

Comments & Controversies

**DEMOCRATIC PARTICIPATION: A CRITICAL
ELEMENT OF PRECAUTIONARY PUBLIC HEALTH
DECISION-MAKING**

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ABSTRACT

The precautionary principle is increasingly discussed in debates about threats to health and the environment, particularly when government actions might inhibit free trade. It is gaining recognition as an overarching principle of decision-making, one that underlies efforts for sustainable development. Pronouncements about the precautionary principle have focused generally on the responsibility of government to act in the face of uncertainty and the shifting of burdens onto proponents. This assumes that government will have the resources, knowledge, expertise, and will to act. The role of the public—those who may be affected by environmental degradation or their representatives—is mostly missing from the discussions. This article outlines a rationale for why participation is critical and explores the theory of citizen participation. The article also describes participatory models used around the world, primarily examples of citizen participation though various models also exist for workers.

The precautionary principle is increasingly being discussed in debates about threats to health and the environment, particularly when government actions might inhibit free trade. It is gaining recognition as a crucial overarching principle of environmental decision-making, one that underlies efforts to achieve sustainable development. Pronouncements about the precautionary principle to date have generally focused on the responsibility of government to take action in the face of uncertainty and the shifting of burdens (for example, of safety, of providing information) onto proponents. This assumes that government will have the resources, knowledge, expertise, and will to take such action. The role of the

public—those who may be affected by environmental degradation—or their representatives—is mostly missing from discussions of the principle. Even a recent European Union Communication on the Precautionary Principle only mentions the notion of “transparency” and consultation when resources permit [1]. Yet there is growing acknowledgment of the importance of citizen participation in complex, uncertain environmental decisions. This is particularly important in the United States where special interests frequently utilize their substantial economic and political strength to stop preventive, precautionary government decisions.

The 1998 Wingspread Statement on the Precautionary Principle provides a useful definition of the principle and is the first to identify citizen participation as a central element in its implementation. It states:

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. 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 [2].

In this commentary, I outline a rationale for why democratic participation is a critical element for precautionary, preventive decision-making. I then explore some of the theory underlying citizen participation and briefly describe some particular participatory models that have been instituted around the world. I finally show that citizen participation can be more effectively applied, based on the type of problem being addressed by decision-makers. I focus primarily on models of citizen participation, though it should be noted that various models of worker participation (for example, participatory technology assessment) exist. One colleague has anecdotally noted that in those countries where precaution is an accepted principle of health policy, workplace co-determination is also widely accepted. Thus, democracy in the workplace is as critical as democracy in society for implementing precaution.

It is concluded that democratic decision-making processes that are inclusive and provide resources to citizens to fully participate can further extend the amount and types of information incorporated into decisions, empower citizens to be pro-active in protecting their lives and health, and ensure that experts alone are not charged with making value-laden decisions. While democracy in and of itself can not ensure that precautionary decisions will be made (nor is it a prerequisite for precaution), it can guarantee participation of those affected by environmental contamination, provide a counterbalance to pressures to maintain the status quo in the face of uncertain information, and ensure that decision-making processes are transparent, legitimate, and accountable. Democratic participation can serve to expose uncertainties and information often not considered during decision-making processes and can bring forth unrecognized alternatives and solutions to problems.

Without the integration of democratic participation, the effectiveness of a precautionary principle in a U.S. context may be severely diminished. While democratic processes have been sporadically incorporated into environmental decision-making processes in the United States, their widespread use is still severely constrained. Without clear mandates, guidelines, and procedures, environmental decision-making processes will continue to be dominated by technocratic, analysis-based approaches that are often not precautionary.

