

# Risk Management REVIEW

Wharton

RISK MANAGEMENT  
AND DECISION  
PROCESSES CENTER  
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## Third Party Auditors on a Broader Range

Approximately 15,000 facilities in the United States using hazardous chemicals in their regular business are registered under section 112(r) of the Clean Air Act (the Rule). To ensure that these facilities have good safety management programs in place, use sound work practices for not releasing hazardous chemicals accidentally, and have excellent plans with emergency response personnel for responding to releases that do occur, it is necessary that these facilities be evaluated on a regular basis. For the federal government that is impossible. For this reason EPA would like to have a method for dealing with this difficult regulatory problem, a method that would be legally and economically sound and that would protect both human life and the environment.



*James C. Belke, EPA's Chemical Emergency Preparedness and Prevention Office (CEPPO), addressing the possibility of revising the regulations associated with section 112(r) of the Clean Air Act to allow state and federal agencies use of third party auditors.*

In an effort to determine if market forces can be used to evaluate facilities regulated by the Rule, Wharton has been part of a task force consisting of EPA's Chemical Emergency Preparedness and Prevention Office (CEPPO), Delaware's Department of Natural

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## Risk Center on the World Wide Web

Visit the Wharton Risk Management and Decision Processes Center's homepage on the World Wide Web at:

<http://opim.wharton.upenn.edu/risk/>

The Wharton School  
University of Pennsylvania

## Academic Research Centers as Neutral Parties: Listening to All Sides

Since its inception, the Wharton Risk Management and Decision Processes Center has encouraged a diversity of views with respect to risk management issues that affect society. We perceive ourselves, and hopefully are perceived by others, as providing a neutral setting for bringing together key representatives from public interest groups, private sector firms and organizations, and regulatory agencies at the city, state and federal levels.

The Center's interest has been to facilitate a discussion through a series of roundtables on programs and policies for dealing with risk-related problems. Our goal in having these roundtables is to find points of consensus across the different groups participating so that initiatives can be implemented that will improve the well-being of society.

Over the past six years, we have had a series of roundtables on the role of market mechanisms and risk management plans in enforcing government regulations. There has been a focus on the role that third party inspections coupled with private insurance can play in reducing environmental risks from industrial facilities. The specific context has been the implementation of Section 112(r) of the Clean Air Act Amendments of 1992. Chemical and other industrial



Howard C. Kunreuther

facilities are required to perform a hazard assessment and to submit a summary report, called the Risk Management Plan (RMP), to the U.S. Environmental Protection Agency (EPA).

There has been a very open and wide ranging discussion by roundtable participants

of the challenges in having companies design RMPs that reduce their environmental risks and lower the chances of worst case scenarios (e.g. another Bhopal-like chemical explosion). But the policy questions are much broader than Section 112(r) and the EPA. They concern the role of public-private partnerships for dealing with environmental risk. The question of the appropriate role of government and the private sector in improving the quality of life is at the center of a wide-ranging debate in Washington, DC today.

At the most recent Risk Center roundtable in January 2001, there was considerable interest in the use of third parties and insurers in implementing RMPs. To illustrate how such a system would work, consider a chemical facility that would like to purchase environmental insurance to protect itself against the costs associated with future chemical accidents. The insurer would hire a certified third party to inspect the firm. Both the insurer and firm would receive a copy of the third

party's report. The report may recommend a set of actions that the firm should take to improve its operations, and the insurer is likely to make coverage conditional on the company making these changes.

The key question on the table is whether the inspector has an obligation to release its report to the regulatory agency, in this case the EPA. As with many controversial issues, several viewpoints have been voiced on this question publicly. There are some who feel that the inspector must report to the EPA any problems that the firm may have after giving them a reasonable period of time to clean up their act. This group contends that there is a need for the EPA to know which companies are operating in a non-safe manner. Others feel that if the inspector were obligated to release his or her report to the EPA, then few firms would voluntarily undertake an inspection. Furthermore, this group claims that high-risk firms have economic incentives to improve their operation after an inspection, so they can obtain insurance and at the same time reduce the chances that their workers or residents living near their plants will be harmed by a future accident.

