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State-level environmental risk perception: an analysis of 20 Comparative Risk Reports

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STATE-LEVEL ENVIRONMENTAL RISK PERCEPTION: AN ANALYSIS OF 20 COMPARATIVE RISK REPORTS

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ABSTRACT

Research was conducted to identify the states that compiled Comparative Risk Reports and the year in which the study was completed. The information relating to the type of committee that compiled the risk report and the final risk rankings was examined. State Comparative Risk Reports were collected for twenty states and the risk rankings that each state compiled were reviewed to determine which states ranked third generation environmental problems and the ranking that those problems were given. The risk reports compiled by each state were also used to determine which states ranked natural resource based problems and the ranking that those problems were given.

Dependent variables were constructed for the third-generation problems global warming, ozone depletion, acid rain as well as for natural resource-based problems. Independent variables were used to indicate the contextual setting of the responses of the individual states. The independent variables that were used are as follows: Total Green Index score, Green Policy score, Green Conditions score, air pollution score, natural resource GSP, per capita income, and bachelor's degree. Two different methods were used to analyze the data compiled for this research, difference of means testing and Pearson bivariate correlation analyses. The difference of means test was used to determine if there were patterns in the relationship between the dependent variables and independent variables that would suggest reasons why states would rank third generation environmental problems and natural resource based problems differently. One-tailed Pearson bivariate correlation analyses were conducted to determine if there were significant statistical associations between the dependent and independent variables.

In analyzing the data from the risk rankings of each state, significant associations were found between concern for global warming and the Green Policy score. Significant associations were also found between the combined rankings of third generation environmental problems and the Air Pollution score taken from the Green Index and between natural resource based problems and natural resource GSP.

CHAPTER 1

INTRODUCTION

Problem Statement

Public perceptions of risk have been found to determine the priorities and legislative agendas of regulatory bodies such as the U.S. EPA, much to the distress of agency technical experts who argue that other hazards deserve higher priority. (Slovic, 1997) As a result, the EPA has developed its environmental policies piecemeal, with each problem addressed separately and without sufficient reference to other problems or to overall effects, risks, and costs. Rarely has the agency evaluated the relative importance of pollutants or environmental media – air, land, and water, or assessed the combined impacts on whole ecosystems and human health. (Riley, 1991)

With the publication of *Unfinished Business* in 1987, the EPA attempted to examine relative risks to human health and the environment posed by various environmental problems. *Unfinished Business* recognized the necessity of local risk perception analysis by stating that national rankings do no necessarily reflect local situations—local analyses are needed. The report recommended that more widespread use of risk as one basis for setting environmental protection priorities would be beneficial at all levels of government. (EPA, 1987)

Research Objectives

Researchers have found that when measuring the level of environmental concern there are certain factors that are associated with pro-environmental orientation. These factors include age, education, political ideology (Van Liere and Dunlap, 1980), income, and employment. (Dunlap et al, 2000) Based on research concerning environmental orientation and risk perception there may be differences between states that rank third-generation environmental problems highly and those that do not. Third-generation environmental problems are those problems whose effects will be passed on to future generations, thus bringing up issues of intergenerational equity. Further, there may be differences between states that ranked loss of natural resources, land loss, habitat loss, species loss, or loss of services provided by the environment relatively highly and those that do not. Factors that may explain variations in the way states rank these issues include wealth, education, environmental policies, environmental conditions, air pollution and percent of state GSP from natural resources (agriculture, natural resource based, fishing, mining, forestry).

This study attempts to examine state-level environmental risk orientation and risk perception through the use of Comparative Risk reports compiled by states after the publication of *Unfinished Business*. Several research questions designed to address the differences between states in risk orientation and perception will be explored in this thesis. Which states completed Comparative Risk projects and when were the studies completed? What was the structure of the committee that prepared the Comparative Risk Report and were there differences among states in the structure of the committee? Which states recognized and ranked the third-generation environmental problems of global warming, ozone depletion, and acid rain? Which states ranked third-generation environmental problems highly? Are states that ranked third-generation environmental problems different from states that did not rank third-generation environmental problems in terms of wealth, education, and environmental policies, environmental conditions, air pollution, and natural resource GSP? Which states ranked loss of natural resources, land loss, habitat loss, species loss, or loss of services provided by the environment? Which states ranked the problems highly? Are states that ranked the above listed items different from states that did not rank the problems highly in terms of wealth, education, environmental policies, environmental conditions, air pollution, and percent of state GSP (agriculture, natural resource based, fishing, mining, forestry) from natural resources? This analysis will attempt to answer these research questions.

