Geographical Techniques to Review and Track Environmental Liabilities

by Philip Miller and Beth Mabee

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Abstract

The identification and quantification of environmental liability exposures is becoming increasingly more important to U.S. property/casualty insurers. This article discusses new tools available to assist in the evaluation of Environmental Impairment Liability (EIL) exposures, and how EIL reserving might be handled in "the Perfect World of the Future."

The opinions expressed in this paper are those of the authors, and do not represent the official views of Insurance Services Office, Inc.

GEOGRAPHICAL TECHNIQUES TO REVIEW AND TRACK ENVIRONMENTAL LIABILITIES

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Introduction

Hazardous waste cleanup costs in the United States continue to escalate. A 1991 University of Tennessee study estimated they may reach $750 billion over the next 30 years.[1] More recently the A. M. Best Company reported "[t]he ultimate cost of environmental and asbestos damages and remediation in the United States could run well over $2 trillion...."[2] Potential liability for these environmental cleanup costs is of

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[1]Milton Russell, et.al., Hazardous Waste Remediation: The Task Ahead, University of Tennessee, Waste Management Research and Education Institute (Dec. 1991), quoted in Environmental Liability: Property and Casualty Insurer Disclosure of Environmental Liabilities (GAO/RCED-93-108, June 2, 1993), p.4.

[2]John H. Snyder and W. Dolson Smith, "Environmental/Asbestos Liability Exposures: A P/C Industry Black Hole," BestWeek Property/Casualty Edition (March 28, 1994), p. P/C 1.

particular concern to property/casualty insurers, even if they haven't knowingly written environmental impairment coverage.

The retroactive joint and several liability provisions of the current Superfund law may result in huge judgments against insureds or former insureds decades after a hazardous activity has been discontinued. When a Potentially Responsible Party (PRP) is notified of an impending cleanup and its associated costs, that PRP is likely to turn immediately to its insurer for defense and, if necessary, liability payments. Sources of pollution ranging from leaking underground fuel tanks to improper waste disposal may affect both commercial and personal lines policies long after the policies themselves have been shredded or sent to long-term storage.

When many activities that have retroactively saddled insurers with huge liabilities took place, they were legal, possibly even common, business practices. The responsible parties may not have understood the concept of environmental pollution, let alone realized they could later be held responsible not only for the cleanup of their own pollutants but for the liabilities of co-polluters who disappeared or declared bankruptcy. Similarly, their insurers included nothing in their Incurred But Not Reported (IBNR) reserves to cover liabilities that were not yet perceived as such--polluting activities that changes in the social climate caused to become retroactive liabilities.

As the September 30 expiration of Superfund nears, the debate over the continuation of its retroactive nature and joint and several liability provisions has intensified. Regardless of the outcome, however, insurers need better methods of quantifying their current and future environmental liabilities--those resulting from past court decisions, and those yet to be incurred.

The Ostrich Approach to Environmental Impairment Liability (EIL) Has Dangerous Consequences

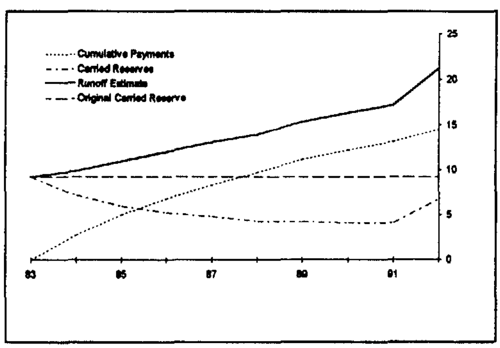
Until recently, insurers have not reserved for many potential environmental losses. Identification of environmental exposures has been difficult and accounting standards have not demanded revelation of tenuous liabilities. The Financial Accounting Standards Board has required that a potential liability appear on a company's balance sheets only when it is reasonably probable that a liability has been incurred and the amount of the loss can be reasonably estimated--difficult if not impossible in a world of long-tail hidden hazards and rapidly changing environmental contamination detection and cleanup technology.

