whistles. As the 2000 Communication made clear: “The precautionary principle was to be considered within a structured approach to the analysis of risk, comprising three elements: risk assessment, risk management, and risk communication. The precautionary principle is particularly relevant to the management of risk.” Cost-benefit analysis and proportionality, along with the explicit acknowledgement that zero risk was not a goal, maintained the status quo philosophy of measuring and managing risk for the economic benefit of this generation.

For instance, the proportionality principle—a modifier of the precautionary principle specifying that “the costs of actions to prevent hazards should not be disproportionate to the likely benefits”²⁰ of those actions—functionally narrows the scope of anticipatory actions: it undermines the capacity of a decision-maker to address larger societal goals

¹⁴ *Commission of the European Communities, Communication from the Commission on the Precautionary Principle* COM (2000) 1final (Feb. 2, 2000) [hereinafter “2000 Commission Communication”], available at http://ec.europa.eu/dgs/health_consumer/library/pub/pub07_en.pdf.

¹⁵ “Proportionality means tailoring measures to the chosen level of protection. Risk can rarely be reduced to zero, but incomplete risk assessments may greatly reduce the range of options open to risk managers. A total ban may not be a proportional response to a potential risk in all cases. However, in certain cases, it is the sole possible response to a given risk.” 2000 Commission Communication, *supra* note 14, at 3.

¹⁶ “Non-discrimination means that comparable situations should not be treated differently, and that different situations should not be treated in the same way, unless there are objective grounds for doing so.” *Id.*

¹⁷ “Consistency means that measures should be of comparable scope and nature to those already taken in equivalent areas in which all scientific data are available.” *Id.*

¹⁸ “Examining costs and benefits entails comparing the overall cost to the Community of action and lack of action, in both the short and long term. This is not simply an economic cost-benefit analysis: its scope is much broader, and includes non-economic considerations, such as the efficacy of possible options and their acceptability to the public. In the conduct of such an examination, account should be taken of the general principle and the case law of the Court that the protection of health takes precedence over economic considerations.” *Id.*

¹⁹ “Subject to review in the light of new scientific data, means measures based on the precautionary principle should be maintained so long as scientific information is incomplete or inconclusive, and the risk is still considered too high to be imposed on society, in view of chosen level of protection. Measures should be periodically reviewed in the light of scientific progress, and amended as necessary.” *Id.*

²⁰ Harremoës *et al.*, *supra* note 11 at 13.

or cumulative impacts of multiple actors and actions. Nor is proportionality a useful guide for problems such as climate change that are global, high risk, and high consequence because proportionality specifically reduces the scale of action to target small, isolated causes of harm. It measures the precautionary action by the financial cost rather than the harm prevented over time.

The most precautionary aspect of the E.U.'s communication was the reverse onus,²¹ which the E.U. describes generally as assigning responsibility for producing scientific evidence. Two growing trends in Europe exemplify this approach to the reverse onus. The first was an E.U. decision to require prior approval on products that regulators determine to be dangerous before marketing the products. The second was to require data on hazards such as chemicals before they were allowed on the market at all. The latter program has been codified in the new E.U. REACH program titled the Registration, Evaluation, and Authorization of Chemical Substances,²² which entered into force on June 1, 2007. Both of these programs, which require the production of information by the entity introducing the chemical into the market, have been aggressively opposed by the United States because it claims that U.S. regulations are already precautionary enough and that any stricter rules will cause an economic train wreck.

Nevertheless, the rest of the 2000 E.U. Communication on the precautionary principle is based essentially on the parallel U.S. philosophy on risk assessment and cost-benefit analysis. That philosophy holds that the market will take care of most environmental problems; most risk can be understood by science; and risk can be managed. If there is residual doubt and some scientific assessments remain inconclusive, the precautionary principle can be applied as a risk management technique at the end of the decision-making process. In some cases, Europe recognizes that some risk management actions must be taken before scientists have reached a consensus on the dangers presented by a technology or chemical. The advantage of adopting the precautionary principle in Europe, even with these limitations, is that the European Union had the political will to act cautiously in the face of uncertainty and take seriously minority views on science.

D. A New Philosophy: Wingspread—The Second Formulation

Attempts to narrow the application of the precautionary principle and wrangling over definitions have missed the real contribution of the precautionary principle. This was not a more stringent definition that would lead to more bans, or a mere tightening of risk assessment and cost-benefit analysis. It was a new philosophy, an implementation framework, and a method that fostered technological innovation.