A HISTORY OF DEMOCRACY IN THE UNITED STATES

Democracy has been a critical value in the U.S. political structure since the American Revolution. Participation has been important in this country to protect individuals from the infringements of government and to allow citizens to scrutinize government decisions [3]. Since the 1930s, formalized democratic participation structures have been adopted to address specific issues, but it was the rise of regulatory rulemaking in the federal agencies, especially the passage of the Administrative Procedures Act of 1946, that led to the institutionalization of citizen participation in government decision-making. Beginning in the 1950s and 1960s citizen participation structures were adopted because they were considered essential to good governance [3]. While the idealized vision of citizen participation during this period was to improve social conditions, today citizen participation is seen primarily as a watchdog activity.

The role of citizen participation in government decision-making took a radical turn in the early 1970s with the rise of the environmental movement. Through laws such as the National Environmental Policy Act and the Freedom of Information Act, the public and its representatives were given avenues to influence government decisions on environmental protection. The Toxics Release Inventory requirements of the Emergency Planning and Community Right-to-Know Act provided citizens with access to information on emissions of toxic substances from industrial facilities that proved to be a critical resource in exposing industry pollution. Various environmental laws provide opportunities for citizen review of agency rulemaking and citizen suits to force agency action. These laws and regulations ensure that the concept and importance of democracy are firmly rooted in environmental politics in the United States and critical to its legitimacy.

WHY PROMOTE DEMOCRATIC PARTICIPATION AS A COMPONENT OF THE PRECAUTIONARY PRINCIPLE?

Decisions in which the precautionary principle would apply are typically dominated by “expert-driven scientific analysis and judgment, de-emphasizing affected interests and other forms of knowledge. The value of science in such decisions is frequently overestimated” [4]. Values inherent in expert approaches

are hidden behind quantitative models and assumptions that effectively exclude public involvement. Even the definition of “expert” is narrow, excluding, for example, the observations and experience of a farmer who understands the land or those living in a contaminated area. While participation in decisions that affect one’s life and health is highly regarded in U.S. culture, decisions about science and technology are frequently excluded from democratic processes [5]. Fiorino concludes that standard approaches to dealing with risk have been technocratic and not democratic [6].

However, highly technical decisions need not be exceptions to democratic practice—citizens have a stake in the outcomes as well as important views and insights to contribute [7]. Habermas noted that the “scientization” of politics (a reliance on technological and scientific forms of rationality) has led to token public involvement. For example, government agency reliance on complex models to estimate risks can effectively limit democratic participation because few individuals in the general public can understand them [8].

Decisions, even if made by a private entity, become public decisions as soon as they might impact the health of an ecosystem, human health, or the commons. Funtowicz and Ravetz argue that when uncertainty is high, values in dispute, and potential impacts of an activity (the “decision-stakes”) large, there is a need for “extended peer communities” to inform the decision-making process [9]. These communities bring additional information and perspectives into the decision-making process, for which “experts” might not have access. When “uncertainty borders with ignorance,” when methodological choices are open to criticism, when scientific knowledge is conditional, and when policy problems are embedded in ethical issues, complex environmental decisions cannot be solved by science or experts alone [10]. This is in part because scientists and experts are not qualified to make ethical decisions regarding societal risks. While scientific knowledge needs to be highly valued in environmental decision-making, there is no single legitimate perspective or source of knowledge.

Those affected by environmental decisions bring a perspective to the decision-making process that is not bounded by disciplinary expertise. Citizen participation can incorporate a broad range of expertise and experience into the decision-making process, including perspectives representing future generations. These “lay experts” may have a personal knowledge that does not come naturally to experts. Such experiential knowledge is inaccessible to experts operating in isolation. It may be useful in assessing which data are strong and relevant and challenging expert claims [10]. Fiorino identifies several main reasons for democratic decision-making processes: Non-experts see problems, issues, and solutions that experts miss; lay judgments reflect a sensitivity to social and political values that experts’ models do not acknowledge; and the lay public may have a better capacity than experts alone for “institutionalizing regret,” accommodating uncertainty, and correcting errors [6]. Thus, citizen participation in complex environmental decisions can augment the knowledge base and considerations on

which decisions are made, increasing the ability of government agencies to identify early warnings of risks, to explore safer alternatives, and ultimately to act on uncertain information.

