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16. Abstract (Limit: 200 words) A summary of two case studies of risk management, one involving seismically substandard buildings in Los Angeles and one involving risks from drinking water, is presented. While state government is shown to be responsible for controlling contamination of drinking water, resource limitations require a major Federal role in providing the necessary scientific information. Seismically substandard buildings exemplify a class of risks of accidental death which local government is generally not managing. The process of risk management is defined as usually involving these steps: (1) hazard identification; (2) risk quantification; (3) comparison with other risks; (4) policy formulation and implementation; and (5) risk monitoring and intervention. The study found that local governments involved in risk management practiced only the last step. Local governments were also found to practice risk management by reaction to some emergency. The methodology of risk management is examined and policy alternatives are considered.			13. Type of Report & Period Covered
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EXECUTIVE SUMMARY

for the
National Science Foundation Project

"Alternative Risk Management Policies for
State and Local Governments"

under Grant PRA 79-10804

Principal Investigator: David Okrent

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PREFACE AND ACKNOWLEDGEMENTS

This report is the executive summary of the final report for the project entitled "Alternative Risk Management Policies for State and Local Governments" which was performed by the University of California, Los Angeles under Grant No. PRA 79-10804 from the National Science Foundation, beginning in the summer of 1979. Five topical reports were also prepared as part of this project. The titles and numbers of all the reports are as follows:

Final Report, Alternative Risk Management Policies for State and Local Governments	UCLA-ENG-8240
Executive Summary, Alternative Risk Management Policies for State and Local Governments	UCLA-ENG-8241
Risk Management Practices in Local Communities: Five Alternatives, M.W. Meyer and K.A. Solomon	UCLA-ENG-8242
Management of Risks Associated with Drinking Water at the Local and State Levels, K.A. Solomon, M.W. Meyer, P. Nelson, J. Szabo and R. Tsai	UCLA-ENG-8243
Risk Management Policy for Earthquake Hazard Reduction, R.K. Sarin	UCLA-ENG-8244
Classification of Risks, K.A. Solomon, M.W. Meyer, P. Nelson and J. Szabo	UCLA-ENG-8245
Problems of State and Local Risk Management: An Overview, W. Bordas	UCLA-ENG-8246

The research team for the project included participants from Decision Research; the University of California, Riverside; and the University of Southern California. David Okrent served as principal investigator.

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EXECUTIVE SUMMARY

1. INTRODUCTION

A study of current practice at the state and local level with regard to the management of risk to public health and safety is described and some proposals for possible improvement in current practice are considered. Only risk management in the preventive mode, as distinct from the emergency response mode, is considered herein, and only involuntary risks, as distinct from occupational or voluntary risks, are considered. Risk management, in our usage, is distinguished from insurance management in that the latter anticipates financial liabilities arising from nonfeasance or malfeasance affecting both lives and property. Risk management, in our usage, is unconcerned with fault in the legal sense and tries to anticipate losses to life and health, but not property, as a means of devising corrective strategies.

The study of current practice included unstructured interviews and a questionnaire posed to a limited sample of state and local officials. It also included two case studies, one of seismically substandard buildings in Los Angeles, and one involving risks from drinking water and some associated problems arising from the disposal of hazardous chemical wastes.

As should be anticipated, a wide variation in risk management practice exists among states, and within states, with regard to the attention given to various risks. At the local level, the variation is still wider, ranging from a sophisticated handling of at least some risk issues in a large city like Los Angeles, to the absence of any risk management (except for the police and fire departments and similar community functions) in a sparsely settled county or small town or city.

Society's knowledge of risk is far from complete. There are significant gaps in societal knowledge of risks from both chronic exposure to a multitude of chemicals and from accidents having a very low probability but possibly high consequences. A fundamental finding of this study is that a quantitative grasp of risk seldom exists in state and local government. The information that is available to society as a whole is frequently not part of the background of responsible local officials, and the concept of managing risk to reduce ill effects on health and safety is sometimes foreign to local governments which are organized to respond only to crises.