Historical information has been of little use in quantifying losses. Past claims have been inconsistently reported, and changes in technology and liability standards have altered the costs of cleanup and the identification of responsible parties.

To complicate matters, many environmental liability suits have involved the interpretation of policy language that insurers believe shields them from responsibility for loss payment. Insurers have been understandably reluctant to reserve for these losses, feeling that such reserves would not reflect "reasonably probable" liabilities, and could even be interpreted as admissions of responsibility for payment (self-fulfilling prophecies). Then too, regulators have tended to pursue "deep pocket" PRPs, leaving the pursuit of smaller or "vanished" parties to the large PRPs and their insurers. The possibility of eventual recovery of cleanup costs from these other parties or their insurers has also limited the appearance of liabilities related to cleanup on insurer balance sheets. This situation has changed during the last year.

A June 1993 Government Accounting Office (GAO) report pointed out that of the nation's 16 largest property/casualty insurers, only 2 in 1990 and 3 in 1991 disclosed dollar amounts related to environmental claims in their annual reports. An additional 5 insurers in 1990 and 8 in 1991 stated they were involved in litigation over environmental claims without mentioning figures. At the same time, insurance executives claim environmental liabilities could significantly affect the financial condition of the PC industry.[3] Industry studies bear this out.

ISO's analysis of the runoff on year-end 1983 loss and loss adjustment reserves for general liability (excluding products) shows a disturbing trend. For eight of the nine calendar years ending December 1992, payments on accident years prior to 1983 have been more than 25% of the prior year's carried reserves. However, as shown in the chart below, the reserves themselves, instead of decreasing after the loss payments, have been flat--or worse yet, grew 65% in 1992! Through 1992 year-end, the $9.2 billion reserve established at year-end 1983 has run off $12 billion deficient.[4] Late emergence of environmental losses is the chief suspect in this adverse development.



A recent analysis by A.M. Best Company showed a 64% increase in industry environmental reserves from 1989 to 1992 (from $3.6 billion to $5.9 billion) compared to a 22% rise in total industry reserves over the same period. The authors of the analysis predicted that

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[3]<u>Environmental Liability: Property and Casualty Insurer Disclosure of Environmental Liabilities</u> (GAO/RCED-93-108, June 2, 1993).

[4]"Loss and Loss Adjustment Expense Reserves at Year-End 1992: Technical Analysis," Insurance Services Office, Inc., October 1993

environmental liability "represents the single largest threat to the property/casualty insurance industry's financial health for the next several decades."[5]

New Reporting Requirements Seek Uniformity in Reserve Handling

In response to the contradictory handling of these claims by different companies, the SEC has promulgated new rules for disclosure of liabilities. *Staff Accounting Bulletin No. 92*, issued June of 1993, directs companies to evaluate environmental liabilities "independently from any potential claim or recovery." Since insurer recovery from others for payment on behalf of their insureds is uncertain as to timing and achievement, the Securities Exchange Commission (SEC) no longer feels that the amount of potential liability should be offset by the amount of potential subrogation recovery. The SEC has also taken the position that "[n]ot withstanding significant uncertainties, management may not delay recognition of a contingent liability until only a single amount can be reasonably estimated." Regardless of how difficult estimating potential liabilities may be, insurers must reflect at least minimum estimates on their GAAP balance sheets now.[6] As a result, they are scrambling for better ways to identify and quantify environmental hazards and their associated loss exposures.

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[5]Snyder and Dolson, Op. Cit., p. P/C 3.

[6]"If management is able to determine that the amount of the liability is likely to fall within a range and no amount within that range can be determined to be the better estimate, the registrant should recognize the minimum amount of the range pursuant to Financial Accounting Standards Board Interpretation No. 14, 'Reasonable Estimation of the Amount of a Loss' ('FIN 14')."