Citizen participation processes need to be improved. Risk communication has typically been an exercise in which experts speak to the public but do not listen. Participation often occurs to legitimize previously made decisions or late in the process, when its impact is minimal. Agencies often ignore the public's advice. The public has had insufficient opportunities, knowledge, and resources to effectively participate in decision-making [11]. Government and industry frequently attempt to reframe problems to make them appear more scientific/technical and dismiss legitimate, value-based concerns as irrational [11]. Further, environmental agencies frequently view their role as mediators and arbitrators of conflicting interests (fostering utilitarian outcomes) rather than trustees of community interests (fostering fairness and justice) [12]. All this has led to disillusionment with government-established "multi-stakeholder" processes and to public mistrust, reflected by environmental organizations, of the ability of government to make wise decisions in the face of uncertainty. It has destroyed citizen faith in the ability of democratic processes to lead to fair decisions.

Public involvement can support precautionary decision-making in several ways. First, it broadens the types of questions asked about problems, allowing for a more in-depth exploration of complex risks. It helps ensure that the right questions are asked about problems and that the scope and nature of analysis are adequate to address the problem [4]. Second, it incorporates the observations, values, and common sense of a wide range of lay "experts" in decisions that cannot be made by science alone. Citizen participation also broadens the range of technological and scientific choices in decision-making by identifying opportunities for alternatives that decision-makers might have missed in their attempts to quantify risk. Finally, by incorporating a wide range of knowledge and values into decision-making (including risk aversion), broad participation may better address the uncertainty and ignorance inherent in complex science and technological decisions, leading to more robust decisions that are more protective of health and the environment.

Democratic processes can also increase the legitimacy of decisions and the accountability of decision-makers (private and public) to prevent harm. This is critical in the U.S. system, where economic interests often wield strong powers in regulatory decision-making. Effective means of participation and valuation of lay citizen ideas can empower those affected by environmental risks to persevere and bring about action. Involvement of the public early in the decision-making process, including problem formulation, can improve the likelihood that decisions will be seen as legitimate and will reduce the potential for challenges that might forestall precautionary action. It can change the image of the public from reactive naysayers to pro-active participants in decisions affecting their lives. While effective participation may cost more in the short run, it can lead to more efficient and appropriate decisions in the long run [4]. Public scrutiny also ensures that

complex decisions affecting public health and the environment are “public” and that those making the decisions are accountable for their impacts. The broader framing of problems and input of information about risks and alternatives by citizens can help enhance the ability to shift burdens onto proponents of hazardous activities (for example, by identifying options for prevention that the proponent has to demonstrate as non-viable).

THE NATURE OF DEMOCRATIC PARTICIPATION

Various theories and descriptions of the components of effective democratic participation have been developed during the last 20 years, originating primarily in Europe and North America. The goal of democratic citizen participation can be described as enhancing “the potential for affected citizens to become part of the decision-making process rather than being victims of the decisions made by anonymous agencies or institutions” [11]. There are several criteria for evaluating democratic participation mechanisms [6, 7]:

- opportunities for individual or group participation in decisions on an equal basis with officials, experts, and other stakeholders, allowing citizens or their representatives to define issues, question experts, and shape the agenda;
- opportunities for learning and improving understanding about issues;
- availability and equality of resources for participation;
- access to decision-makers; and
- ability to influence officials and policies.

Some analysts find that the basis of effective citizen participation can be described in terms of Habermas’ theory of communicative action and his “ideal speech situation.” Habermas has argued that the rational way to make collective decisions is through fair and competent discourse [13]. While fairness involves access to decision-making and influence, competence involves access to tools and information to participate on an equal basis. By definition, discourse implies equality among participants. Implementation of these criteria in practice will lead to “right” citizen participation, which has the following characteristics: 1) It encourages multi-way communication, where people are both speakers and listeners; 2) it is consensual and non-hierarchical, so that no person should surrender their right to contribute; 3) it requires respect for the autonomy of the individual and trust that the person will abide by reasonable rules of social interaction; and 4) it promotes critical self reflection among participants, where people consider the type of society they want to have [14].