Today the EPA has limited personnel for enforcing regulations. Therefore, it is unclear how many firms will actually be audited by the EPA if the status quo prevails. Under a voluntary system of reporting, those firms who are given a clean

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## Environmental Management and Operations Management

Continuing concerns about the impact of company operations on the environment and on the health and safety of employees and community residents have led to a significant increase in interest in research at the intersection of environmental management and operations (EOM). In recognition of the significance of these problems, I have just finished co-editing with Charles Corbett of UCLA two special issues of *Production and Operations Management* on EOM.<sup>1</sup> Since this venture was supported by the Risk Center and several of our corporate associates contributed their energies to reviewing these papers, I thought it appropriate to provide a brief overview of the principal themes presented in these two issues.

**Reverse Logistics, Remanufacturing and Supply Chain Design:** A significant new source of profits from EOM has been the growth of remanufacturing and other eco-supply chain initiatives. Beginning in Europe with product return and recycling legislation, and fast spreading to other parts of the planet, the basic logic was simple: some parts or components of products have a longer economic life than a single use. Redesigning logistics networks to accommodate product returns and remanufacturing and reuse of such parts and components can be quite profitable. In the U.S. alone, remanufacturing is already a \$50 billion/year industry. This is clearly of central concern to operations management and papers

in these issues illustrate some of the challenges for EOM in this area, including: integrating remanufacturing with internal operations and supply chain design, and integrating product design and product take-back.

**Liability and Negligence:** Given the continuing importance of liability for poor environmental performance, it is not surprising that innovations in risk management have focused on supply chains and internal operations. Several papers in these issues focus on the benefits of linking employee health and safety with risk reduction and risk communication initiatives.

**Integrated Management Systems for Operations and EH&S:** Concerning new management systems to promote EH&S excellence and sustainable industrial practices, the papers in these special issues investigate two important themes rooted in operations. The first is lean production, the process of discovering and eliminating waste, originally focused on time, quality defects and excess inventory, but now being used effectively to ferret out environmental wastes. The second source of synergy is between quality and environmental management systems, focused on Enterprise Resource Planning (ERP) systems, and on the Environmental Management System (EMS) under the international standards ISO



Paul R. Kleindorfer

14000. ISO 14000 began development in 1991, after the successful deployment of ISO 9000 standards, and the aspirations underlying ISO 14000 were motivated by the experience with ISO 9000. While it is still too early to say whether there is a strong business case for ISO 14000, there are several

promising indicators in the research presented here that it may, especially when coupled and preceded with the implementation of ISO 9000.

The research published in these special issues represents the current state of EOM amongst an active and growing research community in operations management. New frontiers include, foremost, the use of internet technologies to improve shared knowledge about industrial impacts on the environment, globalization of supply chain and sourcing activities, and the continuing advancement of the science of accident epidemiology and risk analysis. The paradigm of EOM will clearly continue to evolve as researchers and practitioners attempt to meet these new challenges. The bottom line from the papers in these POM special issues is that EOM has become a very fertile area for capturing large synergies between excellence in operations and excellence in EH&S management. ■

— Paul R. Kleindorfer  
Co-Director

<sup>1</sup>These issues will appear in the summer and fall of 2001. Interested readers can obtain further information on the papers discussed here from the Risk Center.

## Will Playing Video Games Reduce Risk?

As complexity grows, risk management requires organizations to shift from top down command and control to decentralized management — to rely on co-evolving, self-adaptive sub-groups and individuals. New approaches are needed to sustain, de-bias, and enhance the performance of these distributed, emergent parts so that the whole improves its risk management capability. They require an understanding of individuals' decision processes and then designing decision aids for improving their choices. This is a broad research area of interest to both the Ackoff Center for the Advancement of the System Approach (ACASA) and the Wharton Risk Management and Decision Processes Center (WRMDC). We have begun to explore some of these issues in the context of the WRMDC project on learning from chemical and other industrial accidents that almost occurred (see the description of the Near-Miss Project in the Newsletter), which ACASA partially supports. We are just in the early stages of learning how to improve risk management for society through better understanding and support of individual and organizational decision processes.



Barry G. Silverman

Given space limits, I omit discussing novel ways that organizations can learn from their parts, and restrict my remarks to the transfer of lessons learned to individual decision makers. In particular, I would like to focus on the design of video games as one of a number of types of de-biasing and

judgment-enhancing “interventions” for risk mitigation and performance improvement in social settings (e.g., teen violence in schools), in healthcare situations, in industrial operations, etc. Let me explain one of these in some detail — the “Heart Sense (HS) Game” sponsored by NIH/National Library of Medicine.