Overview of Comparative Risk Assessment

Comparative Risk analysis is a procedure for ranking environmental problems by their seriousness for the purpose of assigning them program priorities. Teams of experts typically put together a list of problems then sort the problems by types of risk. The experts rank the problems within each type and the relative risk of a problem is then used as a factor in determining what priority the problem should receive. (Cleland-Hamnett, 1993) Besides helping managers identify the worst environmental problems or the greatest risks, Comparative Risk provides a common basis for evaluating the environmental problems and a comprehensive baseline of local risk information. (WCEDM)

After the publication of *Unfinished Business* in 1987, EPA headquarters requested that each EPA Regional office complete a Comparative Risk project for its region. The final reports from the Regional offices showed once again that some of the highest risk problems were receiving less money than lower risk problems. The staff at EPA Headquarters gave substantial grants (approximately $400,000) to several states to undertake statewide Comparative Risk projects. The projects were basically divided into two phases. The first phase was the Risk Assessment Phase and the second phase was the Risk Management Phase. Vermont was the first to receive a grant, followed by the states of Colorado and Washington. The successes of early state projects lead EPA to start giving smaller (usually $100,000) grants to state governments, city governments, non-governmental organizations, and tribal nations. By the late 1990's, EPA was involved in providing technical assistance and funding to 46 projects. The design and implementation of each of the projects was unique, demonstrating the flexibility of the Comparative Risk process. The design of the committee structure, issues list, methodologies, and Phase 2 process was left up to those undertaking the Comparative Risk project. (WCEDM)

The Nature of Perceived Risk

Slovic (2000) offers tentative conclusions into the nature of perceived risk. Several of those conclusions are pertinent to this study and are as follows:

- Perceived risk is quantifiable and predictable
- Groups of laypeople sometimes differ systematically in their perceptions. Experts and lay persons also differ, particularly with regard to the probability and consequences of catastrophic accidents
- Cognitive limitations, biased media coverage, misleading experience and the anxieties generated by the gambles life poses cause uncertainty to be denied, risks to be misjudged and judgments to be believed with unwarranted confidence
- Experts' risk assessments are also susceptible to bias, particularly underestimation due to omitting important pathways to disaster
- The greater the perceived risk, the greater the desired reduction
- The perceived potential for catastrophic loss of life emerges as one of the most important risk characteristics, responsible for the irresolvable disputes between experts and the public which lead to frustration, distrust, conflict and ineffective hazard management

Informing and Educating the Public about Risk

Informing and educating the public about risk is a necessary step along the path of successful risk analysis. Because the EPA's regulations have been largely reactive and based upon public risk perception of certain hazards instead of on the perception of agency experts, there is a need to educate the public concerning the true hazards posed by environmental problems. To successfully educate the public about risk, there are certain limitations that need to be understood. According to Slovic (2000), the limits to public understanding are as follows: people's perceptions of risk are often inaccurate, risk information may frighten and frustrate the public, strong beliefs are hard to modify, and naïve views are easily manipulated by presentation format. Anyone who is attempting to inform and educate the public of a certain risk must be aware of these limitations if they expect to be successful.

The Role of the News Media in Risk Perception

The mass media exert a powerful influence on people's perceptions of the world, the world of risk being no exception. Slovic (2000) provides several suggestions for improving media performance to communicate risk information. First, the problem must be acknowledged. Because understanding risk is central to decisions that are of great consequence to individuals and society, attention needs to be given to addressing the necessity of sustained meetings between journalists, scientists, and risk managers. Second, there should be an effort to introduce young journalists to science writing so that it may be enhanced. Finally, developing science news clearinghouses would allow science journalists' access to knowledgeable and cooperative scientists who can provide them with reliable information about risk topics.

The Role of the EPA in Environmental Policy

The environment is an interrelated whole, and society's environmental protection efforts should be integrated as well. Integration in this case means that government agencies should assess the range of environmental problems of concern and then target protective efforts at the problems that seem to be the most serious. One tool that can help foster the evolution of an integrated and targeted national environmental policy is the concept of environmental risk. The concept of environmental risk, together with its related terminology and analytical methodologies, helps people to discuss disparate environmental problems with a common language. It allows many environmental problems to be measured and compared in common terms, and it allows different risk reduction options to be evaluated from a common basis. An improved ability to compare risks in common terms would have another value as well: it would help society choose more wisely among the range of policy options available for reducing risks. There are heavy costs involved if society fails to set environmental priorities based on risk. If priorities are established based on the greatest opportunities to reduce risk, total risk will be reduced in a more efficient way, lessening threats to both public health and local and global ecosystems. (EPA, 1990)

A Relative Risk Reduction Strategies Committee was assembled by the EPA to provide recommendations for approaches to risk management and for the future direction of national environmental policy. Their recommendations are as follows (EPA, 1990):

- EPA should target its environmental protection efforts on the basis of opportunities for the greatest risk reduction
- EPA should attach as much importance to reducing ecological risk as it does to reducing human health risk

- EPA should improve the data and analytical methodologies that support the assessment, comparison, and reduction of different environmental risks

- EPA should reflect risk-based priorities in its strategic planning processes

- EPA should reflect risk-based priorities in its budget process

- EPA – and the nation as a whole – should make greater use of all the tools available to reduce risk

- EPA should emphasize pollution prevention as the preferred option for reducing risk

- EPA should increase its efforts to integrate environmental considerations into broader aspects of public policy in as fundamental a manner as are economic concerns

- EPA should work to improve public understanding of environmental risks and train a professional workforce to help reduce them

- EPA should develop improved analytical methods to value natural resources and to account for long-term environmental effects in its economic analyses

Outline of Thesis

The second chapter discusses aspects of risk perception including comparative risk assessment, risk orientation, and risk communication. The data and methods used in this study are discussed thoroughly in Chapter 3 and Chapter 4 presents and discusses the results of the analyses conducted in this study. The study concludes with policy-making recommendations and areas of future research in Chapter 5.

