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Shared Management of Reasonable Risk: Implications for Environmental Assessment and Monitoring

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Far too often, the workings of environmental law appear to be unfair to different affected parties, inefficient in its processes, ineffective in its outcomes and unpredictable in its course. Such general complaints take on concrete urgency for those facing management decisions about committing resources to environmental assessment and monitoring. Program management and planning presuppose an adequate conception of the nature of the task to be accomplished.

To a certain extent, however, these complaints about environmental law, and even the underlying deficiencies they validly reflect, derive from a failure to understand what environmental law is and what it is about. A fruitful understanding of environmental law would show why certain dynamics occur and where they can be expected to lead. This Article suggests that environmental law, and the legal liability it creates, is a symptom of a social movement to institute a shared management approach to deciding which risks are reasonable and worth taking. Environmental law provides one method to achieve stable, long-term management solutions for risk-taking in society. The Article also suggests that this conception of environmental law can in fact improve the ability to predict trends relevant to assessment and monitoring.

This Article contains two major parts. Part I presents a general model to assist in understanding the developments in environmental law. The difficulty with environmental law is that there are many complicated and overlapping treaties, statutes and regulations making it difficult to see the forest rather than the trees. This model for

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understanding environmental liability involves two basic concepts: "shared management" and "reasonable risk." Part II of this Article utilizes the model, together with examples from recent laws and cases in the United States, to explore implications for environmental assessment and monitoring.

I. GENERAL MODEL

Environmental law can be understood as part of society's collective effort to manage the risk to which its members are exposed. The law creates shared management structures designed to make decisions about the reasonableness of those risks. This general model breaks naturally into two parts. One part focuses on the shared management structures while the other part focuses on the risk decisions addressed by those structures.

A. Shared Management

It is important first to understand the concept of "shared management." The reference to "management" involves all of the decision making processes necessary to run an enterprise. Management activities oversee exploring and drilling, siting of facilities, transporting and refining, manufacturing, packaging and labeling, shipping product and disposing of waste, as well as responding to complaints and crises and maintaining product stewardship. In other words, management consists of all of the diverse decision making processes involved in running a business.

Shared management is a program of transferring portions of the management process to governmental institutions outside of a company. A hundred years or so ago, that long list of management functions necessary to run a business would have been handled entirely within a private company. Throughout the world, virtually all of those decisions were being made without the involvement of government. The growth of environmental law has caused the increased sharing of such management decision making with government. This sharing has occurred, and continues to occur, at different rates and in different ways in the various jurisdictions around the world.

What results from this process are shared management structures involving multiple decision makers, often unbelievably complex and inefficient. Governmental permits help decide the conditions of exploration and production and the sites of facilities.

Governmental regulations help determine the routes and means of transport. Administrative rules govern product packaging, labeling and use. In addition to such prospective regulation, retrospective compensation laws place performance requirements on all other management decisions. If a management decision in fact injures a person or property, then the judicial institutions of government are likely to evaluate the prudence of that decision and the care with which it was carried out. As a result of these developments, the flow diagram for almost any significant management decision is now extremely complex and involves governmental decision makers.

Shared management structures are now even more complicated than described above. Today government consists of layers of institutions at the local, state, federal, regional and global levels. In the United States, for example, local ordinances and state laws dealing with hazardous chemicals may or may not be preempted by federal laws. Even when federal regulations do preempt state regulations, they often do not preempt state compensation laws for accidents or product related injuries. And it is unclear what role the regional free trade agreements and the World Trade Organization will play in management decisions at the operating level. History, however, displays a relentless logic that leads from the lowering of trade duties on products at the border to attempts to equalize the conditions of production within a common market. Witness, for example, the 200-year history of the United States or the 50-year history leading up to the European Union.

The first point of this Article is to urge that environmental law not be viewed as a set of edicts imposed by an adversarial external government. Instead, it is useful to think of the law as the evolution of a complex structure of shared management. Environmental law establishes the minimal management process that society expects for decision making. The new reality is that numerous stakeholder interests play an active role in the management of the business, through the institutions of government.

B. Reasonable Risk

The second concept in the general model is that of "reasonable risk." This is what shared management structures are trying to decide in the environmental area. "Risk" is now a quasi-scientific question about hazards and the likelihood of harm. But "reasonable" risk is a management concept: it is the risk that is acceptable under the circumstances or the risk that is worth taking. Environmental

law represents society's attempt to agree on what risks are reasonable. Environmental liability merely states the negative side of this problem: we are trying to avoid unreasonable risk, and we will hold liable those who create unreasonable risks.

It is not difficult to find examples of shared management decisions concerning reasonable risks. First, legislatures sometimes decide what risks are reasonable for entire categories of activities or products. In the United States, for example, Congress has determined that no risk is reasonable from a food additive that is an animal carcinogen.[1] Another example is provided by hazardous air pollutants, for which Congress has determined, in effect, that a reasonable risk of cancer is 1 excess case per 1,000,000 people exposed.[2] In such cases, it is the legislative institution of government that decides which risks are worth taking.

Second, an administrative agency may be given the task of deciding which risks are reasonable. In the United States, examples of these agency decisions involve pesticides[3] and chemical substances.[4] A debate arose after the sweeping Republican Congressional victories in November 1994 concerning whether all environmental laws should be changed to require agencies to determine what risks

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[1] *See* Federal Food, Drug, and Cosmetic Act, as amended, 21 U.S.C. § 348(c)(3)(A) (1994). "[N]o [food] additive shall be deemed to be safe if it is found to induce cancer when ingested by man or animal, or if it is found, after tests which are appropriate for the evaluation of the safety of food additives, to induce cancer in man or animal,. . . ."