Heart disease is the number one killer in America, and one of its most resistant aspects is delay in those experiencing symptoms in seeking treatment. Medicines available today can mitigate the effects of heart attacks if given rapidly, ideally less than 60 minutes after an attack. Yet subjects delay an average of 4 to 12 hours before arriving at an ER. Media campaigns, Red Cross videos, as well as physician counseling, have all been unable to reduce this delay. These materials are top-down/didactic and require passive listening. Even if “ingested” before an episode, they are soon forgotten and ignored when a

heart attack occurs. Little knowledge transfer occurs, and behavior is not shifting.

The obstacles arise not just from poor symptom recognition and misdiagnosis, but also due to social issues (e.g., peer pressure, being labeled a hypochondriac), attitudinal problems (e.g., denial, bias), and efficacy concerns (e.g., lengthy ER waits, ability to pay). The HS Game is an attempt to design a judgment de-biasing intervention that can peel away these issues (e.g., denial and misdiagnoses, misperceived peer pressure, fear of being viewed as a hypochondriac, and many more), and shift decisional intent to reduce risk by reducing delay. The game involves having the users gain skills they can transfer to the real world by encountering virtual characters in a village and by trying to convince them to overcome (a Markov chain of) their delay issues. We also hypothesize that an animated, pedagogical agent with full emotive capabilities (facial expression, body language, voice, humor, empathy, etc.) leads users to better short run performance as well as to greater knowledge retention when deployed as an intermittent companion.

The results from prototype testing offer evidence that the fully emotive versions of the game do noticeably better in improving intention shift and lead to greater changes in before- vs. after-game

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## Chemical Safety: A Partnership Among Stakeholders

During his tenure as Administrator of the Environmental Protection Agency, Bill Ruckelshaus once observed "...to carry out the work of environmental protection through a process of claim and counterclaim, suit and countersuit is wasteful, expensive and exhausting. There must be a better way".



*Jim Makris*

Fifteen years ago, those words still resonated in the minds of EPA staff as they ventured into the area of chemical accident prevention, preparedness and response following the terrible disaster in Bhopal.

"...a better way" became the foundation of an extraordinary effort undertaken by the Federal Government, state and local governments, scientific institutions, academia, industry, workers and their organizations, public interest groups, emergency managers and the community. "a better way" began opening a continuous focused dialogue among all stakeholders, and especially between the community and the local industrial facilities. The dialogue resulted in higher levels of local response capability, better planning and preparedness, and a greater understanding of risk and the actions that lead to risk reduction.

These activities had multiple stimuli. Not only did the Federal Government develop national

legislation and regulations including community right to know and risk management planning, but states also developed parallel legislation and established a network of State Emergency Response Commissions (SERCs) and Local Emergency Planning Committees (LEPCs) to assure that

the information was available, and to manage and foster the open discussions among the stakeholders.

Importantly, the private sector stepped forward and initiated vital programs dealing with information to the public regarding risk. The Chemical Manufacturers Association (now the American Chemistry Council) established the Community Awareness and Emergency Response (CAER) process which encouraged facilities to openly discuss safe practices and risks and also to establish local committees. This initiative later was blended into the chemical industry's "Responsible Care".

During the past decade, the number and skill of individuals and institutions that have taken this journey toward chemical safety has continuously expanded. Through the work of the United Nations Environmental Program (UNEP), the Organization for Economic Cooperation and Development

(OECD) and the European Union (EU), similar programs have evolved within the industrialized and industrializing nations of the world.

The Risk Management and Decision Process Center at the Wharton School has been our constant companion on this journey. The Center performed seminal work on "CARAT", a computer based thesaurus of chemical safety terminology as used in different cultures and legislative/regulatory processes throughout the world. This was conducted for the EPA and the OECD and was guided by an international panel of experts. The system is now operational and managed by OECD in Paris.

The analytical techniques of medical epidemiology are being applied to chemical safety through careful examination of accidents and incidents to identify trends and similarities. As a result of this undertaking at Wharton's Risk Center, we hope to be able to detect accident patterns and initiate actions to prevent their reoccurrence. In this work, the Risk Center also expects to incorporate the work of another project dealing with the effective use of "near miss" information. For too many years, much of the broadly shared information on accidents, including root causes, has been limited to actual and significant events. Accidents that almost happened, or near misses, may well provide a bountiful source of data regarding systemic breakdowns.