2. CASE STUDIES

The two hazards chosen for case studies differ widely in their characteristics. As a result they led to contrasting conclusions concerning the proper role of local government.

Drinking water introduces a small, difficult-to-quantify risk to essentially all members of the community. The risk is chronic, not catastrophic, and is common. The contaminants which are likely to be harmful have not all been identified. They are usually invisible. They are not all easily measured. The federal government has prescribed standards for "safe" water, but the risks at these or higher levels of contamination are poorly known, and the potential sources of contamination are multiple and not readily managed. A better scientific resolution of the risks from drinking water is beyond the capabilities of local government. Furthermore, management of this hazard conflicts with, rather than augments, the traditional service delivery function of local government.

The study group concludes that these characteristics tend to diminish the local role in risk management. Chronic risks of low magnitude do not ordinarily stimulate immediate demands for protection; risks common to many localities and concentrated in none are not viewed as principally local problems; hazards eluding easy detection exceed the technical capacity of local governments; highly uncertain risk estimates pose political perils for local officials; and risk management practices impeding or increasing the cost of service delivery may also be perilous.

It is concluded that local government can usually do little beyond monitoring for federally identified contaminants, unless local government happens to be in a position to regulate potential polluters of its own water supply. The responsibility for controlling contamination of drinking water appears to fall on state government; however, resource limitations require a major federal role in providing the necessary scientific information.

Seismically substandard buildings, on the other hand, introduce a significant risk primarily to an identifiable subset of the total population. The risk is catastrophic. At least in Los Angeles, the risk to these individuals is substantially larger than that posed by drinking water to any individual in the same city. The risk may be large compared to other accidental risks. This is a risk which can be and has been evaluated by the local government involved; furthermore, the responsibility for building safety clearly lies with local government.

The risk from earthquakes is not unique to residents of Los Angeles or even California. It may be less in most other parts of the country, but whether the matter has been evaluated and on what basis judgment concerning the need for seismic upgrading would be made is uncertain.

Seismically substandard buildings exemplify a class of risks of accidental death which local government is generally not consciously managing. Similarly, risks from the storage of large quantities of explosive, flammable or toxic chemicals have usually not been evaluated by or for local government in terms of possible low probability causes of a major accident.

Water and air pollution risks are also managed unevenly, or even poorly on occasion. Although federal regulations exist for drinking water and on air quality, there is a frequent incidence of the discovery of intolerable contamination of water or an unacceptable, even dangerous, degree of pollution of the ground and/or air in the vicinity of a smelter, waste disposal dump, factory, or some other technological aspect of society.

One might define a formal process of risk-management as normally involving the following:

- o hazard identification
- o risk quantification
- o comparison with other risks, assessment of benefits, and assessment of risk acceptability and options for risk reduction
- o policy formulation and implementation
- o risk monitoring and intervention

The study group found that where any of these steps were practiced at the local level, it was typically the last step, that of monitoring, performed in response to regulations usually established by *federal* authorities. This practice was termed "management by compliance". The other form of risk management found in local government is risk management by reaction, usually stimulated by an emergency or some newsworthy event.

States differ widely in their resources and in their attitudes toward regulation of industry, agriculture, mining, etc. Based on a limited survey, the study group finds that where states practice risk management, they tend not to use formal methods, such as cost-benefit analysis and decision analysis, to structure the problem, define the alternatives and their consequences, and provide measures of the worth or desirability of each alternative.

The decision analysis performed on seismic hazards to occupants of unreinforced masonry buildings in Los Angeles indicates that this risk may be between ten and 100 times greater than the risk from fire. Some amount of seismic upgrading of these buildings to improve their capabilities to withstand earthquakes appears to be cost-effective with almost any reasonable set of assumptions, and the real question is how much and who should bear the cost (a question which is complicated by the existence of rent control). The study group concludes that the

risk in the unreinforced masonry residential buildings is too large and an improvement in safety is required. The study group also favors improvement for the non-residential buildings; if this is not done, the group believes the city has an obligation to inform the public of the risks involved.

