"The Roles of Insurance and Well-Specified Standards in Dealing with Environmental Risks"

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The Roles of Insurance and Well-Specified Standards in Dealing with Environmental Risks

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The present liability system for managing environmental risks has had huge transaction costs through the courts with limited funds actually utilized for compensation (except to the lawyers) and cleanup of wastes. This paper discusses the use of insurance coupled with well-specified standards as an alternative to the current system. It illustrates the potential for the use of these policy tools in the context of two environmental risk management problems: providing liability protection to contractors involved in asbestos removal and protecting commercial property lenders and owners from liabilities associated with environmental contamination.

INTRODUCTION

In the United States a societal conscience concerning the environment has been evolving since the 1960s. It is an evolution marked by a significant shift in viewpoint. Instead of continuing to see the environment as a resource to be exploited for economic gain, Americans are increasingly coming to see it as a resource with economic and social value in its own right. Hundreds of federal, state, and local statutes have been enacted in a relatively short period of time to protect that value by assigning liability for environmental contamination of the air, water, and soil resources of the United States—and to stipulate who will pay for the cleanup of this contamination.

The burden of this liability is falling largely on the shoulders of the private sector and, more specifically, on property owners. The financial implications of this liability are enormous. It is estimated that accrued liability for environmental risks on real property total approximately US$2 trillion, which is 16–20% of the total estimated US$10–12 trillion value of all property in the United States (Wilson, 1991).

The first major attempt to create a national policy for protection of the environment was in 1969 with the passage of the National Environmental Policy Act. The Environmental Protection Agency (EPA) was created 1 year later, in 1970. Environmental regulation of hazardous materials began in 1976 with enactment of the Resource Conservation and Recovery Act (RCRA). RCRA was designed to protect the environment, conserve natural resources and provide ‘cradle to grave’ legislation governing the handling of hazardous waste. Its provisions also prevent open dumping and facilitate the conversion of existing open dumps to facilities that pose no danger to the environment or to public health.

The liability imposed by RCRA applies primarily to companies that deal with hazardous materials in the normal course of their business. Four years later, in 1980, Congress passed the Comprehensive Environmental Response, Compensation,
and Liability Act, or CERCLA, to deal with the environmental problems RCRA did not adequately address—problems created by hazardous waste produced and abandoned in the past.

These environmental statutes, combined with regulations developed since their passage, have created standards of behavior that often serve as the basis for legal action. As we will show below, the transaction costs and legal expenses incurred through the use of the legal system have been enormous.

This paper proposes insurance as a more efficient policy tool than the current legal system for allocating resources to the business of cleaning up our environment and compensating those who contract diseases. The next section investigates the current liability system and provides evidence on the large transaction costs associated with its use in dealing with environmental risks. Given its much lower administrative costs, insurance appears to be an attractive alternative to the legal system. The third section turns to issues of insurability and indicates special features of environmental risks that pose special challenges. Even if a risk is insurable it may not be profitable because there is not sufficient demand for coverage. Issues of marketability are discussed in the fourth section. A proposal for coupling insurance with well-specified standards and inspections is proposed in the fifth section. These features have enabled insurers to market coverage for two environmental risks, asbestos abatement liability coverage and property transfer liability coverage, which are discussed in the sixth section. The concluding section summarizes the key findings of the paper.

MANAGING ENVIRONMENTAL RISKS THROUGH THE LEGAL SYSTEM

Tort law is the body of common law that deals with wrongs committed between parties outside of contractual obligations. The two functions of tort law are (1) to provide the basis for recovery for an injured party and (2) to deter others from engaging in similar activities.

A tort action has historically required proof of a defendant's intentional or negligent acts before permitting recovery (Prosser and Wade, 1971). Plaintiffs, therefore, have had to prove the following in order to recover damages, which generally consist of bodily injury or property damage claims:

(1) A duty was owed the plaintiff by the defendant.
(2) The duty was violated by the intentional acts or negligence of the defendant, which fall below a standard of care defined by the duty owed.
(3) The acts of the defendant were the 'cause' of injuries suffered by the plaintiff.
(4) The damages suffered by the plaintiff are measurable.

Once a duty has been created, a standard of care governing the behavior of the defendant is then provided. The plaintiff ordinarily must prove that the defendant was negligent in violating that standard of care.

The Emergence of Enterprise Liability

Tort law, however, is constantly evolving. Over the past 40 years an emerging development in tort law has been the concept of enterprise liability. Enterprise liability removes the requirement that a plaintiff prove negligence when a defendant engages in particular types of activity. Instead, it imposes strict liability on a defendant engaged in those activities irrespective of a showing of negligence.