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## Third Party Auditors on a Broader Range

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Resources and Environmental Control (DNREC), and EPA's Region III. The objective of the task force is to investigate whether third party auditors can be used to evaluate facilities responsible for the Rule. The task force wants to determine if a third party auditor can evaluate the Risk Management Program under which facilities must operate, and the Risk Management Plan which facilities must submit.

To evaluate the effectiveness of third party auditors, the task force conducted experiments in ammonia refrigeration facilities and chlorine water treatment facilities in both Delaware and Pennsylvania. Delaware was selected because it has had a state law since 1990 that requires DNREC to conduct process safety inspections. Pennsylvania was selected because it does not have similar inspection



*Kathy Jones, EPA's Chemical Emergency Preparedness and Prevention Office (CEPPO), commenting on how best to extend the work done in Delaware and Pennsylvania.*



*Mikal D. M. Shabazz, EPA Region III, reporting positive results from the third party pilot experiment conducted in Pennsylvania.*

requirements. From a list of individuals provided by Wharton, third party auditors were selected for the experiment in Delaware by DNREC, and for the experiment in Pennsylvania by Region III. Individuals were given two days of training by DNREC in Delaware and Region III in Pennsylvania before they were assigned to audit any facility.

At a roundtable meeting in Wharton on January 26, 2001, Bob Barrish, DNREC, and Mikal Shabazz, Region III, reported that the third party auditors produced excellent results in Delaware and Pennsylvania. Considering that third party auditors functioned well in Delaware and Philadelphia, many individuals asked how third party auditors could be used more broadly, considering that 37 states have refused to implement the Rule and EPA has limited human resources for doing so.

Jim Belke, CEPPO, raised a number of legal questions on how best third party auditors might be certified and evaluated if EPA modifies the regulations of the Rule. Allan R. Fierce and Brian P. Moran explained how the Commonwealth of Massachusetts has used third party auditors for the past five years. Massachusetts has used third party auditors, known as Licensed Site Professionals (LSP), to manage and oversee the assessment and cleanup activities required by its Department of Environmental Protection. Massachusetts has licensed approximately 500 LSPs to successfully address the clean-up of many non-Superfund sites that have been contaminated by the release of chemicals to the ground or to the groundwater. In Massachusetts the use of LSPs has been excellent.



*Sally Mattison, Clean Air Council, discussing the needs of communities relating to third party auditors.*

A number of people raised questions about how much third party auditors might cost if small facilities use them. Marc Halpern and Jim Splain estimated that if a facility was a client of an insurance company, the insurance company would provide an auditor without cost. The insurance company would be interested in improving the operation of the facility in order to lower both the frequency and cost of potential accidents. If the facility were not a client of the insurance company providing the third party auditor, the cost would be approximately \$125 an hour. How long it would take to conduct a complete audit would depend on the nature of the facility.

One of the complicated questions raised by the group was whether communities would be interested in having third party auditors report on the operation



Syd Havely, Rohm and Haas Company, reporting on the role of the community.



Allan R. Fierce and Brian P. Moran, Board of Registration of Hazardous Waste Site Cleanup Professionals, Commonwealth of Massachusetts, explained how Massachusetts has used third party auditors for the past five years.

of a facility. The role of the community is always a concern whenever an agency considers changing environmental regulations. To address this issue, Syd Havely, Rohm and Haas Company, reported that he attempted to find out what the public thought, what is important to them, and how important is the community opinion. The findings that he developed from his questions were interesting:

- 100% believe safety is a major community concern.
- 90% believe that more information on plant safety is needed on the facilities, and that this would be useful in the community.
- 30% believe that third party auditors would have “very high trust and credibility”

in the community; 60% believed third party auditors would have “somewhat high credibility” in the community.

The consensus of the participants at the roundtable was that the operational success of third party auditors in Delaware and Pennsylvania should be extended to the national community. The group also recommended that Wharton and the task force do whatever is necessary to address the legal, financial and community concerns that are necessary to promote third party auditors to all facilities registered under the Rule. ■

## Near-Miss Project

The Near-Miss Project has been expanding rapidly. This is all the more impressive as it was conceived only one year ago at our regular Advisory Committee meeting, and since then has received support from US EPA CEPPPO office, the Learning Laboratory at the Wharton School, the Ackoff Center for Advancement of the Systems Approach at the University of Pennsylvania, and corporate participants.