[2] *See* Clean Air Act, as amended, 42 U.S.C. § 7412(f)(2)(A) (Supp. V 1993). "If [emission] standards promulgated pursuant to subsection (d) of this section and applicable to a category or subcategory of sources emitting a pollutant (or pollutants) classified as a known, probable or possible human carcinogen do not reduce lifetime excess cancer risks to the individual most exposed to emissions from a source in the category or subcategory to less than one in one million, the Administrator shall promulgate standards under this subsection for such source category."

[3] Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. § 136a(c)(5) (1994): "The Administrator shall register a pesticide if . . . [among other conditions] (D) . . . it will not generally cause unreasonable adverse effects on the environment."

[4] Toxic Substances Control Act, 15 U.S.C. § 2605(a) (1994) provides that:

> If the Administrator finds that there is a reasonable basis to conclude that the manufacture, processing, distribution in commerce, use, or disposal of a chemical substance or mixture, or that any combination of such activities, presents or will present an unreasonable risk of injury to health or the environment, the Administrator shall by rule apply one or more of the following requirements to such substance or mixture to the extent necessary to protect adequately against such risk using the least burdensome requirements . . . .

are reasonable through a formal cost-benefit analysis.[5]

Third, courts oversee findings of reasonable risk when they make decisions concerning compensation for past injuries. These decisions are based largely on an evaluation of the past performance of the defendant. In many cases, courts (acting with or without juries) order the defendant to pay compensation only if the defendant acted negligently in the particular circumstances -- in other words, only if the defendant created an unreasonable risk. Sometimes, however, courts hold certain activities involving hazardous substances to be "abnormally dangerous" and order compensation whenever such an activity in fact causes injury.[6] Under a theory of nuisance, a court might determine that the risk or harm created by the activity is reasonable only if the actor compensates for harm caused.[7] Therefore, when the courts enforce strict liability, which does not require proof of negligence, the judgment is still based on a determination of what risk is reasonable. In these instances, the risk evaluation is made by the judge, rather than a jury, and often about categories of activities, not merely the particular case at bar.

Of course, the decision process can become extremely complicated and inefficient when it involves the interaction of institutions of government. Examples are easily found in the areas of health, safety and environment, in which the legislature often enacts a statute that must be interpreted and implemented by an agency. These actions can also be judicially reviewed by the courts at various stages: the act of the legislature for constitutionality, the interpretation of the agency for permissibility, and the factfinding and decisions of the agency for adequacy and appropriateness.

Regardless of which institution of government oversees the decision making process and regardless of whether the decision is a detailed engineering regulation or an award of compensation based on a performance standard, the core decision focuses on how the business should be managed in the face of risk. The problem addressed by environmental law is how to make good decisions con-

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[5] *See* 141 CONG. REC. H2607 (March 3, 1995).

[6] *E.g.*, T & E Industries, Inc. v. Safety Light Corp., 587 A.2d 1249 (N.J. 1991) (holding that processing, handling and disposal of radium constituted abnormally dangerous activity). *Cf.* Analytical Measurements, Inc. v. Keuffel & Esser Co., 843 F. Supp. 920 (N.J. 1993) (holding that determination of "abnormally dangerous activity" is factual issue); Kowalski v. Goodyear Tire & Rubber Co., 841 F. Supp. 104, 108-09 (W.D. N.Y. 1994) (holding that the court's determination of "abnormally dangerous activity" requires substantial evidence).

[7] *See, e.g.*, RESTATEMENT (SECOND) OF TORTS §§ 822, 826, 829A (1979).

cerning the reasonableness of risk and how to get agreement on those decisions.

II. IMPLICATIONS OF THE MODEL FOR ENVIRONMENTAL ASSESSMENT AND MONITORING

This Article proposes that environmental law be viewed as creating a complex structure of shared management, designed in part to determine the reasonableness of the risks faced by members of society. Why is such a general conceptual model useful? Some general answers can be suggested in the area of environmental assessment and monitoring as well as some specific examples.

A. General Implications

The first general implication concerns the information needed for making good management decisions about risk. It is nearly impossible to determine what risks are faced, and whether undertaking them is reasonable, without the benefit of environmental assessment and monitoring. The risks usually cannot be determined without hazard identification, dose-response assessment, exposure assessment, and risk characterization.[8] The feasibility, costs and benefits of management alternatives cannot be estimated without assessment, and cannot be confirmed without monitoring. Decision makers throughout the complex management structure need such information in order to make decisions about reasonable risk.

Second, we need to take very seriously the management aspects of this model. If assessment and monitoring are needed to provide information for making management decisions, then the results of that assessment and monitoring have to be useful from the standpoint of making such risk decisions. When the emphasis is on the basis for environmental liability, the focus is on what the public side of the shared management structure considers to be absolutely essential to decision making. However, the shared management model goes beyond liability. It encourages a more robust view of the relationship between the scientist and the public decision maker.

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[8] *See, e.g.*, NATIONAL RESEARCH COUNCIL, RISK ASSESSMENT IN THE FEDERAL GOVERNMENT: MANAGING THE PROCESS (1983); THE COMMISSION OF THE EUROPEAN COMMUNITIES, COMMISSION DIRECTIVE 93/67/EEC OF 20 JULY 1993, LAYING DOWN THE PRINCIPLES FOR ASSESSMENT OF RISKS TO MAN AND THE ENVIRONMENT OF SUBSTANCES NOTIFIED IN ACCORDANCE WITH COUNCIL DIRECTIVE 67/548/EEC, No. L 227, OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES 8.9.93 (1993).