The decision analysis used a measure of society's willingness to pay to reduce the likelihood of a statistical death that increases non-linearly with higher probability of death to the individual. However, in a very limited survey of individual opinion, it was found, not surprisingly, that the older residents (>70 years of age) are less willing to pay an increased rent to reduce seismic risk, and that the general public do not distinguish critically between a risk of one in 100 and one in 10,000 per year when deciding what increment in rent is acceptable to eliminate such a risk.

The study group believes that the regulatory approach for such a problem needs to consider who benefits directly from a planned action and to provide incentives to those bearing the costs, if possible.

The study group notes that, even in Los Angeles, which has an acute, well-defined problem and knowledgeable employees, there is evidence that the city has been unable to fully enforce seismic design regulations because of financial and trained manpower shortages. The shortage of knowledgeable manpower is far more acute in most other places.

3. ON THE METHODOLOGY OF RISK MANAGEMENT

From the decision analysis of the case of seismically substandard buildings, it was possible to derive a short series of questions to help guide the management of an identified risk, as follows:

- o Is the risk significant?
- o What are the mitigation alternatives?
- o What are the costs and benefits?
- o What are the legal, social, and political ramifications?
- o What constitutes a balanced approach?
- o What are the enforcement and implementation issues?

Of course, there are many risks of potential interest. The study group investigated several different approaches to the classification of risks and concluded that no single taxonomy is likely to be used by an office of risk management. The group believes that multiple taxonomies (and their associated risk profiles), if completed and fleshed out, would provide a portion of the framework needed for decision-making by identifying a more complete array of risks and by profiling these risks for several geographic regions and sub-regions.

The study group also argues that a set of appropriate risk taxonomies and profiles may introduce the person(s) responsible for risk management to a new way to quantitatively represent risk. The favored risk classification approaches included the following:

- o situation in which the hazard or risk is encountered
- o cause of the hazard or risk
- o the kind of hazard or risk
- o geographic division of risk management responsibility

The study group recommends the development of a national risk management information system. The group argues that there is a need for risk classification not only in order to help accumulate and retrieve information, but also to help think about risks. The group feels that classification permits comparison; it insures that some categories of risks are not altogether ignored; and it is a prolegomenon to systematic thinking about risks.

The study group believes that the responsibility for initiation of a national risk management information system must fall on the federal government, since no state or local community has the authority or resources. The group feels that the existence of a national risk management information system could overcome several of the weaknesses of local government in dealing with hazards, and that by providing local governments the information wherewithall

on which to base risk management decisions, the federal government would reinforce the political process in states, counties, and cities. The group does not argue that this would or should necessarily lead to a more nearly uniform approach to risk management among the states.

The study group takes the point of view that while the elected representatives will ultimately need to make the policy decisions concerning risk, the structuring of the alternatives and the assessment of the probabilities of uncertain outcomes is largely a highly technical enterprise and should be done by a technocratic agency (or agencies). The group concludes that the task is too formidable for local government and is inappropriate for the federal government, and that hence, the management of risk must start at the state level with the possibility of strong regional offices which would interact both with the central office and with local officials.

There will exist a need for criteria by which such a technical agency can judge whether a hazard requires attention; the setting of such criteria will involve socio-political decisions.

Given the necessary leadership and support by the state, one can envisage a possible functional mode for the office of risk management of a large city, assuming that the office was given responsibility for trying to prevent or reduce unnecessary yet significant risks and had a reasonable amount of resources available. The outline of such a function might be as follows:

- (1) Develop tentative threshold criteria for action appropriate to identification of potential sources for each category of hazard or risk developed from the taxonomy. For example, for health effects from pollutants in drinking water, there might be five or more thresholds for each chemical or pollutant. Some threshold quantity of waste disposed of per year would require notification of the responsible agency, including means of disposal. For some larger quantity of a chemical, a risk evaluation would be required to be provided by the disposer to the agency. Each chemical that could pose a threat to drinking water in an accident would require notification of an agency. For each of these, some larger quantity might require a risk evaluation.