Enterprise liability has emerged as the tort theory applicable to product liability claims (Priest, 1985) and to injuries from environmental claims and toxic chemicals (Mienhausen, 1991). One reason for this development was the argument by legal scholars, subsequently adopted by the courts, that manufacturers could police their activities and products through quality control much more easily than consumers could detect defects (Shavell, 1987). Even more importantly, the concept of enterprise liability was stimulated by the anticipation that this approach would force manufacturers to invest in loss prevention activities so that the marginal benefits of reducing the loss equal the marginal costs of investing in the mitigation or prevention measures.²

These legal developments were motivated by the view that risk should be spread across the entire population. By making manufacturers and service providers strictly liable for losses caused
by their activities, the cost could be included in the selling prices of their products. Then, instead of claimants needing to prove negligence, funds accumulated from this built-in cost of liability would be available for any claimant establishing that he or she was damaged by a product, regardless of the negligence of the manufacturer. In other words, the tort system, through strict liability, was expected to play the role that insurance is traditionally designed for—spreading risk across a population of similar risks (Landes and Posner, 1987).

**Challenges of the Current System**

Even assuming that strict liability is imposed on a defendant in an environmental claim situation, the next essential component of recovery is the establishment of a causal link between the activity of the defendant and the injury sustained by the plaintiff. The enterprise liability doctrine still requires that this causal connection be established. In fact, there is an implicit assumption that enterprise liability is a type of insurance system whereby those exposed to risk pay a higher price for the product or service in return for financial protection against damage or injury. For this reason the risks that enterprise liability covers should meet the conditions of insurability.

Under the current regulatory system most environmental risks do not meet these insurability conditions. Today there is limited scientific evidence on the relative importance of specific chemicals in causing diseases to humans and injury to the environment. The fields of toxicology and epidemiology are limited in their ability to deduce human cancer risks from animal bioassays due to different sensitivities between humans and animals. Toxicologists will rarely conclude that humans face a known risk because animals in a controlled experiment contract a disease (Kraus et al., 1992). Furthermore, there is little concrete evidence to suggest that more scientific studies and risk assessments will clarify the situation (Graham et al., 1988).

The biggest problem for both plaintiffs and defendants today is establishing a causal link between exposure to hazardous materials and the alleged injury or disease (Rabin, 1987; Ginsberg and Weis, 1981). Failure to establish a causal link may prohibit recovery even where plaintiffs clearly establish they have suffered injury. Defendants are likely to abandon entire areas of activity rather than produce products or services which they perceive expose them to random, high-cost liability (Huber, 1988).

Even for diseases such as asbestosis or mesothelioma where there is greater understanding of causality, it is often difficult for the courts to assign liability. For example, it is difficult to know whether the actor Steve McQueen contracted mesothelioma because he worked with asbestos in the shipyards during World War II or wore an asbestos suit when driving a race car (Viscusi, 1992).

There are likely to be enormous transaction costs and legal expenses incurred by companies in arguing who (if anyone) is responsible for specific losses when an individual claims injury. Several studies conducted by the RAND Institute for Civil Justice have reviewed the costs associated with using the legal system as the means for imposing environmental liability. Two of the studies examine costs associated with CERCLA liabilities, and were undertaken to determine how much of the total expenditures are devoted to the desired end—remediating a CERCLA site. Two additional studies on asbestos litigation aimed to discover how much of the money spent on asbestos claims ended up in the hands of plaintiffs.

RAND produced a study in 1993 which compared cleanup expenditures and transaction costs at private sector CERCLA sites. The study shows that 60% of CERCLA site expenditures are taken up in transaction costs (Dixon, et al., 1993). Thus, only 40 cents of every dollar devoted to CERCLA-required cleanup is spent on the desired investigation and remediation costs.

Asbestos and CERCLA liabilities are of distinctly different types. CERCLA involves government-mandated cleanup liability imposed by specific statutes. Asbestos litigation primarily involves bodily injury claims from asbestosis, lung cancer, and other asbestos-related diseases. Asbestos liability is compensation-oriented rather than cleanup-oriented, with individual claimants seeking redress. While asbestos and CERCLA liabilities differ widely, transaction costs associated with litigating liability, surprisingly, are quite similar.

RAND conducted two studies of the costs of asbestos litigation in order to understand the magnitude of asbestos litigation expenses. The first of these studies reveals that only 37 cents of
every dollar spent on compensation is actually received by the plaintiff. Deborah R. Hensler, a RAND social scientist, testified to the House Judiciary Committee in October 1991 that asbestos transaction costs are 60% of total litigation costs (Hensler, 1991). This figure is nearly identical to the 60% figure seen above in the case of CERCLA transaction-cost share. In other words only 40 cents of each expended dollar went to remediation.