CHAPTER 2

LITERATURE REVIEW

Comparative Risk Assessment

In February of 1987, the Environmental Protection Agency published *Unfinished Business: A Comparative Assessment of Environmental Problems* to examine relative risks to human health and the environment posed by various environmental problems. The project was subdivided into four parts. First, 31 environmental problems were selected. Second, four different types of risk for each problem area were considered: cancer risks, non-cancer risks, ecological effects, and welfare effects. Third, the project did not consider economic or technical controllability of the risks; the qualitative aspects of the risk that people find important; the benefits to society of the activities that cause environmental problems; and the statutory and public mandate for EPA to deal with the risks. Finally, because the intent of the project was to identify areas of unfinished business, risks were assessed as they were then – given the levels of control that were in place. Seventy-five agency professionals were responsible for examining the relative risks posed by these environmental problems. The results of the study are as follows (EPA, 1987):

- No problems rank relatively highly in all four types of risk or relatively low in all four
- Problems that rank relatively high in three of four risk types, or at least medium in all four include: criteria air pollutants, stratospheric ozone depletion, pesticide residues on food; and other pesticide risks
- Problems that rank relatively high in cancer and non-cancer health risks but low in ecological and welfare risks include: hazardous air pollutants, indoor radon, indoor air pollutants other than radon, pesticide application, exposure to consumer products, and worker exposures to chemicals

- Problems that rank relatively high in ecological and welfare risks, but low in both health risks include: global warming, point and non-point sources of surface water pollution, and physical alteration of aquatic habitats (including estuaries and wetlands) and mining waste
- Areas related to ground water consistently rank medium or low

These findings suggest that EPA's priorities appear more closely aligned with public opinion than with the estimated risk of the agency professionals. How the public perceives the seriousness of different environmental problems is very important to the setting of EPA priorities. Measuring these perceptions was not part of the main work of the Comparative Risk project, but the results of a short study done by the project staff to compare the information developed by EPA experts to that of public opinion. (EPA, 1987)

Cleland-Hamnett (1993) states that to ensure a proper place for Comparative Risk in developing environmental priorities, the strongest possible foundation of individual risk assessments must be built. She gives three basic guiding principles in the building of that foundation. The first is the characterization of risk. Characterizing individual risks must be done using straightforward, consistent terminology identifying uncertainties and data gaps so that both experts and citizens can more easily compare one risk to another. The second principle is the need to bring varied expertise into the risk assessment process from the earliest stage. The work of agency professionals needs to be exposed to the critical eye of independent experts, peers, and colleagues in their fields. This will both enhance the quality of the work and maximize the number of people who understand what the work attempts to accomplish. The third guiding principle that must be observed is the need for basic research and state of the environment data. Facts and hard conclusions from data are better than estimates based on extrapolations and interpolations.

Risk Assessment vs. Comparative Risk Analysis

Cleland-Hamnett (1993) also differentiates between risk assessment and Comparative Risk analysis. Risk assessment is a complex process by which scientists determine the harm that an individual substance can inflict on human health or the environment. The process takes place through a number of steps including identifying the particular hazard of the substance, examining the "dose-response" patterns and human exposure considerations and risk characterization: that is both quantitative and qualitative. Comparative Risk analysis is a procedure for ranking environmental problems by their seriousness for the purpose of assigning them program priorities. Teams of experts typically put together a list of problems then sort the problems by types of risk. The experts rank the problems within each type and the relative risk of a problem is then used as a factor in determining what priority the problem should receive.

Perspectives of Experts

Jones (1997) has identified six central themes that emerge from the perspectives of national experts, each of which represents a set of issues into which Comparative Risk projects can provide insight. First, there is a need for change in the manner in which environmental risks are managed. Specifically, too much of our attention is focused on fairly small risks while much larger risks do not get the attention that they deserve. Second, comparing risks provides information that should provide guidance to decision makers for avoiding further incidences of statistical suicide. Third, there is the need to consider public values either in the process of ranking risks or in the application of the risk ranking to the allocation of resources (priority setting). Fourth, experts recognize that the public largely supports and is in fact the reason behind the pursuit of inappropriate risk reduction strategies. Any fundamental change in the direction of risk reduction must somehow gain the support of the public. Fifth, some process is necessary for translating the risk ranking into management strategies. Sixth, some legislators and observers believe that it is necessary to incorporate Comparative Risk language into environmental statutes. They feel the regulatory bureaucracies are reluctant to use Comparative Risk in the absence of statutory requirements.