- (2) Develop ordinances to identify hazard and risk sources which meet threshold criteria.

- (3) Formulate a basis whereby governmental entities can, in practical ways, assess risks that may exceed "acceptable" limits.

- (4) Prepare evaluation processes, methodologies, etc. whereby source identification methods can be checked for adequacy. For example, how would PCB-containing transformers be detected; how would asbestos in buildings, specifically schools, have been thought of as a possible source of air pollution; and how would the use of uranium tailings for

home building material have been identified and detected?

(5) Arrive at a methodology for determining other attributes which may be relevant to decision-making for risk sources which exceed threshold criteria for possible action. For example, such factors would include the benefit associated with the technology responsible for the risk, the dollar cost of reducing the risk, and various socio-economic political issues.

(6) Suggest methods for acquiring appropriate information about other attributes.

(7) Identify and bring forth factors which will potentially enter in judgment on risk acceptance and risk management.

(8) Formulate a proposed risk management policy for each hazard class.

4. ON POLICY ALTERNATIVES

The study group postulates several constraints which, in its opinion, should guide the formulation of alternative risk management systems, as follows:

- o Risk judgments are comparative and comparison entails quantification.
- o Risk judgments may vary across localities.
- o Risk judgments need legitimacy.
- o Risk judgments may need revision in light of information concerning new hazards and new information concerning the riskiness of known hazards.
- o The costs of obtaining the information needed for risk management judgments can be high and should be distributed equitably.

The study group defines and discusses the following five models of risk management:

- o the existing system, which is largely dominated by the federal government
- o the "weak" risk manager, in which the existing system is buttressed by strengthening local capacities to utilize competent professional judgment in managing diverse risks
- o the network of risk managers, whereby relatively weak offices at the state and local level tie into a network that facilitates sharing of data on hazards, risks, risk acceptance criteria, and risk policies
- o the "strong" local risk manager who is charged with the full spectrum of risk management activities, from risk identification to policy and implementation
- o a radical decentralization of risk management, whereby prima facie evidence of riskiness above a low threshold compels the source of risk, no matter whom, to obtain appropriate risk studies showing the acceptability of the safety of proposed activities before proceeding with them.

At the local level, the study group has arrived at a preference for the approach involving a network of "weak" risk managers. The group suggests that the basic elements of a network approach would involve the following:

- o a system of classifying risks
- o central storage of risk information

- o means of developing needed information
- o the maintenance of risk profiles for localities
- o risk managers trained in the utilization of the information.

The study group cautions that the network concept is novel and relies upon information technologies not heretofore utilized. They state that developmental work would be required prior to its implementation and that studies would be needed of the appropriate changes in federal role and policy.

The study group favors a major role in risk management by the states employing an approach lying somewhere between the "strong risk manager" and the network of "weak risk managers". While the states have some resources to devote to the task and should take a strong, leadership role, the overall task of developing methodology, data, and criteria, and of performing complex analyses is too large for any state, and will require a wide variety of assistance from the federal government and the benefit of cooperation, and the interchange of information among the states.

By way of some specific steps which should be of value in advancing the task of risk management, the study group makes several recommendations, including the following:

- o the development and use of multiple risk taxonomies to serve as a background information source and as a working tool for an office of risk management
- o the examination of economic incentives, such as making full liability insurance available
- o the examination of a risk tax as a means of internalizing the cost of risk and of providing an incentive for cost-effective risk reduction measures
- o the holding of workshops on risk management to inform state and local officials.

If the network approach is to receive serious consideration, several studies may be appropriate as a next step, including the following:

- o a policy study to identify changes in federal regulations needed for an effective network
- o an effort to construct alternative models of information systems
- o an experimental effort aimed at determining the likely utilization and effectiveness of a risk-management information network.

It seems that studies such as these might best involve groups like the National Conference of State Legislatures and National Governor's Association.