New Geographic Mapping Technology Can Help

Insurers can more easily respond to this challenge of estimating loss reserves by using new technologies such as geographic information systems (GIS). GIS, as the name implies, can geographically locate addresses and relate them to a wealth of data that is geographically based. These systems identify point, line or polygon-specific data--in GIS terminology, these are "features." Each of these features can be pinpointed on the face of the earth utilizing a principle called "geocoding," the assigning of latitude and longitude based on an address or zip code. Data can be attached to these features and manipulated in a manner similar to spreadsheet or database programs. This can lead to the generation of maps, or the extraction of geographic information without the need for the user to view a map. GIS can be used to calculate the distance from one geographic feature to another or to measure how many features are located within a given area. Examples of these applications are the calculation of the distance an insured drives from his home to his office and the identification of how many insured residences are located within a given county.

The property/casualty insurance industry is a "natural" for the application of GIS technology, because so much of the coverage provided by property/casualty insurance policies is location-specific. These locations are in or near other features, such as counties, states, fire districts, census tracts, water bodies, or rating territories. The relationships between these features can be used in a variety of ways.

GIS technology is most widely used in the property/casualty industry for risk-by-risk underwriting. Using GIS tools and products, underwriters can screen new applications for a wealth of risk-related information that was previously unavailable or available only through time-consuming reference to maps and rating manuals. Inputting the risk address gives the underwriter access to essential information, including rating territories for various coverages, Public Protection Classifications, distances to water bodies, drive-distance-to- work calculations, and demographically based estimates of an area's crime potential. The addition of construction information for a given building may also allow the system to estimate maximum losses from insured events of varying magnitudes.

In addition to screening new applications, the information supplied by GIS systems is used by insurers for portfolio analysis. GIS can enable an insurer to estimate how many risks it writes within 1500 feet of a major water body, or along a given earthquake fault. Combined with modeling software, it may also be used to predict potential losses resulting from a hurricane or major hail storm. This information may assist the insurer in spreading its own risks and, as a side benefit, in obtaining reasonably priced catastrophe reinsurance. Combined with demographic information, GIS portfolio concentration analysis can also assist insurers in planning for future expansion.

From predicting the path of a storm and the concentration of risks in that area to predicting post-disaster adjuster deployment is a small step. The Federal Emergency Management Agency used aerial and satellite photographs and GIS to plan relief efforts after 1993's massive flooding in the Mississippi valley.[7] Combining information on where the risk addresses in an insurer's inforce policy files are with a storm's path, speed, and related factors can provide early estimates of the probable number of properties damaged and the number of claims adjusters that should be deployed. This technology can allow insurers to refine their contingency planning and respond more quickly to natural disasters--an important step in an era when speed is a major criterion used by customers to

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[7]Gary H. Anthes, "Fed Agency Tailors GIS to Locate Flooded Areas," Computerworld (Aug. 2, 1993).

judge the quality of service, and when speed can serve to minimize the ultimate loss payment.

EIL Uses for GIS

Specific uses of GIS involving Environmental Impairment Liability (EIL) exposures are also possible. Federal, state, and local governments have been storing information on actual and potential pollution sites for years in over 800 electronic databases. These databases can help identify environmental contamination risks. Geographic information systems can locate the addresses in an insurer's book of business, and quickly and accurately search the relevant databases for reports of pollution at each insured site and in the surrounding area. Several products now available or under development will allow insurers to access over 2.5 million governmental records on locations with actual and potential contamination. Types of hazards identified will include:

- Sites on the National Priorities List and its state equivalents;
- Other Superfund (CERCLIS)[8] sites;
- RCRA[9] transportation, storage and disposal sites;
- Properties used as solid waste landfills; and
- Leaking underground storage tanks.

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[8]CERCLIS is the information system containing records related to possible violations of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

[9]RCRA is the acronym for the Resource Conservation and Recovery Act of 1976.

Underwriters will be able to use these systems as application-screening tools to gather data on recorded potential hazards at the risk location or in the surrounding areas--for example, within 1/2 mile for underground tanks or 1 mile for Superfund sites.