Accordingly, the full value of the precautionary principle was not realized until the Wingspread Conference on the Precautionary Principle in 1998.²³ It led the way in developing a rigorous method of use applicable to environmental and public health problems large and small. The Wingspread Conference conveners²⁴ were interested in the lack of definitive implementation steps in the Rio precautionary approach. But they were interested also in an entirely different philosophy. They believed, correctly, that risk assessment had failed both as an ethic (why should we “permit” harm that

²¹ “Where there is no prior authorisation procedure, it may be up to the user or to public authorities to demonstrate the nature of a danger and the level of risk of a product or process. In such cases, a specific precautionary measure might be taken to place the burden of proof upon the producer, manufacturer or importer, but this cannot be made a general rule.” 2000 Commission. Communication, *supra* note 14.

²² Registration, Evaluation and Authorisation of Chemicals (REACH), European Parliament and Council Regulation, 1907/2006, 2006 O.J.(L 396) (EC).

²³ See RAFFENSPERGER & TICKNER, *supra* note 1, at 7–11.

²⁴ Through the Science and Environmental Health Network, its Director and principal author of this CLI recommendation of the precautionary principle, Carolyn Raffensperger, organized the Wingspread Conference, along with her colleague Joel Tickner of the University of Massachusetts at Lowell.

is preventable?) and as a practical matter (trends like breast cancer, autism, and climate change were getting worse, not better, under the risk management regime).

The Wingspread conferees issued a widely distributed statement that included an active and positive definition of the principle:

When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.²⁵

While this definition is cited frequently, it is not the most significant contribution of the Wingspread conference and statement. The most valuable contribution was in the implementation steps:

In this context the proponent of an activity, rather than the public, should bear the burden of proof. The process of applying the precautionary principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action.²⁶

E. The Precautionary Principle and Climate Change: A Practical Guide

Applying the precautionary principle to climate change for the specific benefit of future generations invites the three implementation steps identified at Wingspread, plus two steps added after the Conference: 1) reversing the burden of proof; 2) democratic participation; 3) searching for and choosing the best alternative; 4) setting goals; and 5) heeding early warnings. Taken together these five steps provide a robust method for taking meaningful action to prevent harm. Each is recommended as a constituent of a realistic as well as meaningful way to help safeguard the ecological interests of future generations and thereby advance the cause of intergenerational ecological justice.

1. Heed early warnings

Most environmental problems that have become global in scale have given signals early on that were announced by astute observers but ignored by decision-makers. In 2001, the European Environment Agency released a report, *Late Lessons from Early Warnings*, that told the story of numerous environmental and public health issues that had long histories of noted problems but were allowed to continue in the marketplace for decades, and in some cases centuries, after problems had been noted.²⁷ Attending to early warnings is one of the keys to employing a truly precautionary approach. It enables decision-makers to act before a problem has become irreversible or catastrophic.²⁸

Climate change affords one of the best examples of the value of observing changing trends and patterns and then taking action before all the science is complete. The early warning began in 1896 with a scientific theory advanced by Svante Arrhenius about the relation between fossil fuel combustion, carbon dioxide, and temperature. In 1955, Gilbert Plass summarized fifteen years of research that demonstrated that adding more carbon dioxide to the atmosphere captures infrared radiation and warms the Earth. Nineteen eighty-eight was the warmest year in over 100 years, but it was unclear whether that was evidence of anthropogenic climate change. Fast forward to 2007 when the Intergovernmental

²⁵ The Rio precautionary approach is stated negatively and passively—“scientific certainty shall not be used”—and passively since it does not require action to prevent harm.

²⁶ Wingspread Statement on the Precautionary Principle, *supra* note 1, at Appendix A, 353.

²⁷ Harremoës et al., *supra* note 11.

²⁸ *Id.*

Panel on Climate Change issued a Synthesis Report expressing the scientific consensus: “Warming of the climate system is unequivocal, as is now evident from observations of increase.”²⁹ The timeline of scientific evidence demonstrates that at any point from 1896 until this moment we could have intervened and begun to take precautionary actions.

In fact, Professor Lisa Heinzerling makes the case that it is too late to apply the precautionary principle to climate change since the damage is already done. She says: “[T]he precautionary principle as applied to climate change was, at best, an anachronism as soon as it was adopted. At worst, it inadvertently played into the hands of critics of swift and aggressive action on climate change, feeding the industry-funded view that the science of climate change was too uncertain to justify such action.”³⁰ She argues that we are living in, essentially, a post-cautionary world.

Heinzerling is right about the fact that the scientific consensus is established: we have a measure of certainty about the increase in greenhouse gases and the fact that the climate is becoming increasingly unstable. So the precautionary principle is unnecessary for determining whether we take action to avert climate change. But the principle is essential for evaluating the kinds of actions open to us: will we use nuclear power or sequester CO₂ in the ground? Will we seed the ocean with iron or abandon all mitigation measures and focus on adaptation? Those questions will still raise the central epistemological and ethical issues that make the precautionary principle a valuable decision rule.