Those performing assessment and monitoring should be concerned about the ultimate purposes for which their information is needed, and should strive to play a useful role in that shared management process.

Third, the information needed must be cross-disciplinary and integrated, because the ultimate decision is about the reasonableness of risk. The information must be cross-disciplinary because we need to know not only about hazards and potential exposure, but also about technologically feasible alternatives, and the economic costs and benefits of each alternative. This information derives from very diverse sciences and therefore must be integrated because the management task is to make comparisons, weigh alternatives, and balance risks against benefits. That is impossible to do unless the information providers are all using comparable metrics, and all working from commonly understood models and assumptions.

The fourth general point involves risk communication. The information generated through assessment and monitoring is worthless unless it can be communicated effectively to management. To all of management. Management now includes the various institutions of government and the public. There are many audiences to reach; not just scientific colleagues, or the internal corporate management structure, but also governmental officials and general citizens. Each audience operates under distinct process constraints, has somewhat different decisions to make and has vastly different capacities to understand scientific information. The shared management model stresses the integrated nature of the entire decision process, and leads to the conclusion that useful information must be communicated to all decision makers within the shared management structure.

In short, what does society expect of environmental assessment and monitoring, as expressed in its environmental laws? Society expects the parties responsible for assessment and monitoring to generate the information about reasonable risk needed by the relevant shared management structures and to communicate that information in an effective and timely manner to all those with a need to know. If a company cannot manage to do that adequately, and does not actually implement the shared management decisions that are made, it will be held accountable. That, in essence, is environmental law.

Now that the general model is in place and some general implications have been explored, it is time to see whether the model can provide some specific ideas for environmental assessment and

monitoring.

B. Specific Implications

In giving specific examples, this survey will proceed from the traditional and familiar to the more novel. Environmental law originated in and remains centered on the management of current operations at existing facilities, with particular attention to the waste streams leaving those facilities. This historical origin is in keeping with the need to justify societal intrusion into the management of private property. But shared management has moved beyond waste streams to other facets of internal operations, beyond present operations to future and past operations, and beyond facility-based operations to product regulation. In each direction, the clear trend has been toward increasing the amount of shared management involved in decisions over risk. The general model leads to specific suggestions for those conducting assessment and monitoring.

1. Waste Streams from Current Operations at Facilities

The most familiar context for environmental assessment and monitoring is with regard to waste streams from current operations at facilities. The adequacy of such monitoring is sometimes evaluated from the important but narrow perspective of maintaining compliance with a discharge permit. The general model, however, suggests that the perspective be broadened to keep in mind the shared management context. The relevant questions are, "What is the monitoring for and what management decision does it serve?" To the extent that the monitoring is desirable due to some risk well beyond the end of the pipe, the monitoring data are useful if they are helpful in making decisions about the reasonableness of that risk. The assessor should be able to explain to management why she is, or is not, monitoring for a specific substance, or why she is monitoring at a certain level of precision (today nanograms, or even picograms). Generating information has real costs. It is inefficient to generate data without determining why the monitoring data are needed.

In addition, environmental law is increasingly more attentive to assessing discharge impacts to ecological endpoints beyond the immediately receiving medium. These ecological impacts may be important for their own sakes, and also as part of a human risk assessment. Two developments are worth noting.

One important development involves deciding the economic value of lost natural resources and environmental injuries. Cost-benefit management decisions should be based upon information about the incremental effects and costs expected from alternative management options. Moreover, compensation laws require determinations of the damages due for actual injury.[9] Society needs the help of environmental assessment in defining those costs.

Second, there is increasing emphasis in the United States on so-called "indirect risk assessment," which is part of human exposure assessment. Indirect exposures from an air emission, for example, might occur through deposition onto soil, which then gets washed into surface waters, where it is taken up by fish, which are ingested by humans, who thus receive a dose indirectly through the food chain.[10] The U.S. EPA is currently using indirect assessments in the permit process for hazardous waste incinerators,[11] and is

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[9] *See, e.g.*, Oil Pollution Act, 33 U.S.C. § 2702(b)(2) (1994) which states: The damages [under the section on liability] are the following:

(A) Natural resources

Damages for injury to, destruction of, loss of, or loss of use of, natural resources, including the reasonable costs of assessing the damage, which shall be recoverable by a United States trustee, a State trustee, an Indian tribe trustee, or a foreign trustee.

. . . .

(C) Subsistence use

Damages for loss of subsistence use of natural resources, which shall be recoverable by any claimant who so uses natural resources which have been injured, destroyed, or lost, without regard to the ownership or management of the resources.

See also National Oceanic and Atmospheric Administration, Proposed Rule on Natural Resource Damage Assessments, 59 Fed. Reg. 1062 (1994). "Natural resource damage assessments . . . are not intended to replace response actions, which have as their primary purpose the protection of human health, but to supplement them, by providing a process for determining proper compensation to the public for injury to natural resources." *Id.* at 1062.

[10] *E.g.*, Gary L. Liberson, et al., *A Regulatory Conundrum: Indirect Risk Assessment and Dioxin*, Expert Opinion Supplement, COMPLIANCE STRATEGIES REVIEW, Jan. 31, 1994, at 1-4.

Relying on air dispersion modeling and various vapor uptake models, a typical indirect risk assessment will estimate the concentration of selected chemicals (mainly dioxins and furans) in locally grown fruits, vegetables, grasses and grains. The process will continue with an estimation of the intake of these chemicals by beef and dairy cattle and other livestock through ingestion of grasses and grains. Finally, the process will provide an estimate of the contribution of these food sources to the total risk to individuals. The process further expands potential routes of exposure by considering how the chemicals of interest reach the soil, surface waters, sediment, and finally, fish, which subsequently are ingested by individuals.