These database/GIS combinations and others like them can also be used in portfolio analysis to review and track exposures to other hazards. Both underwriting and portfolio analysis can help insurers with disaster planning. The insurer's exposure to potential environmental liabilities is intensified if pollution hazards are located in flood-prone or earthquake-prone areas. Identifying combinations of hazards can help insurers further refine their Probable Maximum Loss (PML) estimates for these areas and make more adequate provision for the deployment of adjusters and equipment should a disaster strike.

Although very little has been done with GIS to date in the area of reserving, the potential for increasing future use is there, particularly with regard to environmental impairment losses.

Geographic Information Technology Can Help Create a Better System

In the "Perfect World of the Future," geographic information databases would be available for all properties, residential and commercial. These databases would describe the physical and commercial characteristics of the properties--information such as previous site uses and the site uses for adjoining properties in addition to the construction, current occupancy, protection and exposure information available today from sources such as ISO Commercial Risk Services, Inc.'s Specific Property Information database. Historical information would be particularly valuable in identifying contaminated sites and leaking tanks where no structures remain. In addition, these databases would include information about soil type, terrain, elevation, ground water, aquifers, and other factors that would promote or impede the spread of environmental contamination. The current databases of government information on actual and potential contamination sites would also have been greatly improved by the adoption of uniform reporting standards and the inclusion of more historical information on both cleanup costs and the loss of property values resulting from reported contamination.

GIS could play a role by creating an "expert system." For example, once a relationship between geology or soil structure and the direction or velocity of a pollutant's spread is established, a map of an area's geology or soil structure could aid in determining the flow of contaminants and thus in estimating the area impacted by toxic levels of hazardous materials.

EIL claims adjusters would have instant access to this information upon entering the property address or some other geographic identifier (such as latitude and longitude) into the computer network. Underwriters would also have access to this information, improving application screening, portfolio management, and the pricing of EIL coverages.[10]

Toward More Accurate Reserving for EIL

In the Perfect World of the Future, such expert systems would be used to determine a damageability index. This index would measure the relative risk of contamination spreading, uncontrolled, should some event at the site cause a leak or other discharge of contaminants.

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[10]In his Insurability and the Regulation of Catastrophic Environmental Risks, p. 18, Martin Katzman finds little evidence to support the idea that EIL premiums are proportional to risks, even as crudely measured as those risks are at present.

This index would require an improved understanding of the area likely to be impacted by the spread of a contaminant. Some current models assume that the area affected by a contaminated site is a circle with a given radius from the source of contamination. Inversely, insurers concerned with particular risk locations have drawn circles around them and attempted to determine what sources of actual or potential contamination, if any, might adversely affect those risks.

The affected area, however, may not be circular nor of some more-or-less arbitrarily selected size.

The relative hazard of the pollutant could play a role in setting the boundaries. It is possible that the more toxic the substance, the further harmful levels of the substance will spread. For this reason the American Society for Testing and Materials standards, which the banking industry uses to search for historical pollutants in the vicinity of collateral properties, specifies record searches for leaking tanks or CERCLIS sites within a 1/2 mile radius of the subject property and for National Priorities List sites within a one mile radius.

The size of the affected area may also change with the risk tolerance of the insurer. Choosing a larger affected area then would be analogous to including a larger margin for adverse deviation.

In addition, factors such as geology and soil type/structure are important. The geology can affect the movement of subsurface flows of water or contaminants. Soil type is also important since (1) the contamination sites are located in the layer of the earth's crust above the permanent ground water level where the soil is and (2) its structure affects the direction and speed of movement.

GIS could help establish the effects of geology and soil structure on the flow of contaminants. By combining maps of the geology, soil structure, and sources of contamination, simulations could be run to test the expected spread of toxic elements against actual conditions.