Another demonstration of low plaintiff compensation, and high transaction costs, occurs in the examination of the broader data set of asbestos litigation cases with open claims. These cases are not yet completed and may involve greater litigation expenses when finally tabulated (Kakalik et al., 1983). The data reports defendants’ total expenditure of $661 million, $400 million of which went to the plaintiffs. After the plaintiff’s $164 million in litigation expenses are subtracted from the $400 million received from the defendants, the amount remaining is $236 million. Therefore, the net return to the plaintiff is 35.7% of total costs ($236 million of $661 million). About 36 cents for every dollar spent goes to the plaintiff. This example shows that broader estimates of transaction costs reveal about the same share of the total costs as the closed cases, even though additional expenses may accrue.

How does insurance compare to the legal system with respect to the transaction costs associated with developing and marketing a policy and settling claims? Based on insurance company data, it is very likely that the insurance system would be a vast improvement over the legal system. The monies available for claim payments through insurance outstrip the tort-based legal system by a large margin. Table 1 details the administrative expenses of ‘Other Liability’ insurance lines for all insurance companies. The expense figure represents all costs associated with underwriting and distribution of the insurance.

Notice the 10-year average administrative expense: 25.1%. The figures reveal that over a 10-year period almost 75 cents of every premium dollar were available for claim payments. This occurred within a narrow range from year to year: maximum expense was 31.9% minimum 20.4%. By comparing transaction costs, the involuntary liability system using tort litigation reveals itself to be expensive and inefficient when compared to insurance.

**INSURING ENVIRONMENTAL RISKS**

Insurance is a mechanism to shift risk contractually. An insurance market exists because, on the one hand, insurers are able to find safety in providing coverage against a large number of risks, and, on the other, insureds want and need protection from the possibility of an unexpectedly large loss resulting from injury, disease or an accident associated with their processes, operations or products. Insurance also can protect the firm against the costs of having to remediate

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**Table 1. Administrative Expenses for All Insurance Companies, for ‘Other Liability’ Lines**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total underwriting expenses incurred as a percentage of premiums written</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>31.9</td>
</tr>
<tr>
<td>1984</td>
<td>30.3</td>
</tr>
<tr>
<td>1985</td>
<td>23.8</td>
</tr>
<tr>
<td>1986</td>
<td>20.4</td>
</tr>
<tr>
<td>1987</td>
<td>22.3</td>
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<tr>
<td>1988</td>
<td>24.1</td>
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<tr>
<td>1989</td>
<td>25.5</td>
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<tr>
<td>1990</td>
<td>26.3</td>
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<tr>
<td>1991</td>
<td>27.9</td>
</tr>
<tr>
<td>1992</td>
<td>27.5</td>
</tr>
<tr>
<td>Total</td>
<td>25.1</td>
</tr>
</tbody>
</table>

*Source: Best’s Aggregate and Averages—Property and Casualty, 1993, p. 157.*
environmental contamination that is discovered in the future. Not every risk is insurable. In some situations, the amount of potential loss cannot be quantified or the coverage may violate existing laws. In many cases, a premium that satisfies both the buyer and the seller cannot be reached.

**Conditions of Insurability**

Two conditions must be met before insurance providers will be willing to provide coverage against an uncertain event. Condition 1 is the ability to identify and quantify the risk. The insurer must know that it is possible to estimate the losses they are likely to incur when providing different levels of coverage. Condition 2 is the ability to set premiums for each potential customer or class of customers. This requires some knowledge of the customer's risk in relation to others in the population of potential insureds. If Conditions 1 and 2 are both satisfied, a risk is considered to be insurable.

Two fundamental problems arise when environmentally-related insurance concepts are tested against these two conditions of insurability. First, the courts have required insurers to pay damages for losses insurers never intended to cover. This is a direct result of policy coverage interpretation problems, which have intensified due to changing definitions of liability. To address this problem there is a need to maintain the integrity of the policy language. Every insurance policy must define the contractual limits of coverage, establish the Maximum Possible Loss (MPL), and describe precisely what risks are insured. If the policy language is interpreted differently than intended by the insurer, the original MPL may be drastically affected and the insurer will be exposed to losses that the premium was not designed to cover. Because of changing policy language interpretation, the determination of loss and loss limits has been arduous and the setting of rates extremely difficult.

The second fundamental problem is that many environmental problems lack the historical information necessary for traditional actuarial modeling in contrast to conventional coverages. Statistically valid information on the probability and magnitude of loss based on historical claims experience generally does not exist in the environmental arena. Insurers, therefore, cannot calculate the potential claims component of their product using traditional actuarial techniques. Faced with these problems, most traditional insurers have chosen not to explore the environmental market.

To deal with this problem, there is a need to specify the frequency of losses of different magnitudes as well as the maximum possible insured loss, so that appropriate premiums can be specified. Since most environmental risks are a result of governmental policy, and have been classified as such only recently, little historical loss data exists on these exposures. Hence, other methods of loss assessment must be found.