[11] *E.g.*, Hazardous Waste: Research Council to Form Committee to Study Link

considering using them to evaluate pollutants under the Clean Air Act.[12] This is a reflection of society's interest in total dose received through all media of exposure.

The shared management model suggests stepping back from the conception of waste streams as a permit problem, and viewing the context surrounding waste as posing a societal management problem. The question is how society can best manage the total risk associated with production, which includes the generation of waste. Although the viable management possibilities are generally limited, they often include management options beyond the conventional waste streams using the media of air or water, and the disposal of solid waste.

We should not be surprised, then, when societies expand liability in order to implement innovative management options. For example, we are now encountering unconventional waste streams. In a recent case in New York, the wife of a worker brought suit claiming that her bladder cancer was caused by a chemical to which she had become exposed through her husband's clothing and hair, when he came home from work at night.[13] In addition, unconventional damages are being awarded. In the United States, defendants may be ordered to pay for medical monitoring programs for plaintiffs.[14] These damages are to provide medical care to watch for adverse health conditions that have not yet developed. This remedy is not so surprising, however, when we view the problem faced by the court as one of how to manage increased risk.

Another trend is expanding liability back up the chain leading to the waste. Several oil companies were recently held liable for cleanup costs as generators of hazardous waste for which they ar-

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Between Health Risks, Waste Combustion, 25 Env't Rep. (BNA) 1266 (Oct. 28, 1994); Hazardous Waste: Indirect Risk Assessment Protocol Inadequate, Should Be Used As Analytical Tool Only, SAB Says, 25 Env't Rep. (BNA) 499 (July 15, 1994). *Cf.* Addendum to the Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions, 58 Fed. Reg. 61,688 (1993).

[12] *E.g.*, Hazardous Waste: Research Council to Form Committee to Study Link Between Health Risks, Waste Combustion, 25 Env't Rep. (BNA) 1266 (Oct. 28, 1994).

[13] Kowalski v. Goodyear Tire & Rubber Co., 841 F. Supp. 104 (W.D. N.Y. 1994) (denying defendant's motion that summary judgment be granted for lack of duty of care, and also defendant's motion to dismiss plaintiff's strict liability cause of action in which the plaintiff alleged injury from release of an abnormally dangerous substance).

[14] *E.g.*, Miranda v. Shell Oil Co., 26 Cal. Rptr.2d 655 (Cal. App. 1993), *review dismissed*, 26 Cal. Rptr.2d 623 (Cal. 1993); Ayers v. Township of Jackson, 525 A.2d 287 (N.J. 1987). *See* In re Paoli Railroad Yard PCB Litigation, 916 F.2d 829, 849-52 (3d Cir. 1990), *cert. denied*, General Electric Co. v. Knight, 499 U.S. 961 (1991) (discussing the increasingly recognized "cause of action for medical monitoring").

ranged disposal at a site away from their refining facilities, even though that waste and its disposal were due to governmental demands to produce aviation fuel in World War II.[15] What is driving this expansion of liability is the stubborn and real societal problem of how best to manage the waste that actually exists. Expanding the scope of liability can be understood as an assertion of societal authority to establish a shared management structure over some aspect of the defendant's decision making.

The general model, therefore, puts discharge permits in a broader societal context, and leads to an expectation of expansion by the decision makers of the management options open to them for dealing with the substantial problem of waste. The model also counsels those conducting monitoring, that the data they gather may be used by an expanded structure of shared managers who have different management agendas and varying abilities to appreciate the relevance of that data. One important legal development has been the giving of management oversight to private citizens through citizen suit provisions in statutes. For example, in March of 1995 environmental groups filed suit against several oil companies for alleged water pollution violations in Alaska's Cook Inlet.[16] EPA had filed administrative complaints a week before, but the environmental plaintiffs were apparently unhappy with the extent of EPA's enforcement effort. The trend has been to authorize private citizens to enforce permit conditions in the courts. One result is that environmental assessors will need to communicate with more parties who have roles in the shared management structure.[17]

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[15] United States v. Shell Oil Co., 841 F. Supp. 962 (C.D. Cal. 1993). *Cf.* 42 U.S.C. § 9607(a)(3) (1988) (dealing with liability of those who arrange for disposal or treatment).

[16] Yereth Rosen, *Oil Companies Sued for Alaska Cook Inlet Pollution*, REUTERS FINANCIAL REPORT, March 1, 1995, *available in* LEXIS, News Library, TXTNEWS File.

[17] *See, e.g.*, Research Council to Form Committee to Study Link Between Health Risks, Waste Combustion, 25 Env't Rep. (BNA) 1266 (Oct. 28, 1994) (final rule is expected on increasing public involvement in the permitting process for facilities to transfer, store and dispose of hazardous waste).

2. Future and Past Operations at Facilities

Competent management conducts careful planning before embarking on new projects, such as constructing new facilities. The environmental impact statements required by statutes under certain circumstances attempt to ensure that adequate planning is performed.[18] Environmental assessment for new facilities should address not only impacts on the natural environment, but also social and economic effects. In the United States, environmental impact statements have for decades addressed at least those socio-economic consequences that are caused directly by impacts on the physical environment, and failure to address such effects could well lead to a court injunction on any governmental actions for which an impact statement was required.[19] Consideration of such effects is essential to a reasonable management decision, and expanded concern for social effects of new projects should be expected. Such concerns also underscore the need for doing environmental assessments in a cross-disciplinary and integrated context.