In a similar way, a restoration index could be established to measure the relative cost of cleaning up after contamination occurs. The history of past site uses would also be important in using such indices, since past usage indicates the types of contamination that may have occurred historically but have yet to surface. With a GIS containing site-specific information such as that described above, actuaries and engineers could also develop parameters for expected costs of restoration and indemnification. These parameters might vary with the characteristics of the site.

Finally, the damageability and restoration indices can be combined with a frequency parameter. This parameter, at least for past contamination, might be estimated from historical land use maps, which can provide a basis for suspected unreported contamination. The parameters could be applied to each risk in a portfolio; the sum of such estimates would be an expected loss estimate for the EIL exposure of the portfolio. Obviously, such an inventory approach requires sufficient computer resources to be feasible.

As loss experience accumulates, the parameters will be updated, leading to new estimates of expected losses. Loss emergence models will be similarly updated, much as current development methods use the latest loss emergence to estimate future emergence.

This will require the development of new actuarial models. Traditional actuarial models of property/casualty loss development are based on the accident year or policy year model, where the event giving rise to the loss is discrete in time and place. In the past two decades, however, we have had to deal with such complexities as triple trigger theories of liability and latency periods from exposure to illness that span decades rather than weeks. Reserving for environmental impairment liabilities will require that actuaries develop models to deal with exposures that are not necessarily independent by year.

The Best Solution--Research, Research, and More Research

For past losses, perhaps the best hope is meaningful Superfund reform that would shift the burden of payment for retroactive losses to one of the proposed "no-fault" trust funds. Whether financed by taxes on industry or insurers, such a fund would immediately decrease insurers' exposure to unexpected, unreserved-for EIL losses.

For more recent losses we must work toward attaining the Perfect World of the Future.

Except for those carriers actively writing EIL business, we can only make heroic assumptions about loss potential and loss emergence. These estimates must be tested constantly against emerging loss data. Then new parameters will be used until they are refined by later data. Uniform EIL data collection standards, such as those under development by the American Society for Testing and Materials, may assist in this effort.

We must also be vigilant in our review of case law and technical journals. Reserve estimates must reflect, to the degree possible, changes in theories of liability and improvements in the technology for dealing with contamination. Technological breakthroughs in detection and remediation techniques can raise costs or lower them--either way we must be aware of them.

We can begin now to develop databases for GIS on two fronts.

First, we can work with existing GIS to look for systems most compatible with the industry's other underwriting needs. Then we can work with these systems to add elements that will increase the systems' utility to the insurance industry. As with any new industry, the GIS field is teeming with start-up companies, each with its own specialty.

Various government agencies, too, offer information such as flood zones, aerial and satellite photographs, and USGS maps that could provide valuable data if fed into GIS. By picking and choosing among the "best of the best," GIS could be enhanced to include important information on water, soil, and topography.

Second, we can use existing underwriting, loss control and claim files to begin compiling the information necessary to make the parameter estimates that will be needed for the reserving techniques. Information from these files, in conjunction with on-site inspections, should allow at least rudimentary correlation of cleanup costs/damages paid with distance of the site from the pollutant. On-site inspections may also increase our understanding of the relationships between topography, hazard types, and speed and path of pollutant migration. Insurer files and inspections are not the only potential sources of this information. Information on site use and existing pollutants has been collected by real estate lenders and securities firms. Environmental engineers can contribute estimates of average remediation costs. A diligent search will undoubtedly uncover further sources of historical information.

Conclusion

The ultimate costs to clean up environmental contamination in this country will be staggering. If the property/casualty insurance industry remains potentially liable for unanticipated and unfunded retroactive environmental impairment liabilities, it must aggressively search for the means to identify and quantify those exposures. Future actuarial research should center on how to accomplish this task.

The expansion of current environmental databases and the development of models and simulation routines needed to estimate parameters for EIL reserving pose considerable challenges for the members of the Casualty Actuarial Society over the next several years.

We urge the talented minds of the CAS to work on combining new reserving techniques with GIS technology to ensure that balance sheets can be adjusted realistically to reflect possible liabilities for policies written with pollution coverage or without pollution exclusions.