**Using Science to Develop Insurable Products**

The role of science is critical to the development of sound environmental insurance products. Scientific models have been used by environmental insurance providers as replacements for historical standard actuarial models to define the maximum possible loss, average loss and the frequency of loss.

The scientific modeling process is based on a thorough examination of the insurance opportunity. Each risk characteristic is analyzed in detail. The pressure points relating to randomness, causes of loss, limitations of loss and customer selection are uncovered. These are used to identify insurable situations that exist within the market. They key components of the scientific approach are as follows:

- **Accepted standards** The environmental risk must have a generally accepted scientific or engineering standard for assessing the environmental factors associated with that risk. The standard serves two purposes. It can be used to screen out potential clients as candidates for insurance who do not meet the standards. It also can be used to determine the magnitude of losses under the assumption that the insured party is adhering to this standard. A uniform standard can arise from government regulation (e.g. the number of permissible asbestos fibers in the air as determined by OSHA or EPA), from industry itself (e.g. product specifications by trade associations) or from financial institutions (e.g., determination that the radon levels are below a prespecified level before a mortgage is issued on property).

- **Well-defined risk characterization** A well-defined protocol, such as how to undertake an
environmental audit, must be developed to characterize the risk. This protocol which normally incorporates the engineering standard, should be based on sound scientific principles and backed by scientific data. This requires the insurance company to develop close associations with members of the scientific world.

- **Underwriting standards** Underwriting standards must be developed based on the integration of the existing engineering standard and the scientifically based model. These underwriting standards, which are often associated with the characteristics of the firm or the property being insured, are utilized to characterize the quality of potential clients. For example, if an asbestos remediation policy is being considered, then the insurer will want to determine whether the firm is following appropriate safety procedures as part of its underwriting standard. If so, it may only be willing to provide insurance to those firms who follow particular safety guidelines.

- **Scientifically determined rates** Rates must be based on the scientific models coupled with the underwriting standard. The resulting premium structure reflects the use of non-traditional models since historical data on these environmental risks do not normally exist. These rates reflect the degree of uncertainty associated with the risk. For example, suppose a group of experts agree that their best estimate of the chances that an individual will contract cancer by being exposed to a particular substance for a certain length of time is \( P = 0.001 \). At the same time the experts note that there is a great deal of uncertainty surrounding this estimate. The insurer is likely to specify a higher rate to cover this risk than for a more certain risk where \( P = 0.001 \) (Kunreuther, et al., 1993).

- **Monitoring insured behavior** Insureds must be closely monitored to ensure that their behavior conforms to the original scientific model. Otherwise the rates charged by the insurer will not reflect the risk as determined by the scientific modeling activity. The original model must be adjusted as additional scientific and statistical information becomes available over time.

In summary, a risk is insurable if one can determine the frequency and magnitude of losses within some reasonable limits. Having well-specified standards enables the insurer to undertake scientific modeling that will enable it to determine the degree of uncertainty associated with the risk. The greater the uncertainty the higher the premium is likely to be. By developing underwriting standards to separate good risks from bad and by monitoring activity, uncertainty is reduced on the magnitude of claims and future rates can be refined.

**MARKETING ENVIRONMENTAL INSURANCE**

Even if a risk is insurable it still may not be profitable. In other works, it may not be possible to specify a rate where there is sufficient demand to yield sufficient profit by offering coverage. In such cases there will be no market for insurance.

Marketing presents unique challenges in the environmental insurance arena. The challenge is for the insurer to create products that satisfy the conditions of insurability. The open question is whether there will be a sufficiently large market for the product so that it becomes profitable for insurers to offer it. There are no easy answers as to how one markets a new insurance product but one can delineate a set of opportunities and barriers for creating a market for the product.

**Role of Well-specified Standards**

As stated earlier in this paper, a key ingredient in the insurability of an environmental risk is that a well-specified standard be accepted by those affected by the risk. From a marketing standpoint, a given standard must be widely accepted in the market as a precondition for the successful sale of the insurance coverage. The standard can be imposed by government regulation (e.g. maximum number of asbestos fibers in the air) or it can be voluntary accepted (e.g. firms ensuring that the pollution associated with producing particular goods do not exceed certain levels which they impose themselves.)

If firms do not accept certain standards then it may be difficult to market insurance as illustrated by the case of underground storage tanks. One effective methodology for early detection of leaks in underground storage tanks is the regular measurement of fluid levels in the tanks. An unexpected drop in fluid level indicates a leak. Monitoring fluid levels could be a standard which
would enable insurers to offer coverage for providing protection against leaks. In other words, insurance that protects against the impact of a potential leak can be designed based on the monitoring. The insurance will not be marketable, however, if customers do not adopt reasonable fluid monitoring requirements.