An important aspect of fair and competent participation is the willingness of government authorities to share power, an uncommon aspect of most environmental decision-making processes. Arnstein argues that “there is a critical difference between going through an empty ritual of participation and having the real power needed to affect the outcome of the process. . . . Participation without

redistribution of power is an empty and frustrating process for the powerless.” She proposes a “ladder” or hierarchy of citizen participation, which describes the least to the most democratic processes. At the low rungs of the ladder are manipulation (non-participation), then increasing degrees of tokenism, finally reaching degrees of citizen control—up to the right to decide [15].

While a fair and competent process of democratic participation is important for implementing the precautionary principle, Sclove argues that it is not a sufficient condition to ensure that technologies are substantively democratic [16]. Citing Langdon Winner and others, Sclove argues that technological innovation can affect political and social structures over long periods of time (that is, democratic structures). Therefore, processes and criteria are needed to evaluate the impacts of technologies on democratic structures, as a “first-order” consideration equal with economics. This seems logical since government agencies make many “public” decisions about technologies by either internal research and development, research funding, or subsidies. According to Sclove, the issue is not rejecting technology or economics but rather to be more discriminating in how we design, choose, and use technologies [17]. Involving citizens in the substantive outcomes of technological decision-making will empower them to ask how the outcome is going to affect the structure of society; create avenues for worker and community involvement in the early stages of research, development, and monitoring; allow an exploration of the interactions across technologies; and lead to broadening the menu of technological choices.

METHODS OF DEMOCRATIC DECISION-MAKING

Methods of participatory citizen decision-making have been widely discussed during the last 20 years in North America and Europe. Nonetheless, their use in environmental decision-making is still isolated and sporadic at best. In the United States, there are no requirements for citizen participation in environmental decision-making other than notice and comment requirements under the Administrative Procedures Act and particular environmental statutes. Further, the models for participatory decision-making used to date are primarily advisory in nature—the government agency can choose to not follow recommendations—and do not provide “decision-authority” to citizens. This section presents a brief introduction of specific methods of democratic participation that have been applied in practice. They are described in *greater detail elsewhere* [11, 18].

While most democratic decision-making processes have dealt with immediate problem-solving or already existing problems (for example, hazardous waste site clean-up), some of the more innovative methods are designed to involve citizens before decisions or commitments have been made. Europe has generally been the testing ground for these more innovative processes in national policy formation because of its stronger social movements [3].

Most analysts suggest that there is no one “right” model of citizen participation, and that direct democratic participation may not be appropriate for all decisions. Often a mix of complementary models may lead to the best decisions. Eight models of democratic participation that have been used to date are briefly described below. They are grouped by: 1) processes involving local or regional issues; 2) processes involving regional or national issues; and 3) processes involving representation by interest groups (pluralist).

A comparison of these processes is presented in Table 1, based on the following criteria: The capacity they provide to citizens to determine outcomes

Table 1. Comparison of Models of Citizen Participation

Model	Decision-authority	Discourse ability	Competence	Formulation
Group A: local/regional issues				
Good Neighbor Agreement	delegated power	high	medium/high	negotiated
Community-based research	delegated power	high	medium/high	lay person
Citizen advisory committees	consultation/advisory	low/medium	low/medium	lay person/stakeholder
Citizen juries	genuine influence	high	medium/high	layperson
Group B: regional/national issues				
Consensus conferences	genuine influence	high	high	lay person
Scenario workshops	genuine influence/shared decision-making	high	medium	lay person/stakeholder
Group C: pluralist				
Regulatory negotiation	genuine influence/shared decision-making	low/medium	low/medium	negotiated/stakeholder
Stakeholder committees	consultation/advisory	low/medium	low/medium	stakeholder

(decision-authority); the ability of citizens to frame questions, debate information, and gather information as needed (fairness/discourse ability); the amount of information/background provided to participants and resources to participate (competence). The models are also compared based on their underlying formulation: stakeholder-based (for example, pluralist-representatives of organizations); layperson; and negotiated (citizens or citizen representatives negotiate outcomes).