Public Risk Perception

Public perceptions of risk have been found to determine the priorities and legislative agendas of regulatory bodies such as the U.S. EPA, much to the distress of agency technical experts who argue that other hazards deserve higher priority. (Slovic, 1997) Areas of relatively high risk but low EPA effort include: indoor radon; indoor air pollution; stratospheric ozone depletion; global warming; nonpoint sources; discharges to estuaries, coastal waters, and oceans; other pesticide risks; accidental releases of toxic substances; consumer products; and worker exposure. Areas of high EPA effort but relatively medium or low risks include: RCRA sites, Superfund sites, underground storage tanks, and municipal nonhazardous waste sites. (Morganstern and Sessions, 1988) The majority of the budget of the EPA in recent years has gone to hazardous waste, primarily because the public believes that the cleanup of Superfund sites is the most serious environmental threat that the country faces. Hazards that are perceived as more serious by experts are not perceived as such by the public. The public's reactions to risk can be attributed to sensitivity to technical, social, and psychological qualities of hazards that are not well modeled in technical risk assessments. The limitations of risk science, the importance and difficulty of maintaining trust, and the complex, sociopolitical nature of risk point to the need for a new approach – one that focuses on introducing more public participation into both risk assessment and risk decision-making in order to make the decision process more democratic, improve the relevance and quality of technical analysis, and increase the legitimacy and public acceptance of the resulting decisions. (Slovic, 1997)

EPA has developed its environmental policies piecemeal, with each problem addressed separately and without sufficient reference to other problems or to overall effects, risks, and costs. Rarely has the agency evaluated the relative importance of pollutants or environmental media – air, land, and water, or assessed the combined impacts on whole ecosystems and human health. Sound science can help establish priorities and allocate resources on the basis of risk. Using risk as a common denominator creates a measurement that makes it possible to distinguish between the risks associated with environmental hazards. The laws concerning environmental hazards are a better reflection of constituent opinion than of scientific judgment. The translation of scientific knowledge to politicians and the public is necessary to make rational risk assessment a part of every citizen's common sense. (Riley, 1991) According to Riley (1991), the time has come to pay as much attention to how we spend our resources as to what we spend them on. The traditional approach to environmental protection – command and control regulations as oriented toward specific technologies – as much as it has achieved, is no longer sufficient. The great complexity of our environmental problems requires an equivalent complexity in our responses. A report by the Science Advisory Board has suggested increased research, public education and information dissemination, technical assistance, market incentives, and, above all, a national mobilization to prevent the creation of pollution in the first place. (Riley, 1991)

Measuring Perceptions of Environmental Risk

Weber et al (2000) conceptually and empirically developed a scale that measures perceptions of environmental risk (PER). PER is a measure that is different from the measure of environmental knowledge but equally important because people tend to act on their perceptions regardless of whether they are accurate. The authors define perceptions of environmental risk as a general measurement of risk which assesses the degree to which one perceives danger, peril, or hazards to either self, community, society, or all three, in regard to specific environmental issues.

Society constructs its view of the environment and of environmental problems within the context of its cultural values and its social and political norms. Often, these values and norms are communicated through the mass media and through educational institutions, which have had a great impact on the perceptions society constructs as representative of environmental issues. An individual's perception of risk regarding environmental problems is often socially mediated because it is partially derived from information presented in the mass media and environmental curricula rather than from immediate sensory contact with environmental damage. Environmental risk incorporates an overall perception regarding specific environmental issues such as loss of wetlands, toxic materials, agricultural runoff, water use, air pollution, waste disposal, shoreline erosion, and land development. Therefore, perceptions of environmental risk are as much about understanding the interaction of people and society as they are about understanding how the environment works. There is evidence that, for many environmental risks, significant differences in judgments may be observed for those who differ in socioeconomic status, education level, geographic locality, and ethnicity. (Weber et al, 2000)

Conventional wisdom has long held that concern about environmental quality is limited primarily to residents of wealthy, industrialized nations. Residents of the poorer, nonindustrialized nations are assumed to be too preoccupied with economic and physical survival to be concerned about environmental problems. Dunlap and Gallup (1993) hypothesized that conventional wisdom regarding differences in environmental concern between rich and poor nations might hold true at the level of the general public. However, from the results of the Health of the Planet survey, the authors concluded that conventional wisdom is wrong about the existence of major differences in levels of environmental concern between citizens of rich and poor nations. (Dunlap and Gallup, 1993)

Environmental problems are salient and important issues in both wealthy and poor nations, and residents of poor nations express as much concern about environmental quality, as do those in wealthy nations.   The findings of strong environmental concern throughout the 24 nations surveyed may reflect the fact that environmental quality is no longer seen as a postmaterialist value, and that environmental degradation is increasingly recognized as a direct treat to human health and welfare. According to Dunlap and Gallup (1993), protecting one's family from environmental hazards seems to be joining the provision of food, clothing, and shelter as a basic human goal. The results of the survey may also reflect the fact that social science analyses of environmentalism have downplayed the role of direct human experience with environmental degradation, which is especially noticeable at the local levels in the poorer nations. Personal experience, combined with increased awareness of the global impact of human activities, has likely made people around the world begin to recognize that their welfare is inextricably related to that of the environment.