Customer Motivation

Normally insurance is purchased by firms to protect themselves against unexpected losses. Customers frequently purchase environmental insurance for very different reasons. Sometimes the purchase of environmental insurance is mandatory. Government regulations regarding underground storage tanks, for example, require that owners demonstrate that they have the financial capacity to pay for potential cleanup from tank leakage. Insurance is one method to meet this requirement. In some states, insurance is the only method smaller owners of tanks can use to meet this requirement.

In other instances, customers purchase environmental insurance in order to free the company to proceed with its core business activity, unencumbered by environmental risk. For example, a commercial property owner may be unable to lease commercial space because asbestos exists on the premises. The owner may, rightfully, have little concern about health risks arising from the asbestos, but he or she needs insurance for asbestos exposure to all the potential tenants' concerns and lease the property.

Similarly, an asbestos abatement contractor may not be concerned about the health impacts of an asbestos release during abatement activity. However, property owners will require insurance coverage for exposure as a prerequisite for starting the job. The insurance is purchased to meet short-term business requirements, not to provide protection against asbestos-related risks.

A securitized mortgage manager may purchase environmental insurance on properties in the portfolio in hopes of earning a higher rating on the securities, not because of environmental concerns. A real estate developer saddled with a potentially contaminated property may be willing to pay for environmental insurance, even at a premium price, in order to sell a property the market perceives as environmentally tainted.

The purchase of environmental insurance may also be driven by a business' low tolerance for risk. Firms will purchase insurance to assuage concerns about the impact of an environmental incident or discovery upon the financial viability of the business. If there is significant ambiguity as to whether an environmental risk will threaten a company's business, insurance is likely to be viewed as a valuable protective mechanism.

Challenges of Insurance Distribution

The distribution system for traditional insurance products also becomes a handicap in the environmental insurance field. Most insurance brokers are comfortable with the vast array of established products available to their corporate customers. Environmental coverages, however, are very different. The core of the product may involve extensive engineering information, which is often foreign to the insurance broker and the corporate risk manager.

In addition, since many environmental coverages are based, at least in part, on environmental regulations, brokers must familiarize themselves with a new body of knowledge. Changes in regulations and new interpretations by the courts of both environmental law and insurance coverages present an additional sales barrier that brokers must overcome.

Brokers may also have to present environmental insurance options to an entirely new set of corporate decision makers. Traditionally, the insurance purchase is the sole purview of the corporate risk manager, who selects the insurance based on the options presented by the broker. Environmental coverages introduce a whole new cast of characters, any of whom may have more authority and decision-making capability than the risk manager. General counsel, operations managers, vice presidents of acquisition, finance, marketing or business development may all have a vote in the final purchase of environmental insurance coverages.

Since these coverages are new and there is limited awareness within corporate structures of their importance, companies often have not included the cost of this form of protection in their budget. Therefore, money must be diverted from other corporate endeavors. A more likely scenario is one where the decision to buy environmental risk insurance is postponed until money becomes available and corporate decision makers
Figure 1. A program of well-specified standards with insurance.

become more comfortable with the entire concept. This is especially true with the voluntary insurance coverage that is not connected to a specific corporate event, such as the sale of a property.

A PROPOSAL FOR MODIFYING THE CURRENT SYSTEM

Figure 1 illustrates a system of insurance coupled with well-specified standards, inspections and monitoring procedures to reduce losses from environmental risks. These features are designed to make it more likely that a risk will be viewed as insurable and marketable, while satisfying the social goals of environmental policy. We describe each of the features of this approach below.

Develop Well-specified Standards

A set of clearly specified standards should be set
by the relevant regulatory agencies after consulting with the interested parties associated with a particular risk. These standards will substantially reduce the uncertainties associated with the technology-based standards now used to determine a firm's liability for some environmental risks. A well-specified standard would be more desirable from the firm's as well as the insurer's point of view. Such standards are easier to monitor and provide greater certainty as to potential liability.

To illustrate the benefits of this feature, consider the problem faced by firms governed by 'Best Available Technology' requirements today. Existing standards require that current Best Available Technology be used as part of a firm's operation. Hence, if a new technology is developed, firms are unclear as to their liability if they fail to adopt it. Insurers are reluctant to provide coverage against liability for these risks because they are unclear as to how 'Best Available Technology' standards will be applied.

**Inspections to Determine Whether Standards Are Met**

If a well-specified standard is adopted, it is possible to determine whether it is being met by inspections and monitoring. Inspections can be mandated by a government or regulatory agency. Elevators are inspected periodically to ensure that passengers are safe; buildings are inspected to make sure that they meet existing fire codes. Inspections can also be required by private sector institutions. For example, insurance companies often require inspections of property before providing coverage.

**Provide Insurance Against Specific Losses**

If private insurers are willing to provide policies covering the costs of claims, this would have advantages over the current system for two principal reasons. First, insurance is more effective in encouraging deterrence. Insurers have financial incentives to closely monitor the activities of their policyholders and guarantee compliance with the standards. Enforced compliance with regulatory standards is a better deterrence vehicle than the perceived random imposition of liability under the current system.