Each of the models described attempts to achieve the “ideal discourse” and addresses the criteria of fairness and competence to different degrees. Analysts suggest that some of the most common participatory methods, such as public hearings, referendums, scientific advisory groups, and arbitration, do not lead to discourse on their own [11]. For example, public hearings often occur once a decision has been made or far into the decision-making process. They also may be heavily biased toward proponents’ interests. With effective citizen organizing, a public hearing can be an effective method not for discourse, but for putting forward a strong message in opposition to or in favor of a particular project. These common methods are not considered here.

Good Neighbor Agreements

Because of the inability of government agencies to address many local problems, there is a need for citizens to supplement direct governance through citizen participation in private decision-making. As instruments that “provide a vehicle for community organizations and a corporation to recognize and formalize their roles within a community,” Good Neighbor Agreements fill this void [19]. These agreements—often arising out of a particular incident—may consist either of non-enforceable agreements, involving commitments to going beyond compliance and for citizen inspection/access to information opportunities, or legally enforceable contracts linked to permitting, which involve company requirements, for example, analyzing prevention opportunities, citizen oversight, and local hiring.

Community-Based Research/‘Science shops’

An important element of democratic participation is the ability of citizens to independently and critically examine evidence and conduct their own studies, asking questions relevant to themselves. Community-based research is designed to serve and empower the community. Communities participate in identifying and defining the problems; initiating research; considering local expertise, observations, and knowledge; formulating action plans; and initiating preventive action [5]. The Dutch “science shops” represent one model where university-based centers harness the expertise and idealism of students and faculty in assisting community organizations in environmental and social research [5, 20] An extension of community-based research is the idea of participatory design where

laypeople (or union representatives) are involved in corporate decisions regarding design of technologies and services.

Citizen Advisory Committees

Citizen advisory committees (CAC)—widely used in the United States—are generally used in decision-making surrounding local, state, or regional issues. The panels are generally established by a sponsor (usually a government agency but also in recent years a particular industry) to provide a range of views and advice on a pre-defined problem [21]. The panelists are chosen mainly from among leaders in the community, who may or may not represent diverse interests. The panels inform public agencies about community attitudes; educate citizens about proposed actions; increase ultimate acceptance of decisions; allow government and industry to deal with one relatively small body of citizens rather than the entire community; and can signal errors made by technical experts [21]. However, they have been criticized for their limited scope, citizen authority, and frequent legitimization of pre-determined decisions [22].

Citizen Juries

Citizen juries are a direct form of citizen participation in decision-making processes, modeled after the legal jury system. In a citizen jury, a randomly selected group of 12 jurors, designated to represent the general public, is impaneled to study a specific issue. A neutral mediator develops a narrow charge to jurors and during four to five days of hearings they hear from “witnesses” who represent a wide range of views on the issue. Jury members may pose questions to the witnesses. They then deliberate the information and issue findings and recommendations to policy makers. The Jury concept shows that “a group of randomly selected citizens, when exposed to good information presented by witnesses from differing points of view, is able to make good judgments on public policy matters even though in terms of training and experience there are many people more competent than they are” [23]. Citizen Juries may be limited because “jurors” do not receive training in the issues discussed, minority positions may not be adequately represented, and there is no guarantee the sponsor agency will actually utilize the results in decision-making [23, 24].