Environmental law has also affected the planning needed before undertaking a new project that involves purchasing assets from another party. Some of the most difficult developments in the United States concern the due diligence required by a purchaser to discover past acts of pollution before acquiring land, facilities, or an ongoing business that owns or operates land. There has been a great deal of litigation about the degree of pre-purchase assessment that is needed to keep from buying the liability for the cleanup of past releases that the purchaser did not cause.[20]

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[18] *E.g.*, National Environmental Policy Act, 42 U.S.C. § 4331 (1994).

[19] *See, e.g.*, CEQ regulations concerning the National Environmental Policy Act (NEPA), 40 C.F.R. §§ 1502.16, 1508.8, 1508.14 (1994). Examples of court injunctions are Chelsea Neighborhood Ass'ns v. U.S. Postal Service, 516 F.2d 378 (2d Cir. 1975) and Mullin v. Skinner, 756 F. Supp. 904 (E.D. N.C. 1990).

Establishing the necessity to draw the line at some point is Metropolitan Edison Co. v. People Against Nuclear Energy (PANE), 460 U.S. 766 (1983), in which the U.S. Supreme Court held that NEPA did not require the Nuclear Regulatory Commission to take into account the psychological stress caused by fear of another accident, before restarting a nuclear reactor at Three Mile Island.

[20] *See* 42 U.S.C. § 9607(a) (1988). The parties who are presumptively liable for response costs for hazardous substances include present owners and operators of a facility, as well as past owners or operators at the time of disposal. Several narrow defenses are established by 42 U.S.C. § 9607(b), including certain circumstances in which the "release or threat of release" of the hazardous substance was "caused solely by . . . (3) an act or omission of a third party other than . . . one whose act or omission occurs in connection with a contractual relationship . . . with the defendant. . . ."

The Superfund Amendments and Reauthorization Act of 1986 (SARA) added sec-

There are several trends in the area of cleanup liability for past operations — trends that manifest the managerial nature of the problems being faced. First, government is clearly extending its management role in this area. Now under U.S. law, cleanup costs may be recoverable for "releases" of hazardous substances that never leave the private facility.[21] Prior to these developments, common law liability was generally triggered only if the owner or operator injured persons or the property of others, or deprived others of the use and enjoyment of their own property. Government is now involved in the management decision regarding cleanup whenever a release occurs.

A serious problem familiar to all managers is where to obtain the funds to pay for a decision to clean up a pollution release. Shared management structures have similar financial problems, with possible solutions ranging from expending general funds (whether covered by current taxes or borrowed against future revenues) to raising money by increasing product prices. It is no surprise that the trend is to extend ever wider the circle of those potentially liable to help fund the cleanup costs.[22] For political and perhaps economic reasons, the cleanup costs are assessed increasingly to the project, and to whoever eventually owns, manages or derives a benefit from the project.

Society increasingly expects management oversight to continue

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tion 9601(35)(A), a definition of "contractual relationship" as including "instruments transferring title or possession, unless the real property . . . was acquired by the defendant after the disposal" and, for example, "[a]t the time the defendant acquired the facility the defendant did not know and had no reason to know that any hazardous substance which is the subject of the release or threatened release was disposed of on, in, or at the facility." Under subsection (B), "[t]o establish that the defendant had no reason to know, . . . the defendant must have undertaken, at the time of acquisition, all appropriate inquiry into the previous ownership and uses of the property consistent with good commercial or customary practice in an effort to minimize liability."

For cases litigating these obviously fact-specific and time-specific issues, see WILLIAM H. RODGERS, JR., ENVIRONMENTAL LAW 799 (2d ed. 1994).

[21] United States v. Mottolo, 695 F. Supp. 615, 623 (D. N.H. 1988), *aff'd*, 26 F.3d 261 (1st Cir. 1994) (releases of hazardous chemicals); United States v. Iron Mountain Mines, Inc., 812 F. Supp. 1528, 1536-37 (E.D. Cal. 1992) (dealing with acid mine drainage).

[22] For a general overview, see RODGERS, *supra* note 20, at 748-99. *See, e.g.*, United States v. Shell Oil Co., 841 F. Supp. 962 (C.D. Cal. 1993) (finding against defendants on act of war defense); Analytical Measurements, Inc. v. Keuffel & Esser Co., 843 F. Supp. 920, 925-27 (D. N.J. 1993) (under New Jersey law, a factual issue existed whether a parent of a subsidiary could be liable for the polluting activities of the latter, although those activities had ceased about 20 years before the purchase of that company's assets by the parent).

beyond the commercial life of a project.[23] Of course, the difficult question of reasonable risk is, "How clean is clean enough?" The management decision rule in the United States under Superfund has been undefined and indeterminate. This has resulted in the negotiation of remedies on a site-by-site basis.[24] A bill passed in 1995 by the U.S. House of Representatives would apparently subject many cleanup orders to risk assessment and cost-benefit analysis.[25] Whatever management criterion is applied in this context to determine whether risk is reasonable, it is clear that environmental assessment and monitoring must remain at the heart of the decision making process.

As this Article will suggest later, what is clean enough in a society today might not be clean enough tomorrow. This increase in the risk aversion of societal decision makers should be expected, particularly if the wealth of the society and its population density both increase. To those called upon to help manage the waste or pay for the cleanup, a heightened standard of acceptability might seem to be an injustice, the unfairness associated with applying later legal standards to earlier actions. Using the general model proposed here, however, the problem is seen as one of management and the dynamic of increased expectations is to be expected. At least as a model for understanding what transpires, as opposed to a normative model for justifying it, viewing legal action as management is likely to be more productive than debating blame or fault.