The initial findings have already caught the attention of large corporations and small businesses alike in the international arena. The presentation of James Phimister (Postgraduate Fellow at the Center) and Ulku Oktem on “Design and Implementation of Successful Near-Miss Programs” has been accepted for an educational session in the upcoming AIHA Conference in New Orleans, June 2001. We will also have a booth (Booth #2649) where we will have an opportunity



*Ulku Oktem and Paul Kleindorfer discussing Phase II of Wharton's Near-Miss Project with participants.*



*Chrysoula J. Komis, OSHA, commenting on company compliance assistance at OSHA.*

to display the Center's activities and discuss the Near-Miss Project's progress with a large number of meeting attendees.

The first product of Phase II is a “**Near-Miss Self-Audit Tool**”. This comprehensive audit system includes two different questionnaires. One is designed for employees and is recommended for both line and management ranks. The other is for EH&S personnel to fill out themselves. Guidelines are provided to assess the responses to each question in either form. The step by step process helps to convert the results into a format that would identify gaps in the system. Finally, the comprehensive guideline section provides best practices as tools to benchmark and to close the identified gaps. Currently, the “Self Audit Tool” is only available to the project participants in hard copy. Our future plans include converting it into an intranet-based software for timely, quick and corporate-wide implementation.

On April 6, 2001 we held a mid-term project review meeting for Phase II. The objectives were reinforced as:

- Developing a Near-Miss Management System that can be implemented easily and intuitively.
- Developing tools to integrate this Near-Miss Management System seamlessly into the overall management culture to improve the total corporate performance.
- Linking existing accident analysis methods and accident epidemiology framework with Near Miss.
- Understanding what statistical tools and analytic methods might be compatible with current company cultures.

In evaluating statistical and analytic tools, we envision linking the near-miss system to total corporate EH&S management systems at two levels. Level one



*Grover A. Vós, ATOFINA Chemical, Inc., commenting on the adoption of prototype software.*

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## Advisory Committee Meeting

The Center will hold the semi-annual meeting of its Advisory Committee on Thursday, June 14, in the Terrace Room, Logan Hall, on the campus of the University of Pennsylvania. The meeting will start at 8:30 am and adjourn at 3:30 pm.

The meeting will begin with a review of the Center's research initiatives, including an overview of the following:

1. Cat Risk Project
2. EPA Cooperative Agreement
3. Other On-Going Research
4. Near-Miss Project
5. Accident Epidemiology
6. Third Party Audits

Our luncheon speaker will be Eric W. Orts, Director of the Environmental Management Program and Professor of Legal Studies in the Wharton School at the University of Pennsylvania. He will speak on the Wharton-WRI

sponsored Bell Conference "*Emerging Digital Technologies: Opportunities and Risks for Business, Society and the Environment*".

This will take place at Wharton, July 19–21, 2001. The Center is actively involved in the planning of this Conference and would like to have as many of its Corporate Associates as possible attend.

After lunch the Advisory Committee will break into small groups to discuss research challenges associated with the theme of the day "Markets and Regulations for Efficient Risk Management".

Three groups will be convened:

1. Integrating risk management tools from finance with operations (e.g., weather derivatives and other financial hedge instruments, new forms of contracting).

2. Market-driven and Market-enabled Regulation (from Third Party Audits to Insurance to Reputation effects from ISO 14000 certification).

3. Risk Management and Risk Bearing for Extreme Events (Catastrophe insurance, near-miss and accident prevention activities, Management Systems Innovations).

Philip Lewis, President of the Advisory Committee, will conclude the meeting discussing Future Plans for the Center. ■

## Will Playing Video Games Reduce Risk?

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knowledge about symptoms and delay issues. The prototype passed scientific review by the American Heart Association, and focus groups of physicians stated that if widely disseminated it would lead to ERs being filled to capacity with cardiac patients. If these early results are confirmed through rigorous follow-up, there may be significant potential in this type of interven-

tion for improving web-based EH&S training, accident prevention and near-miss programs, and perhaps contributing to decision-making more generally. Research on ways to leverage advances in communication technology to align behaviors and attitudes of stakeholders towards good health and safety practices is one of the several areas of mutual interest between the Ackoff Center

for Advancement of the Systems Approach and the Wharton Risk Center. We look forward to working together on these and related issues over the coming months. ■

—Barry G. Silverman

*Barry G. Silverman is Director of the Ackoff Center for Advancement of the System Approach (ACASA) in the School of Engineering and Applied Sciences (SEAS) at the University of Pennsylvania.*

## Wharton Managing Catastrophic Risk Project

The Wharton Managing Catastrophic Risks Project held a Sponsor's meeting on May 11, 2001, where both its current research activities as well as future plans were discussed. Here are the highlights of the topics discussed at the meeting:

Paul Kleindorfer presented the results of new analyses for the Florida and New York markets for catastrophe insurance, including updated income and price elasticity results. Topics for discussion included competition, regulation and company strategies for bundled homeowner policies in a market in which unbundled coverage is also offered.