We must use all the scientific tools at hand to monitor changes in Earth’s life support systems. As with climate change, most early warnings will not come with full scientific proof or consensus about causation, timing, and extent of the damage. A first order of business must be to attend to these warnings and take action to prevent more damage. Trends such as the gradual warming, rising seas; loss of Arctic ice; and changes in seasonality for indicator species all provide us with scientific clues about the direction in which we are headed. Attending to these warnings may enable us to forestall catastrophic warming.

2. Set goals

Goals set the compass direction for actions taken by government and the private sector, giving us something to aim for and a way to measure progress. If problems can be prevented, we have a moral and arguably legal obligation to future generations to do so. Setting goals and then measuring our progress is essential to making sure the situation does not get worse. Goals such as those set in the Kyoto Protocol³¹ mandating greenhouse gas reduction allow us to measure progress toward preventing and mitigating harm.³²

²⁹ Intergovernmental Panel on Climate Change, *Climate Change 2007 Synthesis Report: Summary for Policy Makers* (2007), available at http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf.

³⁰ Lisa Heinzerling, *Climate Change, Human Health, and the Post-Cautionary Principle*, 96 GEO. L. J. 445, 458 (2008).

³¹ Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, FCCC/CP/1997/7/Add.1; 2002(II) BGBI 967; Cm 5379; reprinted in 37 I.L.M. 32 (1998) and 5 Weston & Carlson V.E.20d

³² The core commitment under the Protocol, contained in Article 3, paragraph 1, requires each Annex I Party to ensure that its total emissions from GHG sources listed in Annex A of the Protocol over the commitment period do not exceed its allowable level of emissions. (Annex A covers GHG emissions from the energy, industrial processes, solvent and other product use, agriculture and waste sectors; see appendix I) The allowable level of emissions is called the Party’s assigned amount. Each Annex B Party has a specific emissions target listed in Annex B, which is set relative to its emissions of GHGs in its base year (see Figure 1). The Annex B emissions target and the Party’s emissions of GHGs in the base year determine each Party’s initial assigned amount for the Protocol’s five-year first commitment period (2008–2012). This quantity is denominated in individual units, called assigned amount units or AAUs, each of which represents an allowance to emit one metric tonne of carbon dioxide equivalent.” United Nations Secretariat, *Framework Convention on Climate Change. Kyoto Protocol Reference Manual on Accounting of Emissions and Assigned Amounts*, (2007).

3. Identify and choose the best alternative to help meet the goal

The precautionary principle contains the mandate to take preventive action. Identifying and choosing the best alternative to the technology or action that threatens harm is the heart of that action. Assessing alternatives has been a long-standing practice in both federal and state law. A forward-thinking provision in the National Environmental Policy Act (NEPA) requires an analysis of the environmental impacts of a project, including documentation of alternatives to the proposed action³³. The NEPA regulations state:

The primary purpose of an environmental impact statement is to serve as an action-forcing device to insure that the policies and goals defined in the Act are infused into the ongoing programs and actions of the Federal Government. It shall provide full and fair discussion of significant environmental impacts and shall inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment.³⁴

Regrettably, most environmental decision-making in the United States consists of an individual risk assessment of a given technology and considers the tradeoffs of not using that technology. The tradeoff is generally framed as a binary decision, an either/or statement: “Either use nuclear power or have insufficient energy.”

Instead, alternatives assessment evaluates many technologies and identifies the alternative that both meets the goal and creates the least chance for harm. Alternatives assessment is implicit in current discussions of energy options. Coal, nuclear, solar, wind, and of course conservation are all possible methods for providing adequate electricity. The question is, which technology or suite of technologies will provide this generation’s energy needs without compromising future generations’ ability to meet their needs? Assessing alternatives and then choosing the best is crucial to making precautionary decisions.

At present, as shown later in the Green Paper, in federal or state evaluations of alternatives under NEPA or its state equivalents, no jurisdiction requires the decision-maker to choose the best alternative. This renders the alternatives assessment process a near meaningless exercise. Future legislative patches must require the choice of the alternative that is the best environmental and/or public health option, not just the most cost-effective option.