3. Environmental Assessment of Products

Today many societies expect adequate management of everything leaving the company's operating site, whether it has economic value in the marketplace or not. The law of liability for injuries caused by the company's products after shipment actually predates liability for waste streams. Courts may hold manufacturers liable for injuries caused by defectively designed products or containers, defective product information and warnings, and manufacturing defects (such as "off-spec product").[26] Two recent examples point

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[23] *See, e.g.*, U.S., Colorado reach "unprecedented" cleanup pact at Rocky Mountain Arsenal, BNA Chemical Regulation Daily (June 15, 1995) (reporting agreement reached "without litigation" to clean up the nation's largest Superfund site).

[24] RODGERS, *supra* note 20, at 731. For a general overview, see RODGERS at 724-45.

[25] *See supra* note 5.

[26] *See* RESTATEMENT (SECOND) OF TORTS § 402A (1965) (strict liability of product

to the direction of change. In a case that went to trial in March of 1995, the city of Fresno, California, sued three manufacturers of the pesticide DBCP.[27] The city alleged that DBCP used by farmers in the area was contaminating city wells, and that the danger had been known to the manufacturers when the product was sold. In another California DBCP case, the court ordered compensation for the costs of medical monitoring.[28] The plaintiffs alleged that the DBCP was used by farmers in the manner intended, had migrated into groundwater, and had been ingested by plaintiffs at a public school. Clearly, society increasingly expects the management of products to extend well beyond their sale and even beyond their intended use.

Once the problems with harmful products are viewed side-by-side with the problems with waste from facilities and understood from the perspective of shared management, then it is reasonable to expect legal liability for products to follow a pattern similar to that for waste. The search for management options may expand in the former case, just as it has in the latter. And along with increased public management goes the need for more environmental assessment and monitoring.

For example, Life Cycle Assessment (LCA) is a "cradle-to-grave" management approach for products. LCA assesses not only the environmental impact of product production and distribution, but also the impact of extracting and using natural resources and the impact of ultimate disposal or recycling after use. LCA is important to the full-cost pricing long favored by many economists and legal liability theorists.[29] Full-cost pricing means that the price of the finished product should cover the total costs associated with the product, including all the health risks and environmental costs discovered through LCA. Products are underpriced and thus tend to be overconsumed when their prices do not reflect the total cradle-to-grave costs. LCA and full-cost pricing may also become important elements in achieving the international goal of sustainable development, as it is articulated, for example, in Agenda 21 and the follow-up U.N. programs after the Conference on Environment and

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seller); RESTATEMENT (THIRD) OF TORTS § 1 (Tentative Draft No. 2; March 13, 1995).

[27] Greg Ahlstrand, *Fresno Suit Over DBCP Under Way*, THE FRESNO BEE, March 2, 1995, at B1; Mark Arax, *Banned DBCP Still Haunts San Joaquin Valley Water*, L.A. TIMES, June 12, 1995, at A1.

[28] Miranda v. Shell Oil Co., 26 Cal. Rptr.2d 655 (Cal. App. 1993), *review dismissed*, 26 Cal. Rptr.2d 623 (Cal. 1993).

[29] *Cf.* GUIDO CALABRESI, THE COSTS OF ACCIDENTS (1970) (especially Chapter 5, discussing market deterrence).

Development in Rio de Janeiro in 1992.[30] LCA can also be expected to play a role in implementing treaties that invoke the precautionary principle of international law.[31]

The shared management approach to reasonable risk thus provides a natural context in which LCA functions as a management tool. The model might also add an important perspective to the contents of LCA. LCA can begin to flounder at the inventory phase — the phase where the assessor identifies all of the environmental costs. This phase can be plagued by the boundary problem: where should we draw the line with regard to which costs to count?[32] Once we begin to track causal chains in the environment, we find that most effects are connected to other effects, and an LCA for a simple product, such as paper or polystyrene cups, might turn out to be a study of nearly everything. Perhaps it would help to ask, "What is the LCA information for?" To the extent that the answer is "to make good shared management decisions about reasonable risk," then the concept of reasonable risk may help to set boundaries on the extent of the inventory that is actually needed.

Ecolabeling is one area where some societies might use LCA to establish public management criteria for awarding ecolabels.[33] But the general model of shared management suggests that something more fundamental is going on with ecolabeling. In effect, the ecolabeling movement is trying to expand the decision making role of the individual consumer within the shared management structure. Of course, the individual consumer is the decision maker with regard to whether to buy an individual unit of product. The pertinent question is, "What information does that decision maker need to make his or her decision?" The minimum that every consumer needs

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[30] *E.g.*, Nicholas A. Robinson, *"Colloquium: The Rio Environmental Law Treaties" IUCN's Proposed Covenant on Environment & Development*, 13 PACE ENVTL. L. REV. 133 (1995). *Cf. Organization for Economic Co-operation and Development: Council Recommendation on the Application of the Polluter-Pays Principle to Accidental Pollution*, 28 I.L.M. 1320, 1322 (1989). "The Polluter-Pays Principle . . . means that the polluter should bear the expenses of carrying out the pollution prevention and control measures. . . . In other words, the cost of these measures should be reflected in the cost of goods and services which cause pollution in production and/or consumption," quoting from the Recommendation of the Council of 14 November 1974.

[31] For a survey and analysis of formulations of the precautionary principle in treaties, see James E. Hickey, Jr., and Vern R. Walker, *Refining the Precautionary Principle in International Environmental Law*, 14 VA. ENVTL. L.J. 423 (1995).