A second reason why insurance is desirable is that the terms of compensation can be contractually set rather than being determined by the courts. This can substantially reduce the transaction costs that are associated with the current system while at the same time deemphasizing the importance of establishing a causal connection between exposure and compensation. As will be illustrated later in this paper, an insurance policy can provide for compensation at predetermined levels solely based on release of hazardous materials.

For insurance to be a viable policy option, however, the conditions of insurability and marketability need to be fulfilled. If a clear standard is specified and an appropriate inspection is conducted to ensure that the standard is met, the insurer would be able to estimate the probability and outcomes associated with the risk to determine an appropriate premium to charge. If the uncertainty of the risk is very high, then insurers may want to set high rates. If these premiums exceed customers' willingness to pay and insurance is not required, then the risk would be considered unmarketable.

**Monitoring and Control Procedures**

Monitoring and control procedures that can be easily implemented are necessary ingredients for the success of an insurance program. Insurers would periodically check a firm's operations to make sure it is following a set of previously specified guidelines. If the firm has been lax in following the guidelines, three options are normally open to the insurer:

1. Require the firm to undertake a set of remediation measures as a condition for continued insurance
2. Raise the premium to reflect the additional risk or
3. Cancel the insurance policy.

**Periodic Review of Standards**

Over time, more accurate data will become available through the application of increasingly sophisticated risk assessments and the compilation of new data on losses and claims payments from insurance companies. Therefore, it makes sense to review the standard at prescribed intervals,
such as once every 5 years, in order to evaluate the impact of these data on the risk in question.

TWO ILLUSTRATIVE EXAMPLES

This section describes two examples in which insurance is currently available to protect a firm or individual against liability from environmental risks. The first example, which involves the use of insurance to protect contractors engaged in asbestos remediation work, illustrates how a well-specified standard enabled insurance premiums to be based on risk. In addition, favorable market conditions permitted product introduction and acceptance.

The second example, involving insurance to protect owners of property from potential liability for unknown contamination on their land, describes the attempt by insurers to develop premiums based on risk when a standard is only imperfectly specified and accepted by the market.

Illustrative Example 1: Asbestos Abatement Liability Coverage

Nature of the Problem
Asbestos is the common name for a group of natural minerals that occur as masses of compact or relatively long, silky fibers. In the 1960s the mineral was identified as a carcinogen—a product known to cause cancer in human beings. Medical evidence established that airborne asbestos fibers that are inhaled or swallowed are linked to a number of diseases, including asbestosis (chronic lung disease), lung cancer, and mesothelioma (a cancer affecting the membrane lining of the chest cavity). In the early 1970s, the government began banning the use of asbestos.

Beginning in the early 1980s, significant pressure developed in American society to remove asbestos from existing structures. This pressure was fueled by public concern over the health effects of asbestos exposure, as well as by government requirements that schools be surveyed to determine the extent of asbestos contained in their structures. In the early to mid-1980s, both the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administrati-
unfavorable to the insurer. In contrast, clear policy language that details definitions of occurrence, damages, coverage triggers, exclusions and exceptions to exclusions have fared much better in the courts. Environmental insurance providers therefore concluded that the customized policy overcomes the weakness of standard policy forms and is likely to be upheld in court.

- Loss model/pricing An extensive review of the medical literature was undertaken with particular emphasis on dose response models articulated by OSHA (see Bennett, 1993). In promulgating standards which regulate occupational exposure to asbestos for industry, OSHA developed quantitative risk assessment models to project excess mortality and morbidity as a function of dose. For each of four different disease classes (i.e. lung cancer, mesothelioma, asbestosis, and gastrointestinal cancer) mortality and morbidity was shown to vary with the concentration of airborne asbestos fiber and the duration of exposure.

In accordance with the OSHA models, it was possible to estimate the relative frequency of disease manifestation associated with specific exposure levels to asbestos fiber and to construct proprietary mortality/morbidity tables for each disease class for exposures anticipated from typical abatement activities. Abatement activities have lower exposure than levels associated with occupational hazards.

The expected loss frequency associated with abatement contractors required additional data, specifically, the number of third-party persons in close proximity to abatement activities, the asbestos fiber concentrations outside the work area and the duration of exposure during abatement. These fiber data, along with project duration distributions accumulated from a sample of actual abatement projects, permitted estimates of the dosage of asbestos experienced by third parties outside the work area. Synthesizing these data with the mortality/morbidity tables described above, it was now possible to project disease manifestation frequencies in terms of contractor revenues.