Poortinga and Pidgeon (2003) state that the importance of public understanding of science can best be described by quoting the 1985 Royal Society report on public understanding of science. In this report it is argued that "Science and technology permeate our everyday lives", and therefore "an understanding of science is important for individual citizens to participate in a democratic society". Considering that many risks involve or emerge from scientific developments, an understanding of science may be an essential part of public understanding of these risks. The authors designed a 2002 study, in part, to provide scientists and policy makers with an understanding of how the public views and characterizes science and scientific procedures in settings where risk and policy interact. They used a questionnaire designed to get comparative data on five risk issues that are prominent within UK society and have complementary as well as contrasting features. The risk issues studied were climate change, mobile phones, radioactive waste, GM food, and genetic testing.

Risk issues do not emerge in a vacuum. They surface in a society that already has to deal with numerous other issues, with which the risk issues have to compete. The risk issues were shown to be important to a subset of people, and the risk cases issues were reported to be less important than most of the other personal and social issues. Only 28.1% of the survey respondents were "very interested" in the issue of climate change.

Respondents indicated that climate change and radioactive waste posed the highest risk to themselves. Evaluating the risks on various psychometric characteristics, respondents agreed that climate change was the risk with exhibited the most unknown consequences. They also agreed that it poses the highest risk to future generations. In general, climate change was generally seen as a bad thing, with the benefits of climate change seen as low and the risks as high. Consequently, concern was high, while overall climate change was unacceptable to most people. (Poortinga and Pidgeon, 2003)

Several decades of research on risk perception have found that humans tend to fear similar things for similar reasons. These patterns of risk perception are less often based on facts and more often on affective and intuitive factors. Ropeik and Slovic (2003) identify several characteristics as to why people are commonly more afraid of some relatively small risks and less afraid of others, which in certain ways cause greater harm. These characteristics are control, the dread factor, choice, children, new risks, awareness, vulnerability, risk-benefit trade-off, and trust. Research has shown that people often overestimate the frequency and seriousness of dramatic, sensational, dreaded, well-publicized causes of death. In contrast, they often underestimate the risks from more familiar, accepted causes that claim lives one by one. (Morganstern and Sessions, 1988)

By understanding these characteristics and by accepting that they are intrinsic, policy-makers can incorporate risk perception values, as well as careful fact-based analysis, into their risk management decisions. When risk perception characteristics trigger high concern about a relatively low risk among large groups of people, those people pressure government for protection form that lesser risk. This action forces government to allocate resources in a less than optimal way. Time and money spent on protecting people from relatively low risks because they evoke high concern are not available to protect people from greater risks, which do not trigger as much worry. Risk communication, informed and empowered by an understanding of risk perception, must become a priority at the highest levels of policy-making in government, business and international affairs. (Ropeik and Slovic, 2003)

Risk Communication

Sandman (2003) proposes four paradigms of risk communication: "Watch out" – appropriate for the high-hazard, low-outrage; "Calm down" – appropriate for the low-hazard, high-outrage risk; moderate hazard, moderate outrage; and high hazard, high outrage. He characterizes the high hazard, low outrage paradigm as being toward an apathetic audience and communication with this audience is likely to make use of mass media. The outrage management or low hazard, high outrage paradigm concerns people who are outraged, largely at you. The means of communication is in-person dialogue and the audience usually does most of the talking. The moderate hazard, moderate outrage paradigm is characterized by an attentive audience of stakeholders with whom communication will rely on interpersonal dialogue supplemented by specialized media such as newspapers and web sites. The final paradigm concerns crisis communication: high hazard, high outrage. In this sort of risk communication the audience is huge and very upset. Crisis communication also makes use of mass media. According to Sandman, people's response to risk is mostly a response to outrage. When hazard is high and outrage is low, people under-react. And when hazard is low and outrage is high, they over-react. (Sandman, 2003)

The Conservative Movement and the Dominant Social Paradigm

While there has always been opposition to environmental movements and protection, the global frame of environmental problems is generating even more – especially from the mainstream conservative movement. The global frame of environmental problems is the "schemata of interpretation" that enables us to perceive that, for the first time in history, humans are disrupting the global ecosystem in ways that affect, not only "environmental quality," but also the current and future well-being of our species. (McCright and Dunlap, 2000)

According to McCright and Dunlap (2000), conservatives often strongly defend a traditional frame about humans and nature that some have called the Dominant Social Paradigm and others have called Manifest Destiny. The Dominant Social Paradigm includes core elements of conservative ideology, but also faith in science and technology, support for economic growth, faith in material abundance, and faith in future prosperity. The discourse of Manifest Destiny stresses that human welfare is dependent upon unlimited access to abundant natural resources, development of these resources, and transformation of these resources into useful commodities through labor.