[32] *See* Paul R. Portney, *The Price Is Right: Making Use of Life Cycle Analyses; Product Life Cycle Analysis*, 10(2) ISSUES IN SCIENCE AND TECHNOLOGY 69 (1993).

[33] *See* Candice Stevens, *The Environmental Life-Cycle and Trade*, OECD OBSERVER, June 8, 1994, at 8.

to know to make a good decision is price. Full-cost pricing is an attempt to get the product's price to reflect all the product's costs, including its environmental impacts. What the ecolabeling debate should be about is what additional information (beyond price) the consumer needs and can use.[34] Additionally, what form should that information take, in order to keep from manipulating or misleading that consumer?

III. SHARED MANAGEMENT, RISK COMMUNICATION, AND LEGAL LIABILITY

Whether dealing with wastes or products, all roads eventually lead to risk communication within shared management structures. One thing is very clear: effective communication of appropriate information about risk, uncertainty, costs and benefits is critical to meeting society's expectations and minimizing environmental liability. Moreover, such effective communication is expected to occur between those conducting environmental assessment and all participants in the shared management structure. These participants include the internal management of the company, suppliers, other affected businesses, product consumers, regulators, legislators, judges, environmental groups, the press, and the general public. The general model views all of these parties as sharing in the management decision making. They all need and expect adequate information to make their decisions.

All consideration of risk communication today should proceed in full awareness of the growing scientific literature in this area. The literature is produced by social and other scientists who study the causal factors that influence the effectiveness of communication about risk.[35] Some of these factors involve psychological characteristics of people — such as the need to simplify information or the tendency to maintain already formed beliefs in the face of contrary evidence.[36] Other factors vary with the objective situation presented, such as the distribution of risks and benefits from a proposed

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[34] *See* Portney, *supra* note 32 (suggesting that LCA be used selectively to supplement, not supplant, price signals).

[35] *E.g.*, NATIONAL RESEARCH COUNCIL, IMPROVING RISK COMMUNICATION (1989) (hereinafter RISK COMMUNICATION); Paul Slovic, *Informing and Educating the Public About Risk*, 6 RISK ANALYSIS 403 (1986); Paul Slovic, *Perceived Risk, Trust, and Democracy*, 13 RISK ANALYSIS 675 (1993).

[36] *See* Baruch Fischhoff, *Risk: A Guide to Controversy*, reprinted as Appendix C in RISK COMMUNICATION, *supra* note 35, at 299-304.

course of action or the gravity of a possible harm. Yet other factors are more institutional in nature, such as imbalances in access to information or decision making processes.[37] Effective risk communication within a shared management structure requires careful analysis of the different combinations of factors at play with the various participants.

Communication must be distinguished from information. Too often environmental assessors concentrate only on generating information and perhaps disseminating it. Communication, however, puts the emphasis on the recipient audience. The goal is to adapt the information to the conceptual framework of each participant in the shared management structure, thus meeting each of their different needs for useful information. Risk should be characterized in a way useful to the various decision makers, and communicated to them in appropriate formulations.

Failure to communicate adequately about risk is one of the oldest justifications for imposing environmental liability. In products liability, it is referred to as "failure to warn"; in occupational health, the expression is "hazard communication"; with respect to community notification, there is the "right to know"; in other areas, it is simply "informed consent." Whatever the name of the obligation, the underlying legal reality is the same. The liability rules prescribe the minimum information that a decision maker is entitled by law to receive.

A sound approach to shared management may urge providing more than the legal minimum. In a recent U.S. case, a train collided with a negligently driven truck that was carrying herbicide. In the collision, the train and crew were engulfed in a cloud of the chemical powder. The railroad and the injured train crew sued the owner and operator of the truck for damages. After the collision, the manufacturer of the chemical cargo offered to provide the railroad with the scientific data needed to analyze samples for the chemical content on the condition that the railroad would release the manufacturer from any liability stemming from the collision.[38] The railroad refused to do so. From an adversarial legal perspective, the manufacturer perhaps acted in a calculated and narrowly rational manner. But from the shared management perspective, it should not

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[37] *See* RISK COMMUNICATION, *supra* note 35, at 108-116.

[38] *See* Southern Pacific Transp. Co. v. Builders Transport, Inc., 1993 U.S. Dist. LEXIS 8644 (Order and Reasons), 1993 U.S. Dist. LEXIS 16464 (E.D. La. 1993) (Findings of Fact and Conclusions of Law), *aff'd*, 48 F.3d 531 (5th Cir. 1995).

be surprising that society expected much more from that manufacturer than using such information to try to negotiate a release from liability. If the railroad had not been able to perform the decontamination task without the help of the manufacturer, then the manufacturer ran a risk of having liability imposed upon it. When one potential party to a shared management structure refuses to share necessary information with the other decision makers, society should not expect the remaining participants in that structure to stand by idly. Liability in part defines the outer boundaries of shared management structures.

Although the need for information helps explain a good deal of the trend to extend liability, other pervasive forces are also at work. As environmental assessors working for industry or government know from their personal experience, management's expectations change over time. The information that management expects assessors to develop today, and communicate to them tomorrow, is the information that managers will need the day after — even if management cannot identify today what information they will need! In fact, management often does not know what information will be needed. This is due in part to the nature of decision making about reasonable risk. Information changes about the nature and extent of the risk, costs and benefits change, economic and other social conditions change, and attitudes change about which risks and costs are acceptable. It should not be surprising that the shared management decisions of society will, over time, reflect changes in societal expectations.