Consensus Conferences/Planning Cells

Consensus conferences and planning cells are two mechanisms to involve citizens in examining broadly defined questions of current regional or national importance. Both mechanisms rely on ordinary citizens being trained in an issue, being able to reframe questions, and informing social debates on broad technological and policy issues before decisions have been made. The consensus conference has been defined as: “A forum in which a group of lay people put questions

about a scientific or technological subject of controversial political or social interest to experts, listen to the experts' answers, then reach a consensus about this subject and finally report their findings at a press conference" [25]. In a consensus conference, a focused dialogue occurs between the general public and experts. Unlike a Citizen Jury, the lay panel receives neutral training on the issue and has substantial freedom to frame the problem and ask questions. Results of the panels are widely distributed in the media and local hearings are held, as a way to stimulate informed public debate, improve public understanding of technologies, and to inform and influence decision-makers. These "lay panels" can be limited when a yes/no decision is needed and require concerted recruiting efforts to ensure a diverse panel [5, 11, 25-27].

Scenario Workshops

Scenario workshops are a method for involving different groups such as residents, government, academics, and business in the broad societal assessment of possibilities and needs related to future technological developments. The concept is based on the idea that those affected by decisions and developments should have an influence before problems are formulated and solutions selected [28]. The workshops consist of various phases of problem formulation, technical evaluation, visioning, and analysis of how various alternatives could be implemented. The Danish Board of Technology scenario workshop model includes a multi-step process where alternative scenarios are developed (different roles of technology and who should act), including: 1) critical analysis of each future scenario; 2) formulation of a vision for the community or society based or not based on the original scenarios; 3) evaluation of barriers (cultural, institutional, economic, and legal) to realizing the preferred vision; and 4) development of an action plan to overcome identified barriers [16, 28]. Scenario workshops are a way for citizens, who often have a unique perspective unbounded by technical or economic feasibility, to creatively and constructively participate in decisions on technology and planning, examining the impacts and interactions of multiple technologies at once [29].

Regulatory Negotiation

Negotiated rulemaking complements conventional notice-and-comment rulemaking, particularly for complex and contentious environment science-policy decisions [30]. In regulatory negotiation, an agency convenes representatives of interests affected by a proposed rule, before the agency makes a decision on the rule's content. This enables the representatives to reach agreement on the substance of the rule through consultation and negotiation. The negotiating committee has significant control over its operation, composition, and use of resources, though the agency has final authority over wording [30, 31]. While useful for well-defined, technical problems where a decision is needed in a relatively short

period of time, participation in such negotiated rules is limited, discourse on non-technical issues generally does not occur, and it is unlikely that negotiated rules will lead to stringent standards and innovation as affected industries will likely not negotiate strong demands on themselves [31].

Stakeholder Committees

Stakeholder, or advisory, committees are widely convened by government agencies in the development of rules, policies, and programs. Such committees are now mandated under some laws, including the 1972 Federal Advisory Committee Act (FACA), which establishes requirements for advisory committees including: inclusion of a wide range of affected interests, holding open meetings, and seeking public comment [32]. The content and scope of such committees are usually determined by the sponsoring agency and are technical or policy in nature. Stakeholder processes suffer from some weaknesses: inadequate representation (and sometimes influence), narrow framing of issues, and inequality of resources and power. Analyses have found such processes to be bureaucratic, an over-reliance on which can limit efforts to institute more community-based decision-making processes. The EPA's largest stakeholder process, the Common Sense Initiative, has been criticized for its lack of substantive and innovative results, slow pace, and power dynamics [31].

APPLYING DEMOCRATIC PARTICIPATION TO SUPPORT PRECAUTIONARY DECISION-MAKING

Scholars and advocates of citizen participation agree that a purely technocratic approach to complex environmental decision-making is incompatible with democratic ideals. Unfortunately, many government agencies have failed to recognize that complex environmental risks cannot be adequately addressed through a purely expert-driven "sound science" approach. Experts must be "on tap and not on top." Values and other forms of knowledge play a critical role in environmental decisions [33]. Democratic participation is also needed to determine the methods by which decisions will be made and evidence weighed [6]. The methods by which evidence on hazard and risk are analyzed (for example, quantitative risk assessment) strongly influence the types of questions asked about problems, the types and amount of information used in decision-making, and how uncertainty is treated.