Loss severity, or the cost associated with claims from asbestos abatement activities, was estimated from the comprehensive cost studies prepared by the RAND Institute of Civil Justice (Kaklik et al., 1993). These studies presented size of loss distributions from asbestos lawsuits prior to the 1982 Manville bankruptcy, providing breakdowns of victim compensation, defense litigation costs and unallocated loss expense. Conservative trend factors and disease latencies were selected to estimate ultimate loss distributions and expenses associated with adjusting losses.

- Test marketing Assessing the marketability of asbestos liability coverage did not require extensive analysis because obtaining liability coverage for abatement contractors was a precondition of their obtaining work.

Based on their original modeling, more than 50,000 asbestos-abatement projects have been insured by ERIC. The insurance company has consistently reviewed the operations of its insurers, including air monitoring data on releases of asbestos fibers. The number of incidents involving fiber release have been minimal (less than 100), and damage payments have been well within anticipated guidelines.

Illustrative Example 2: Property Transfer Liability Coverage

Nature of the Problem
The Comprehensive Environmental Response, Corporation and Liability Act (CERCLA), commonly known as Superfund, governs hazardous waste produced and abandoned in the past. It mandates a strong liability scheme that dictates that those responsible for environmental contamination will, to the extent possible, pay the costs of cleanup. The courts have interpreted CERCLA as imposing a system of broad liability of three types:

1. Joint and several liability Imposes liability without respect to proportionate liability among parties. If a business is liable for any portion of a contamination, it may have liability imposed for the full cost of the contamination cleanup.
2. Retroactive liability Imposes on current owners of property liability for all environmental cleanups now required, even for activities un-
 undertake by prior owners which may have been perfectly legal at the time the activity was carried out.

(3) **Strict liability** Imposes liability without requiring a showing of criminal intent or contribution. A business can be liable for a current environmental cleanup solely because contamination now exists at unacceptable levels, even if the current owner had always complied with prior standards of behavior.

CERCLA specifies that four classes of people can be held liable for environmental cleanup costs:

(1) Current owners/operators of hazardous waste facilities
(2) Persons who formerly owned or operated a facility at the time of disposal of any hazardous substance
(3) Persons who arranged for disposal or treatment of a hazardous substance at any facility owned or operated by another person (a ‘generator’)
(4) Transporters of hazardous waste to a facility

In order to protect themselves from the possibility of having to pay for cleanup costs, purchasers of property and their lenders perform pre-acquisition site assessments to identify potential contamination. Site assessments have significant limitations in detecting all contamination, leaving the new owner and the lender exposed to potentially significant liability.

**Feasibility of Insurance**

Insurance coverage has been designed to assume the liability of owners from potential Superfund exposure. This Property Transfer Liability (PTL) coverage protects commercial real estate purchasers and their lenders from liability for contamination that is present but as yet undetected on the property.

To obtain this coverage, a customer must obtain pre-acquisition site assessments from an independent engineering consulting firm that has been pre-qualified by the insurance company to conduct assessments. Any contamination discovered during the site assessment will be excluded from coverage. A PTL policy has the potential of significantly impacting on the private marketplace and its response to CERCLA. In essence, the insurers imposed a standard that 'no significant contamination' be detected as a basis for offering customers a policy.

By requiring a review of properties for contamination, PTL demands that existing contamination be identified. By identifying the problem in advance of the transaction, the cost of removing the contamination will be included in the value of property. The magnitude of the unknown risk (contamination that is not uncovered by assessment) is reflected in the insurance premium. In essence, this insurance becomes a tool to both discover and quantify the costs associated with existing environmental contamination—making it a powerful instrument of environmental policy.

The three tasks necessary to move the productive concept to reality are characterized as follows:

- **Defining coverage** PTL insurance is designed for commercial properties, as opposed to industrial or residential properties. Low contamination frequency associated with commercial properties makes the insurance affordable to a large audience of buyers.
- **Develop loss model/pricing** The contamination rate of commercial properties has averaged about 12% nationally. This figure was determined by ERIC from a database of 9000 environmental audits. This rate is the percentage of properties that have contamination in excess of permissible government exposure levels. Pre-acquisition audits will still fail to detect contamination when it actually exists on some of the properties. In these situations a claim would be filed by a property owner who had PTL coverage.

To estimate the potential losses associated with contamination that was not detected by a pre-acquisition assessment, an examination of the costs of federal and state mandated cleanups at more than 3000 sites was undertaken. Available data indicates that the average cost of remedial action (CORA) (1991 dollars) ranges from $102,000 for underground storage tanks (USTs) to just over $33 million for Federal National Priority List (NPL) sites.

Once potential loss frequency (failure to discover contamination) and ranges of severity are understood, the issue becomes that of determining how loss may be distributed. A legal model based on 150 federal and state statutes was constructed to understand loss allocation.
Based on the above data it is possible to determine a premium which reflects the risk and the uncertainty surrounding it. With a probability of contamination at $P = 0.1$ and the chances of a claim $q < 0.10$, it is possible to offer insurance at a reasonable price even if the cleanup costs for undetected contaminated sites are unpredictable and in some cases may be relatively high.