The Conservative Movement and Global Warming

McCright and Dunlap identified three broad counter-claims through which the conservative movement challenges the legitimacy of global warming. First, the conservative movement criticizes the scientific evidence and general beliefs in support of the existence of anthropogenic global warming. Second, the movement emphasizes the potential benefits of global warming, if it should occur. Third, the conservative's stress that taking any proposed internationally binding action would have numerous negative consequences. (McCright and Dunlap, 2000)

Global warming was successfully defined as a social problem and placed on the policy agenda by the early 1990s, but its problem status was quickly challenged. McCright and Dunlap argue that a new strand of environmental opposition – the conservative movement – is at the core of recent challenges to global environmental problems, particularly global warming. Their study is a necessary first step in demonstrating that the controversy over global warming - and the resulting difficulty its advocates have in keeping it on the public agenda – is not simply a function of waning media attention, the ambiguities of climate change signals, or the complexities of climate science, but stems, in large part, from the concerted efforts of a powerful countermovement. (McCright and Dunlap, 2000)

The Value of Natural Ecosystems

According to Reducing Risk, natural ecosystems like forests, wetlands, and oceans are extraordinarily valuable. However, over the past 20 years and especially over the past decade, EPA has paid too little attention to them. The Agency's lack of concern reflects society's views as expressed in environmental legislation; ecological degradation probably is seen as a less serious problem because it is often subtle, long-term, and cumulative. In short, human health and welfare ultimately rely upon the life support systems and natural resources provided by healthy ecosystems. National efforts to evaluate relative environmental risks should recognize the vital links between human life and natural ecosystems. Up to this point, they have not. (EPA, 1990)

Measuring Pro-environmental Orientation

The emergence of global environmental problems as major policy issues symbolizes the growing awareness of the problematic relationship between modern industrialized societies and the physical environments on which they depend. Kempton concluded that three general sets of environmental beliefs play crucial roles in the "cultural models" by which Americans attempt to make sense of environmental issues: (1) Nature is a limited resource upon which humans rely; (2) Nature is balanced, highly interdependent and complex, and therefore susceptible to human interference; and (3) materialism and lack of contact with nature have led our society to devalue nature. (Dunlap et al, 2000)

The emergence of ozone depletion, climate change, and human-induced global environmental change in general suggest the importance of including items focusing on the likelihood of potentially catastrophic environmental changes or "ecocrises" besetting humankind into an environmental paradigm that would differ from the dominant social paradigm that predominated in the 1980s. Riley et al conceptualized a New Environmental Paradigm (NEP) that could be used to measure proenvironmental orientation. The scale was revised in 2000 and renamed the New Ecological Paradigm Scale. (Dunlap et al, 2000)

A study conducted using this scale to measure proenvironmental orientation found that people employed in primary industries have lower NEP scores and that income is negatively related to endorsement of the NEP. A study conducted in Washington found that there was a modest increase in residents' endorsement of elements of the NEP over a 14-year period. The largest increase occurred on the two items that most clearly focus on the likelihood of ecological catastrophe, suggesting that the emergence of major problems such as ozone depletion and global warming have had some effect on the public. (Dunlap et al, 2000)

Van Liere and Dunlap (1980) reviewed the evidence on the social correlates of environmental concern and suggested that only three of the five hypothesized relationships should be considered empirical generalizations. Age, education, and political ideology were consistently associated with environmental concern, and thus they concluded that younger, well-educated, and politically liberal persons tend to be more concerned about environmental quality than their older, less educated, and politically conservative counterparts. The evidence is less conclusive for residence, political party identification, and occupational prestige, since they were correlated more weakly and/or less consistently with environmental concern.

Literature Conclusion

In summary, researchers have found that when measuring the level of environmental concern there are certain factors that are associated with proenvironmental orientation. These factors include age, education, political ideology (Van Liere and Dunlap, 1980), income, and employment. (Dunlap et al, 2000) Policy-makers can incorporate risk perception values, as well as careful fact-based analysis, into their risk management decisions if they have an understanding of the characteristics of why people are commonly more afraid of some relatively small risks and less afraid of others. In certain ways, these other risks cause greater harm and are intrinsic. Risk communication, informed and empowered by an understanding of risk perception, must become a priority at the highest levels of policy-making in government, business and international affairs. (Ropeik and Slovic, 2003)

It is important to examine environmental risk perception on a state-by-state basis to determine the factors that contribute to state-level environmental risk perception. By analyzing state-level risk perception through the use of state Comparative Risk rankings, we will be able to determine the reasons for the difference in the way states view third-generation environmental problems and natural resource based environmental problems. The next chapter will present the data and methods upon which this analysis will be based.