Despite the wealth of literature and discussion on innovative democratic decision-making methods, their incorporation into environmental decision-making has been limited. Public involvement is usually an afterthought, while those interests that might be affected by regulation are consulted regularly. "Citizens" or the "public" are generally considered one stakeholder, with industry and government as the other stakeholders. Government agencies generally have

the power to control the scope of the nature of citizen participation and frame the questions that need to be addressed.

Legislation and public policy, combined with procedures, are needed to improve citizen participation methods. Barriers to effective democratic participation must also be addressed.

Establishing Clear Mandates for Democratic Participation

Current laws generally do not establish mechanisms for true citizen discourse in decision-making. With the exception of negotiated rule-making, government agencies are not obliged to incorporate citizen input into decisions—only, in some instances, to respond to comments.

Clear mandates (through statutes, executive orders or agency guidelines) should establish democratic participation, although not necessarily specific methods. The influence of the participatory method will need to be established, that is, whether the authority will be required to examine or adopt the results of the process or whether those involved will have actual decision-making powers. Such mandates could establish criteria that would define the types of decisions requiring citizen participation and list appropriate methods. The methods will depend on the nature of the problem and its scope—national, regional, or local. Public access to information, the right to know, is a requisite—although not the only one—for democratic participation.

Developing Procedures for When and How to Apply Democratic Models

Some methods, such as consensus conferences, scenario workshops, and citizen juries, are already well-developed in Europe and the United States, and could be easily adapted for different decision-making contexts. State-of-the-art democratic participation procedures could be defined by an independent scientific/technical body (with the involvement of different stakeholders) such as the National Academy of Sciences. The procedures would detail how government authorities should choose participants, the process of defining and modifying the charge and scope of the process, resources needed, and how results will be presented and incorporated into decision-making.

Such procedures would outline who should be involved in particular decisions and when participatory processes should be undertaken. Those involved in an environmental health decision might include agency personnel, academic scientists, workers who might be affected by exposure or by job dislocation, representatives of affected businesses, affected communities, or lay citizens. Who should be involved may vary at different stages of a decision. For example, a less participatory process (hearings) might be appropriate in an evaluation of scientific

information, with greater democratic participation when the ultimate policy decision is made.

In considering when citizen participation should begin, decision-makers need to consider the value that citizens can add in framing the problem and providing and examining information. For example, public participation in defining the research agenda might focus efforts on the development of clean production options. More contentious and value-laden problems, as well as establishment of new activities with significant potential impacts, should incorporate greater upfront citizen participation and control.

I propose a matrix (Figure 1) for determining the type and level of citizen participation in decision-making. As decisions become more complex, uncertain, and value-laden, and the potential severity of impacts increases, more participative decision-making structures, allowing affected citizens greater authority in the decision-making process, are needed. The left side of the matrix presents the increasing levels of decision-making authority while the right side presents the types of decision-making processes that might achieve a given amount of authority. Decision-makers should rely on multiple types of participation processes.

Overcome Barriers to Democratic Participation

A principal barrier is the lack of financial and technical resources for the public to competently participate and independently examine issues. This is particularly a problem in multi-stakeholder processes where affected industry often has significantly more resources than does the public. Some of these issues are addressed in the European consensus conference and science shop models in which government agencies provide technical training and stipends to participants, allow citizens to ask their own questions, and provide funding to universities and other research centers to assist citizens in independently examining issues. Government funding agencies in the United States, such as the National Science Foundation and National Institutes of Health, could provide funding for centers specializing in participatory research so that citizens have access to independent technical expertise.