- **Test Marketing** PTL insurance was not marketable until potential customers were comfortable with the purchase of a pre-acquisition environmental assessment prior to purchasing property. Before assessments were an accepted form of business practice (i.e., a standard of behavior), customers added the cost of an assessment to the cost of the insurance. The customer thus perceived the total cost associated with purchasing an insurance policy to be prohibitively expensive.

The shift toward market acceptance of environmental assessment for investigating property was vividly demonstrated in videotapes of more than 30 focus groups conducted across the country over a 2-year period from 1991 to 1992. Initially, the research subjects, all vice presidents of acquisition of the country's largest development and investment companies, ordered an environmental assessment on properties only when contamination was suspected. However, during the 18 months of the study, assessments became standard on all properties. The same attitudinal change was reflected in the lending industry as the majority of the nation's banks began to require assessments as preconditions for most bank-financed real estate transactions (see Bennett, 1993).

It is also critical to the sale of PTL coverage that the cost of the insurance be included in the overall closing costs for the sale of a property. When the cost of insurance is framed against the cost of the property, and can be financed with the property, the environmental insurance avoids the problems of a non-budgeted expense.

**Lessons Learned**

In the process of examining the results of the creation and sale of the asbestos abatement and property transfer products, several lessons related to the potential public policy impacts of insurance policies on environmental exposures have been learned. First, by being based on well-specified standards, environmental insurance can provide an effective means of institutionalizing the standards. By monitoring its insureds' activity as part of its ongoing underwriting, insurance companies provide enormous incentives for their insureds to comply with the standards. This is especially true where the insurance is 'required' to permit the insured to perform its core business activity (e.g., where contractors must show insurance to work) or where it dramatically impacts the insurer's ability to proceed with a specific business transaction (e.g., where environmental insurance is required to obtain financing). This monitoring function also deters undesirable behavior by increasing the consequences of non-compliance.

Second, as mentioned earlier in this paper, one of the two key functions of common law is to provide a means of recovery, or compensation. As a contract, insurance can both broaden or narrow the conditions upon which payment will be made. Those conditions need not rely on existing tort doctrines as preconditions for payments to be made. In areas such as perceived environmental risks, it may be easier and less costly to all parties to adopt contractual conditions of payment rather than utilize the common law for imposing liability. For example, PTL insurance responds to releases of hazards above permissible exposure levels without regard to actual harm caused.

Finally, insurance performs both these functions with minimal ongoing governmental involvement. For example, based on accepted performance standards, which in the case of property transfer coverage were entirely privately created, the insurance industry undertook its own monitoring activity rather than relying on regulatory agencies.

**CONCLUSIONS**

This paper makes a case for the development of well-designed standards so that more environmental risks will be insurable and marketable. Insurance promises to be more efficient than the current legal system because it has lower administrative and transaction costs.

Insurance, coupled with clear standards and regulations, encourages deterrence and loss-prevention activities. Firms and their insurers will
have incentives to undertake inspections. Insurers will want to engage in monitoring and control efforts and impose appropriate penalties and premium increases for insurers who fail to meet existing standards. Furthermore, firms will be encouraged to pursue innovations that reduce future risks.

Currently, most environmental risks do not satisfy the basic conditions of insurability or marketability, and hence insurers are reluctant to provide coverage against them. The private marketplace has attempted to develop coverage for underground storage tanks, lead-based paint exposures, landfills (both hazardous and non-hazardous), and other clearly identifiable exposures. Only limited success has been experienced in these areas. An understanding of the issues identified in this paper may assist policy makers in the design of regulations and creation of market conditions to permit the insurance industry to play a more central role in environmental policy. In large measure, the government can both create and destroy the conditions which would permit insurance to be developed and sold.

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NOTES

1. A comprehensive discussion of the origins of the EPA is contained in Landy et al. (1990).
2. For two excellent summaries of this literature, see Landes and Posner (1987) and Shavell (1987).
3. Note that a small part of the 75% may be expended in claim-adjusting costs.
4. The insurer may still be willing to provide insurance coverage at a much higher rate than on its normal policy to a firm that does not meet a given underwriting standard but still wants coverage.
5. See Asbestos Hazard Emergency Response Act (AHERA), Section 203 of Toxic Substance Control Act, 15 USC 2461–2654.
8. The preamble to the issuance of OSHA Asbestos Regulations for the Construction Industry (29 CFR 1926.58) contains an analysis of the relevant studies used by OSHA in setting the permissible exposure level (29 CFR 1926.58(c)).

REFERENCES

Asbestos Abatement Reports, 15 October 1990.