Each state will have its own special risks to consider. Each state will have its own strengths and its own limitations on resources. One cannot expect to deal with all of these problems simultaneously. However, a joint examination of the feasibility and desirability of a network approach by several state and local governmental entities, together with an examination of the implications for a changing federal role, could provide the necessary information for a judgment on whether there is merit in some version of the network alternative to risk management.

An important finding, which is central to an improvement in local risk management, is the need for introducing quantitative conceptions of risk at the local level, to complement the traditional political and social conceptions. The absence of thinking of risk in quantitative terms, of necessity, limits the adequacy of the information which enters the decision making process; this must be remedied if an improved approach to risk management at the local level is to be developed.

An equivalent, albeit different, effort should be devoted to the identification, categorization, and measure of the benefits associated with the societal activities which introduce these risks. This is a field in which relatively little solid information exists.

A considerable number of specific issues which require further study have been raised during this project. Several of these are discussed briefly below:

- o How should state and local governments approach the question, "How safe is safe enough?", for those hazards for which they have responsibility and for which guidance has not been provided by federal regulatory agencies or other recognized authoritative groups? Benefits and societal needs, among other attributes, may enter into a judgment that something is "safe" or "unsafe". Thus, there will not be a unique definition of "safe". Nevertheless, decisions are continually being made by state or local governments which directly involve an imposition of risk on their constituents. And, frequently, by acts of omission, they permit risks later judged to be intolerable to be imposed on their constituents. How should society ascertain whether the upper threshold of acceptable risk is being violated for some of the people? At what point would resources expended to do this exceed the benefit obtained? Are there risks which are flatly unacceptable and which require a mechanism to assure their identification and correction?
- o British law imposes a requirement on technological facilities to keep them as safe as practical. Is there a similar requirement in the United States? If not, should there be, and how should it be

instituted? Would such a risk requirement provide the appropriate incentives for risk management, or is it limited to "attributable effects"? Is there a workable mechanism which achieves the transfer of the cost of risk from the public to the liable party for non-attributable risks?

- o Is there a mechanism for achieving a more cost-effective expenditure of societal resources committed to risk reduction? Should cost-effective expenditure for risk reduction be a goal of state and local government, or should socio-political factors dominate?
- o The safety of the storage of large quantities of hazardous chemicals appears to be the responsibility of local government for the most part. This is largely handled via regulations imposed by the fire and building departments, or their equivalent. Experience in the United States and elsewhere indicates strongly that catastrophic accidents are rarely evaluated in this process, and that the risks involved to individuals living or working nearby can vary widely and sometimes be quite large. If local governments generally lack the resources and expertise to regulate adequately the storage of large quantities of hazardous chemicals, what, if anything, should be changed? Should a federal or state approach similar to that under adoption in the United Kingdom be pursued?
- o Are the current federal regulations with regard to the disposal of hazardous wastes and to local sources of ground, water and air pollution adequate? If not, how should they be changed? If adequate in principle, do they work in practice? What does it take at the state and local level to assure the necessary compliance?
- o How should limitations on total available societal resources be factored into risk management at the state and local level? Can analysis provide meaningful answers on when further expenditures on direct risk reduction may lead to a net increase in societal risk because of economic or political disruptions? Are such considerations of importance only in a national sense, or do they apply at the state and local level? If so, how?
- o Frequently, measures taken to reduce one risk introduce a new risk, possibly of a different nature. Can the matter of competing risks be included into risk management at the state and local level?

If so, how and under what circumstances?

- o If the state has jurisdiction and responsibility for managing risks that can impact strongly on a local government entity, either from the point of view of health or economics (e.g., the costs of cleanup, or of alternate and expensive facilities such as new wells made necessary because of contamination of the old ones), how should local government assure itself of the adequacy of the steps taken by others on its behalf?

The problems in developing a more systematic and more nearly optimal approach to risk management at state and local level are difficult, to say the least. Nevertheless, the continuing series of episodes of local ground, air and water pollution reported almost weekly in the press are only one piece of evidence that all is not well in this regard.

A Congressional examination of the feasibility and usefulness of steps by the federal government to assist the development of improved risk-management at the state and local level may warrant consideration.