The study results are co-authored by Martin Grace and Robert Klein of Georgia State University.

Howard Kunreuther then discussed the status of a book on **"New Approaches to the Management of Natural Hazards"** which is being written jointly between Applied Insurance Research (AIR), EQECAT, Risk Management Solutions (RMS) and the Wharton team. The book will explicitly address uncertainty in the context of formal risk assessment models and bring together the collective wisdom of the three leading firms in this area (AIR, EQECAT, RMS) with the Wharton team on how to deal with uncertainty as well as linking science with policy. It will illustrate linkages



*Partially collapsed building due to fire damage.*

of risk assessment and risk management as well as how uncertainty affects the analysis of mitigation using three model cities (Oakland, CA; Long Beach, CA; Miami/Dade County, FL) as well as rate making, insurance portfolio decision making, and risk financing. The audience for this book would be a sophisticated risk manager who has some appreciation for the role that modeling and quantitative analysis can play in improving the decision-making process. The book could also be used in courses in risk management. It is anticipated that the book will be completed by the end of this coming fall.

David Cummins then discussed a study on basis risk coauthored with David Lalonde of Applied Insurance Research and Richard Phillips of Georgia State. It simulates hurricanes using the Applied Insurance

Research Hurricane model and utilizes exposure data on nearly all homeowners' insurers writing insurance in Florida to analyze the effectiveness of index-linked CAT option spreads in hedging hurricane risk. The study finds that most insurers can hedge efficiently using 4 intra-state regional index contracts.

In the afternoon, discussion turned to new areas of research in the financing and management of extreme hazards led by Neil Doherty and Cummins. New techniques based on option pricing, demand theory, and contract theory are being used to design new instruments and financial strategies for dealing with extreme risk. Some of these new ideas include contingent equity, contingent leverage, second risk, capital determination, capital allocation, and return on risk capital.

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## World Bank Conference

On January 8–10, 2001 the Provention Consortium of the World Bank sponsored an international conference at the World Bank in Washington, DC on “Innovations in Managing Catastrophic Risk: How Can They Help the Poor?” It was co-organized by the Wharton Risk Center in conjunction with the Financial Sector Development Department and the Disaster Management Facility of the World Bank, and was designated as a Wharton Impact Conference. The meeting brought together leading academics, development practitioners, private sector leaders, and public policy experts to examine issues surrounding the management of catastrophic risk in emerging economies.

The overall goal of this two-day conference was to explore the role of mitigation, instruments for disaster risk transfer and their relevance for protecting the poor from disaster impacts. Case studies illustrated the challenges and opportunities for utilizing new approaches for reducing disaster losses. Additional commentary focused on the special problems of managing disaster losses in low-income areas and developing mitigation strategies and their links to insurance and new financial instruments.

Other presentations examined the role that risk transfer mechanisms can play in promoting awareness and investment in disaster mitigation measures, and their potential effectiveness in insulating the poor from disaster impacts. Presenters discussed both traditional and non-traditional mechanisms for transferring or financing risk, and answer the following questions: How can these instruments help developing country governments to reduce disaster risk? How can they directly help the poor to manage risk?

Participants also discussed how new developments in the field of disaster risk management have changed the way one thinks about natural disasters in both developed and developing countries. Discussion examined the role that technology and modeling are playing in quantifying the risks associated with natural hazards and the role of new financial instruments in providing protection against catastrophic losses from a future hurricane, earthquake or other natural hazard. There was also a spirited interchange between participants on the role that mitigation and loss prevention can play as part of a hazard management strategy and how they can reduce the magnitude of future disaster losses.