Scientists in fields ranging from fisheries management to life cycle assessment have derived principles for comparing alternatives.³⁵ A good alternative:

- is anticipatory and preventive;
- increases the health and resilience of the whole system;
- can be monitored and is reversible;
- reduces rather than adds to cumulative impacts;
- leaves an asset to future generations if there is a corresponding debt;

³³ NEPA, the Environmental Quality Improvement Act of 1970, as amended (42 U.S.C. 4371 et seq.), sec. 309 of the Clean Air Act, as amended (42 U.S.C. 7609), and E.O. 11514 (Mar. 5, 1970, as amended by E.O. 11991, May 24, 1977).

³⁴ 40 C.F.R. §1502.1 (1995).

³⁵ See, for example, those from fisheries management. “One must consider a variety of plausible hypotheses about the world; consider a variety of possible strategies; favor actions that are robust to uncertainties; hedge; favor actions that are informative; probe and experiment; monitor results; update assessments and modify policy accordingly; and favor actions that are reversible.” Donald Ludwig *et al.*, *Uncertainty, Resource Exploitation, and Conservation: Lessons from History* 260(2) SCIENCE 17 (April 2 1993), available at <http://www.ids.org.au/~cneville/Ludwig1993.htm>.

- is fair within generations and between generations; and
- increases rather than decreases options and preserves options for future generations.³⁶

4. Reverse the burden of proof

The allocation of the burden of proof is a critical element of the structure of every law, including environmental laws. It defines which person the law requires to prove their case in order for the law to take action. If the person with the burden of proof fails to provide enough evidence to convince the regulator, judge or jury that she is correct on the facts, then that person loses the dispute and the law will not act on her behalf. The outcome of many legal disputes is decided solely by the allocation of the burden of proof. Thus, the allocation of the burden of proof defines the interest that the law regards as the preferred interest, the interest that the law protects in cases of doubt. Because the legal system must decide cases, it is not a question of *whether* the law should prefer one interest or another, but *which* interest. The law must decide what it values most in cases of doubt. In cases of doubt involving conflicts between environmental and economic interests, the law should protect human and environmental health rather than unimpeded economic activity.

Within the context of the precautionary principle, reversing the burden of proof means that the proponent of a potentially damaging activity or technology, not the public or its governmental proxy, bears the responsibility to a) test the activity or technology for safety; b) provide information about the safety or potential harm to regulators and/or the public; c) search for and choose the least harmful alternative; and d) pay for damage and cleanup. Various jurisdictions, particularly in Europe, have employed a range of strategies to compel industries to test chemicals for safety and provide such data to regulating bodies.³⁷

5. Expand democratic participation

The Wingspread Statement asserted that stakeholders have a right to participate in decisions that affect their lives. This requirement has both epistemological and ethical grounds. The pragmatic epistemological reason for expanding democratic participation in decision-making is that the precautionary principle operates in the domain of uncertainty. Consequently, scientists alone cannot determine either the full extent of harm or the best preventive actions. In addition, parties with interests in the outcome of the decision are more likely than distant decision-makers to have relevant information.

The ethical basis for democratic participation is stated in Article 21 of the Universal Declaration of Human Rights (UDHR).³⁸ “Everyone has the right to take part in the government of his [sic] country, directly or through freely chosen representatives.” Article 29 of the UDHR includes a corresponding responsibility: “Everyone has duties to the community in which alone the free and full development of his [sic] personality is possible.”

³⁶ Edith Brown Weiss has identified preservation of options as one of the 3 fundamental principles of intergenerational equity: the principle of conservation of options, which requires each generation to conserve the diversity of the natural and cultural resource base so as not to restrict the options available for future generations. EDITH BROWN WEISS, IN FAIRNESS TO FUTURE GENERATIONS: INTERNATIONAL LAW, COMMON PATRIMONY, AND INTERGENERATIONAL EQUITY 26 (1989).

³⁷ See, e.g. The EU REACH program, *supra* note 22.

³⁸ Dec. 10, 1948, GA Res. 217A, UN GAOR, 3d Sess., Pt. I, Resolutions, at 71, U.N. Doc. A/810 (1948); reprinted in 3 Weston & Carlson III.A.1.

F. Future Generations

If affected stakeholders should be at the table, then future generations should be seated and given a voice in all decisions that affect their well-being. Current generations can provide representation for future generations through a variety of mechanisms. Perhaps the most straightforward is to appoint or designate legal guardians of future generations, empowered to represent the interests of those to come. Guardians are discussed fully in CLI Recommendations 10 and 12 in CLI Policy Paper Appendix B.³⁹

We stand on the threshold of the future. The actions of this generation will determine whether future generations can meet their most basic needs of life and community. The precautionary principle is the best guide for moving forward with care, wisdom, and compassion for future generations—and for intergenerational ecological justice in the process.

³⁹ See also CLI Background Paper No. 14 in CLI Policy Paper Appendix A.