Another Important Barrier is Lack of Trust

The public lacks confidence in government, and government does not trust lay citizens and their representatives to make informed decisions on issues generally considered the realm of experts. The public has been disillusioned by the lack of genuine opportunities to participate, the failure of many multi-stakeholder processes, the frequent disregard of their concerns as “emotional,” the failure of government to incorporate their concerns in decisions, and the power that economic interests exert in agency decision-making. Part of this distrust relates to the role of government agencies—government environmental agencies often see

	Level of citizen participation	Participation process type
<p>Low complexity, relatively technical, low conflict, small scale or minimal potential impact</p> <p style="text-align: center;">↓</p>	Government informing (one way information flow)	Risk communication pamphlets
	Consultation (begin two/multi-way communication minimal decision power)	Hearings/notice and comment Stakeholder meetings
	Advisory	Citizen advisory committees FACA Committees
<p>Increasing complexity, range of values, conflict, magnitude/ scale of potential impacts, uncertainty, degree of citizen organization, availability of resources for participation and ability to set agenda</p> <p style="text-align: center;">↓</p>	Genuine influence/ legal recourse for poor decisions	Citizen jury Consensus conference
	Shared decision-making/partnership	Regulatory negotiation Scenario workshops
	Delegated power/ Veto power/Citizen accountability	Citizen review boards Community-based research Good Neighbor Agreements Local citizen initiatives
<p>High complexity, range of values, conflict, scale of potential impacts (widespread or locally intense), uneven distribution of impacts, high uncertainty or relative certainty of impacts</p>	Citizen decision authority (final decision power) panels	Citizen technology panels Citizen grand jury

Figure 1. A matrix for determining the appropriate level of citizen participation for precautionary decision-making.

themselves as mediators and service providers (both industry and the public being clients) rather than as trustees of the public interest. Securing two-way trust and communication, an important component of effective discourse, requires an acknowledgement by decision-makers that many complex environmental problems are not amenable to purely technical solutions. Renn et al. suggest that trust is promoted when [11]:

- interaction takes place face-to-face over a reasonable period of time;
- participants are able to secure independent expert advice;
- participants are free to question the sincerity of involved parties;
- parties are involved early in the decision-making process;
- all available information is made freely accessible to all involved;
- the process of selecting options is transparent;
- citizens are given some control over the format of the discourse; and
- the decision-making body seriously considers or endorses the outcome of the participation process.

Trust also requires a citizen commitment to fully participate in decision-making processes and to become informed and ask relevant questions, as well as an openness to re-examining positions although not underlying values.

CONCLUSIONS

The addition of democratic participation as an essential component of the precautionary principle can enhance the ability of decision-makers to make truly precautionary decisions and address barriers to precaution in the U.S. system, where agencies are often required to quantify risk in order to create a defensible decision-making record and are hence reluctant to act unless sufficient evidence of harm exists. The recommendations of empanelled citizens (including the identification of alternative courses of action) may provide a sufficient rationale for an agency to act in the face of uncertainty and to shift burdens onto the proponent of an activity, or it may provide a basis for citizens to lobby for change.

While not an absolute determinate for precautionary decision-making, fair and competent democratic decision-making processes would help ensure that decisions about technologies and highly uncertain environmental health risks not remain primarily in the domain of experts but also incorporate a broader range of considerations and questions. It would provide citizens and their representatives a pro-active role in identifying, proposing, and examining options for preventing environmental harm. It would increase the legitimacy of public involvement in a realm of decision-making where the public has typically been portrayed as reactive, anti-science, and naysayers. Finally, greater citizen control in environmental decision-making creates accountability and can lead to more effective, sensible, precautionary actions in situations in which government bureaucracies have been reluctant to act because a strong causal case cannot be made or

economic pressures to maintain the status quo exist. In an open society such as the United States, democratic participation is critical to the legitimacy of the regulatory process.

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