During the last part of the conference, small group break-out sessions built on the major themes of the conference and related them to reducing the vulnerability of the poor to disasters. Discussion explored some ongoing case studies and focused on their impact in helping the poor reduce risk, and issues for future development. Moderators from each breakout session then made brief presentations on the main conclusions of their discussions at a concluding plenary session. An open discussion followed on recommendations for future research, policy, operational programs and potential products. ■

*For an Agenda and details on this conference, visit the Provention Consortium's website at:*

**[http://  
www.proventionconsortium.org/  
conferences/innovations.htm](http://www.proventionconsortium.org/conferences/innovations.htm)**

## Accident Epidemiology and Environmental Justice

The Accident Epidemiology Project has as its primary objective the development of approaches that will maximize preventive learnings from government and industry investigations of accidental chemical releases. Current activity is concerned with the use and development of the epidemiological approach utilizing the RMP\*Info database which was made available to Center researchers by the U. S. EPA/CEPPO following the initial submission deadline of June 21, 1999 under section 112(r) of the Clean Air Act Amendments of 1990.

Initial analytic results have investigated the relationships between the following factors:

- The characteristics of the facility itself, including facility location, size and the type of hazard present (as characterized by the chemicals and process used, the training and management systems in place, and other facility-specific characteristics);
- The nature of regulations in force that are applicable to this facility and the nature of enforcement activities;
- The socio-demographic characteristics of the host community for the facility, which characteristics are intended to represent the level of pressure brought on the facility to operate safely and to inform the community of the hazards it faces.

These initial results point to interesting statistical relationships between accident rates and the

characteristics of the facility and applicable regulations. I want to report here briefly on the last named set of factors related to ethnicity and socio-economic characteristics of the surrounding neighborhood of a facility. Several previous empirical studies have suggested that the ability of a community to engage in collective action, which is often thought to be strongly associated with the socio-economic status (SES) of the community, may be taken into account by firms in their location or capacity expansion decisions. One consequence of this is the possibility that less influential socio-economic groups may face an inordinate burden in the location of risky infrastructure in their vicinity.

Our analysis of the RMP\*Info database provides some support for this possibility. The results of our analysis on RMP\*Info provides evidence that higher-risk facilities, while bringing economic benefits to a greater surrounding community, are more likely to be found in counties with substantially poor and/or minority populations to which the collateral environmental, property, and health risks are less likely to be countered by community resistance. An alternative though related perspective is that communities burdened by low SES and past and present discrimination are willing to accept these risks (or that those not willing to do so leave) in order to obtain the economic benefits of nearby facility location. Our results further suggest that lack of higher education is at least as important a

factor as race in driving the risk-SES location (or relocation) patterns identified in our study.

The initial findings here suggest the continuing importance of company-community interactions, in addition to internal risk mitigation, in improving preparedness and prevention of accidents. This is for the obvious reasons of informing those exposed to the risk of hazardous facilities, but also for reasons of responding appropriately to concerns related to environmental justice.

Next steps in the accident epidemiology project will be to analyze process and chemical characteristics as precursors of accident rates. As an extension of this work, we will also consider specific sectoral studies as well as the association, if any, between the financial characteristics of the parent company of a facility and the frequency or severity of accidents. Sectoral studies may be of interest also in triangulating accidents with near-miss data (see page 8 in this newsletter for a discussion of our near-miss project).

For further details on the environmental justice results reported above, download the entire paper from the Center's website: Michael R. Elliott, Paul R. Kleindorfer and Robert A. Lowe, "Environmental Justice Revisited: Community Pressure and Frequency and Severity of U.S. Chemical Industry Accidents", Working Paper, The Wharton Risk Center, May, 2001. ■

## Academic Research Centers as Neutral Parties: Listening to All Sides

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bill of risk by the inspector have an incentive to release their report to the EPA. The EPA should want to audit those firms who do not submit an inspection report. The more firms that release their third party report, the greater the chances that the EPA will audit a non-compliant firm.

There are challenges associated with implementing a voluntary system of inspection. What happens if the third party discovers a situation in the firm that is life-threatening? If the company does not take actions to reduce this risk to an acceptable

level, is the inspector duty-bound to report this to the regulatory agency? Is the inspector liable if an accident occurs and he hasn't reported the risk to the regulatory agency? Unless these questions are resolved in a way that satisfies groups opposed to voluntary inspections, it may be difficult to implement this proposed private-public partnership.

Those of us associated with the Risk Center are most interested in working with public and private sector agencies, organizations, and groups to reduce environmental risk.