Many industrialized countries have experienced the direction of change to be toward less tolerance of increased risk. This is to be expected. The amount of information about toxicity and exposure continuously increases, while increased wealth and improved welfare increase risk aversion. Many other factors, such as economic conditions and education about the environment, undoubtedly play a role in producing an uneven but generally upward trend of risk intolerance. When this is coupled with a trend toward more participation by the general public in the decision making processes of government, the result is an expansion of the sharing of management with the public. The area of legal liability offers many examples of increased shared management through law. A few examples will serve to illustrate the point.

First, there is the area lawyers call standing. To have standing is to have a sufficiently peculiar stake in a controversy so as to be allowed to participate in a legal proceeding before a court or agen-

cy. The question is who is entitled to bring or participate in an action to enforce the law. In terms of the general model, it is the question of who is entitled to participate in shared management through the courts or agencies. The environmental movement in the United States gained considerable power as the rules which govern standing permitted more parties to enforce the laws. Restrictions on standing are regarded as a significant threat to that movement.[39]

Second, there are constantly evolving causes of action. A cause of action is the legal claim itself that is enforceable in the courts. It embodies the substantive laws to be enforced, as well as what must be proved in court in order to enforce them. From the perspective of the general model, they are the judicially enforceable management decision rules adopted by society. Today there is a bewildering array of such judicially enforceable rules, and their number only increases over time. Legislatures enact new statutes conferring enforcement initiative on the executive branch or on the public, and in common law jurisdictions, the courts themselves can institute new or expanded causes of action. Retrenchment of a cause of action is the exception.

A third major area of change is access to information. In the United States there are very liberal rules allowing discovery of private documents in litigation.[40] Moreover, there are strong regulations requiring reporting of company data from environmental assessment and monitoring. Such rules open more communication channels regarding reasonable risk within the shared management structure. The trend is to make more information public. The shared management model suggests that this trend is reasonable and will continue. It is reasonable because, given the increased sharing of management, the participating decision makers can sensibly insist that they must have access to all information needed to make their respective decisions. Although production trade secrets need to be protected, there is obvious pressure to share all risk and benefit information.

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[39] *Cf.* United States v. SCRAP, 412 U.S. 669 (1973); Lujan v. Defenders of Wildlife, 504 U.S. 555 (1992); Lujan v. National Wildlife Federation, 497 U.S. 871 (1990).

[40] For recent debate concerning environmental assessments, compare Koppers Co., Inc. v. Aetna Casualty and Surety Co., 847 F. Supp. 360 (W.D. Pa. 1994), *mandamus granted*, 40 F.3d 1240 (3d Cir. 1994) (ruling that "self-evaluation privilege" against discovery does not apply to "environmental reports, records, and memoranda"); Reichhold Chemicals, Inc. v. Textron, Inc., 157 F.R.D. 522 (N.D. Fla. 1994) (finding qualified privilege of "self-critical analysis" for certain retrospective environmental assessments).

A fourth example is an increase in the types of injury for which society will order compensatory damages. As mentioned earlier, a number of jurisdictions in the United States now allow damages for medical monitoring for signs of cancer.[41] Moreover, a plaintiff exposed to a carcinogen is sometimes allowed to recover for the fear of developing cancer.[42] So far, however, many jurisdictions have been reluctant to allow compensation for the increase in the risk of cancer in cases where it is not reasonably probable that cancer will occur.[43] But this is a very delicate balance. The courts clearly are wrestling with the question of the appropriate compensation for being in fact subjected to an unreasonable risk. What is at issue is the redistribution of a portion of the benefits to be derived from risk-taking, even in the absence of actual physical injury. When this issue is viewed as a shared management problem, an increasing amount of such innovative compensation by the courts can be expected, and perhaps even by legislatures.

CONCLUSION

This Article has presented a general model with which to understand legal liability associated with environmental assessment and monitoring. The suggestion is to think about such assessment as occurring within the context of a shared management structure that is trying to make decisions about reasonable risk. Ultimately, what society expects from environmental assessors is help in making good decisions about managing risk. This means that it expects private parties with information, or the capacity to generate information, to participate effectively in the shared management structures making those decisions. Moreover, society expects those parties to communicate that information effectively to all those within the shared management structure with a need to know the information, and expects them to explain the significance of that information for good risk management. What is reflected in environmental liability is governmental enforcement of the minimum requirements engendered by those expectations.

Due to many historical factors, environmental law today is

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[41] *See* note 14 and accompanying text. *See also supra*, note 28 and accompanying text.

[42] *E.g.*, Mauro v. Raymark Indus., Inc., 561 A.2d 257 (N.J. 1989); Sorenson v. Raymark Indus., Inc., 756 P.2d 740 (Wash. App. 1988).

[43] *See Mauro*, 561 A.2d 257.

often a piecemeal and inefficient means of effectuating such shared management. The resort to liability as a means of creating shared management structures is likely to be symptomatic of the fact that non-legal structures have proved to be less than effective. Society should not be surprised if such liability-oriented structures also prove to be relatively ineffective, and inefficient as well. But societies often welcome help in designing shared management structures that are more effective and efficient. Societies need the help of those gathering assessment and monitoring data to define the vision of what can reasonably be achieved, both technologically and economically. Such suggestions are more likely to be trusted if they come from parties who appreciate the management problems faced by the society, and who are willing to work toward fair, effective and stable solutions to those problems and not just toward private short-term goals. The shared management model, therefore, suggests that the environmental arena, when properly understood, is pregnant with opportunities for simultaneously improving environmental health, economic wealth, and social strength.