We feel that the roundtables have been most useful in bringing key issues to the fore, such as those noted above. Those of us in the academic community who are involved in the highly charged area of risk need to hear all sides of the question with an open mind. Otherwise, we will have lost the opportunity to serve as neutral parties and help facilitate solutions that could be win-win, not only for society but for most, if not all, the concerned stakeholders. ■

— **Howard C. Kunreuther**  
*Co-Director*

## Chemical Safety: A Partnership Among Stakeholders

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Finally, an exciting new initiative is under development within the Center regarding the use of third party audits for chemical safety. A pilot project, jointly between the State of Delaware, EPA and the Risk Center has been underway for several months. At a Wharton Roundtable earlier this year, the efficiency, effectiveness and impact of developing a voluntary program to achieve compliance with appropriate standards and practices in chemical safety was discussed and a considerable amount of enthusiasm emerged from many of the stakeholders. Such an undertaking could help satisfy the important obligation of public authorities to create and manage effective safety programs

universally, but also provide an opportunity to focus expert attention on the major areas of risk. This discussion is continuing intensely at this time. Additional roundtables and stakeholder meetings will be held as this notion matures.

The foundation for these last actions was laid several years ago. Open discussion among all parties has fostered a higher level of trust and provided a framework for innovative thinking by us all. While this paper focused on some Wharton work, Texas A & M, the Center for Chemical Process Safety, the National Safety Council, the World Environment Center, Tufts and MIT and other institutions have all been important partners in this

undertaking. Together, we are improving our knowledge of the nature of the risks posed by chemical accidents and, with this information, moving toward a better understanding of how to prevent them. The public, the community, and all stakeholders are vital participants as we move toward the statement of Thomas Jefferson that people "...are inherently capable of making proper judgments when they are properly informed". ■

— **Jim Makris**  
*Jim Makris is Director of EPA's Chemical Emergency Preparedness and Prevention Office. He has been a Special Advisor to the Center's Advisory Committee for several years.*

## Near-Miss Project

*continued from page 8*

would be based on similarities between management of near-misses and incidents at each step of processing an event. Here we focus on statistical tools that help improve both systems. Level two deals with processing the data collected by the combined near-miss and incident systems. Here we draw on similarities between the quality control data processing and near-miss/incident data analysis.

The key product of Phase II is going to be a prototype Near-Miss Management Software that incorporates all the critical issues our near-miss studies have identified, and builds on the recommendations we have made from best practices. We will develop the

product to be easily adaptable to our corporate members' systems. The product will be available at the end of August.

Our future study plans include developing knowledge management modules for the prototype software, as well as expanding the near-miss management concept into global markets and looking into international education and applications. ■

*Phase I results can be found on the Center's web site:*

<http://opim.wharton.upenn.edu/risk/wp/wplist00.html>

*Organizations that want more detailed information or want to participate in the project should contact Ulku Oktem: [oktem@wharton.upenn.edu](mailto:oktem@wharton.upenn.edu)*

## CORPORATE ASSOCIATES

The Corporate Associates program is a vital part of the Risk Center's operation. Corporate Associates sit on the Center's Advisory Committee, participate in roundtable discussions, and offer information and insight into the value, direction and timing of research projects. In addition, Corporate Associates provide the Center with important financial support.

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## Wharton Managing Catastrophic Risk Project

*continued from page 10*

Kleindorfer and Kunreuther then reported on the January World Bank Conference on "Innovations In Managing Catastrophic Risks: How Can They Help The Poor?" held at the World Bank in January 8–10, 2001. (For more details on the Conference, see the column on page 11 of this Newsletter). Building on the themes of the conference, there ensued a discussion on plans for this project to undertake analyses of the role of mitigation and risk

transfer mechanisms for residences and infrastructure in other parts of the world (e.g. Japan, Turkey, China).

Sponsors and Cooperating Partners of the Managing Catastrophic Risk Project include Applied Insurance Research, American Reinsurance, EQECAT, Insurance Services Office, Property and Casualty Rating Organization of Japan, Risk Management Solutions, State Farm, Swiss Re, Tokio Marine and Fire Insurance Company, and USAA. ■

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## Keeping in Touch

If you would like to be added to our mailing list, please telephone, mail, e-mail or fax the information at right to Kate Fang in the Risk Center (telephone, 215-898-1212; fax, 215-573-2130; e-mail, [fangf@wharton.upenn.edu](mailto:fangf@wharton.upenn.edu)). If you want to be removed from our mailing list, please let us know.

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