CHAPTER 3

DATA AND METHODS

Comparative Risk Report Examination

This chapter outlines the sources of data used for this research as well as the statistical methods used to analyze the data. Research was conducted to identify the states that compiled Comparative Risk reports and the year in which the study was completed. The internet was used to identify the states that received money to begin the risk projects and phone calls were made to the agency responsible for the project to locate a copy of the risk report. A total of twenty state Comparative Risk reports were collected and used in this research.

The information relating to the type of committee that compiled the risk report and the final risk rankings was examined. Data on the type of committee used by each state was collected 1) to determine the structure of the committee that prepared the Comparative Risk report (public participation, technical committee, or both), 2) to determine if there were differences among states in the structure of the committee, and 3) to determine the range of individuals and agencies that participated in the risk ranking process.

Comparative Risk reports were examined to determine which states recognized and ranked the third-generation environmental problems of global warming, ozone depletion, and acid rain. Which states ranked third-generation environmental problems highly? Are states that ranked third-generation environmental problems different from states that did not rank third-generation environmental problems in terms of wealth, education, and environmental policies, environmental conditions, air pollution, and natural resource GSP? Which states ranked loss of natural resources, land loss, habitat loss, species loss, or loss of services provided by the environment? Which states ranked the problems highly? Are states that ranked these problems different from states that did not rank the problems highly, in terms of wealth, education, environmental policies, environmental conditions, air pollution, and percent of state GSP from natural resources (agriculture, natural resource-based, fishing, mining, and forestry) from natural resources? To address the research questions concerning third-generation environmental problems and natural resource-based problems, dependent and independent variables were constructed. The following paragraphs will discuss the construction of these variables.

Dependent Variable Construction

State Comparative Risk reports were collected for twenty states and the risk rankings that each state compiled were reviewed to determine which states ranked third-generation environmental problems and the ranking that those problems were given. The third-generation problems that were considered were as follows: global warming, ozone depletion, and acid rain. The rankings were used to determine which states ranked third-generation environmental problems highly as well as to determine if the states that ranked these problems highly were significantly different from states that did not rank the problems highly in the areas of wealth, education, environmental policies, environmental conditions, air pollution, and natural resource GSP.

The risk reports compiled by each state were also used to determine which states ranked natural resource-based problems and the ranking that those problems were given. The natural resource-based problems that were considered were loss of natural resources, land loss, habitat loss, species loss, and loss of services provided by the environment and other closely related natural resource-based problems. The rankings for natural resource-based problems were used to determine which states ranked these problems highly and if the states that ranked the problems highly were significantly different from the states that gave these problems a lower ranking in terms of wealth, education, environmental policies, environmental conditions, air pollution and natural resource GSP.

The state rankings for third-generation environmental problems and natural resource-based problems were divided into four risk categories with 0 designating that the problem was not ranked, 1 that the problem was ranked "low", 2 that the problem was ranked "medium", and 3 that the problem was ranked "high." The purpose of this exercise was 1) to determine which states ranked third-generation environmental problems and natural resource-based problems, 2) to determine which states ranked the problems highly, and 3) to determine if the states that ranked the problems highly were significantly different from states that did not rank the problems highly in the areas of wealth, education, Green Index data, and for natural resource-based problems the percentage of the state GSP that was from natural resources.

Concern for global warming, ozone depletion, acid rain, the combination of the rankings for these third-generation environmental problems, and natural resource-based problems were the dependent variables that were analyzed. The following table will give an overview of the construction of the dependent variables including the way that each dependent variable was scored before the analysis, the variable type, and the data source (Table 3.1).

Table 3.1 Dependent Variable Construction

Variable Name	Indicated By	Variable Type	Data Source
Global Warming	Relative position of air issues with rankings of 0-3 with the rankings indicating the following 0 – Problem not ranked 1 – Problem ranked "low" 2 – Problem ranked "medium" 3 – Problem ranked "high"	Ordinal	State Comparative Risk Report
Ozone Depletion	Relative position of air issues with rankings of 0-3 with the rankings indicating the following 0 – Problem not ranked 1 – Problem ranked "low" 2 – Problem ranked "medium" 3 – Problem ranked "high"	Ordinal	State Comparative Risk Report
Acid Rain	Relative position of air issues with rankings of 0-3 with the rankings indicating the following 0 – Problem not ranked 1 – Problem ranked "low" 2 – Problem ranked "medium" 3 – Problem ranked "high"	Ordinal	State Comparative Risk Report
Natural Resource-Based Problems	Relative position of air issues with rankings of 0-3 with the rankings indicating the following 0 – Problem not ranked 1 – Problem ranked "low" 2 – Problem ranked "medium" 3 – Problem ranked "high"	Ordinal	State Comparative Risk Report

(Compiled by Author)

Independent Variable Construction

Independent variables were used to indicate the contextual setting of the responses of the individual states. The independent variables that were used are as follows: Total Green Index score, Green Policy score, Green Conditions score, air pollution score, natural resource GSP, per capita income, and bachelor's degree. The independent variables Total Green Index score, Green Policy score, Green Conditions score, air pollution score and natural resource GSP were taken from the *Green Index: A State-by-State Guide to the Nation's Environmental Health*. The definitions for the variables taken from the *Green Index* are as follows:

- Total Green Index Score – a composite ranking for the following sets of indicators: air pollution, water pollution, energy use and production, transportation efficiency, toxic chemical waste, hazardous and solid waste, community health, workplace health, agricultural pollution, forestry and fish, fun and quality of life, state policy initiatives, and leadership in congress

- Green Policy Score – a composite ranking for the following sets of indicators: state policy initiatives and leadership in congress

- Green Conditions Score - a composite ranking for the following sets of indicators: air pollution, water pollution, energy use and production, transportation efficiency, toxic chemical waste, hazardous and solid waste, community health, workplace health, agricultural pollution, forestry and fish, and fun and quality of life

- Air Pollution Score – a composite score for the following sets of indicators: population with air violating standards for ozone and carbon monoxide, state spending on air pollution, density of motor vehicle traffic and pollution, toxic chemical releases by industry to air, toxic emissions without end-of-stack controls, high-risk cancer facilities, ozone-depleting emissions, acid rain, air emissions from U. S. electric utilities, and carbon dioxide emissions from all fuels

The lower the composite score for the above four Green Index variables the better the state ranks in terms of environmental health.

- Natural Resource GSP – average total contribution from agriculture, mining, timber, and energy industries to state's total goods and services during 1963-1986

The GSP is given as a percentage of the state gross product. The independent variable education is the percent of persons 25 or older with a bachelor's degree or higher. The income variable is the per capita income of the population given in dollars. The figures for the education and income variables were taken from the 1990 census. The following table will give a brief synopsis of the construction of the independent variables including the name, indication, data type, and data source (Table 3.2).

Table 3.2 Independent Variable Construction

Variable Name	Indicated By	Variable Type	Data Source
Total Green Index Score	Numerical score with a lower score indicating a more "green" state	Continuous	Green Index
Green Conditions Score	Numerical score with a lower score indicating a more "green" state	Continuous	Green Index
Green Policy Score	Numerical score with a lower score indicating a more "green" state	Continuous	Green Index
Air Pollution Score	Numerical score with a lower score indicating a more "green" state	Continuous	Green Index
Natural Resource GSP	Percentage of the state's GSP from natural resources	Continuous	Green Index
Education	Percentage of individuals 25 or older with a bachelor's degree	Continuous	1990 Census
Income	Per Capita Income	Continuous	1990 Census

(Compiled by Author)

Methods of Analysis

Two different methods were used to analyze the data compiled for this research, difference of means testing and Pearson bivariate correlation analyses. The difference of means test was used to determine if there were patterns in the relationship between the dependent variables and independent variables that would suggest reasons why states would rank third-generation environmental problems and natural resource-based problems differently. For example, is there a difference in education levels between states that ranked third-generation environmental problems “high” and states that ranked these problems “low”? Analysis of each of the dependent variables (global warming, ozone depletion, acid rain, and natural resource-based problems) was conducted in this manner.

The second method of analysis used was the Pearson correlation analysis. One-tailed Pearson bivariate correlation analyses were conducted to determine if there were significant statistical associations between the dependent and independent variables. This second method of analysis was used to verify the patterns that were suggested by the difference of means analysis. According to Clogg et al (1994), as the number of distinct categories for a certain variable approaches five, the variable begins to behave more like a continuous variable than an ordinal variable and Pearson correlations can be used.

CHAPTER 4

RESULTS AND DISCUSSION

States Receiving EPA Assistance

This chapter outlines the results of the compiled data and the analysis of that data. Based on the information compiled, the following states received grant money from the Environmental Protection Agency to compile Comparative Risk Reports (Table 4.1).

Table 4.1 States Receiving Money to Compile State Comparative Risk Reports

Alaska	Florida	Maryland	North Dakota	Tennessee
Alabama	Hawaii	Maine	New Hampshire	Texas
Arizona	Iowa	Michigan	New Jersey	Utah
California	Illinois	Minnesota	New York	Vermont
Colorado	Kentucky	Missouri	Ohio	Wisconsin
Connecticut	Louisiana	Mississippi	Oregon	

(Compiled by Author)

State Comparative Risk Reports

An attempt was made to locate the report for each of these twenty-nine states, but in some instances the department responsible for completing the report did not know the current location of the report, either due to a difference in administration or due to the amount of time since the report had been completed. In addition, some of the reports have not been completed. Twenty completed reports were located and were used in this study (Figure 4.1). The states in yellow in Figure 4.1 indicate states with Comparative Risk reports used in this study. The ten EPA regions are outlined in the figure. The following table will identify those twenty states, the name of their respective comparative risk projects, the year the project was completed, the agency responsible for completing the report, and the number of problems listed in the final integrated ranking (Table 4.2).

The final risk rankings for each state are provided in the Appendix.

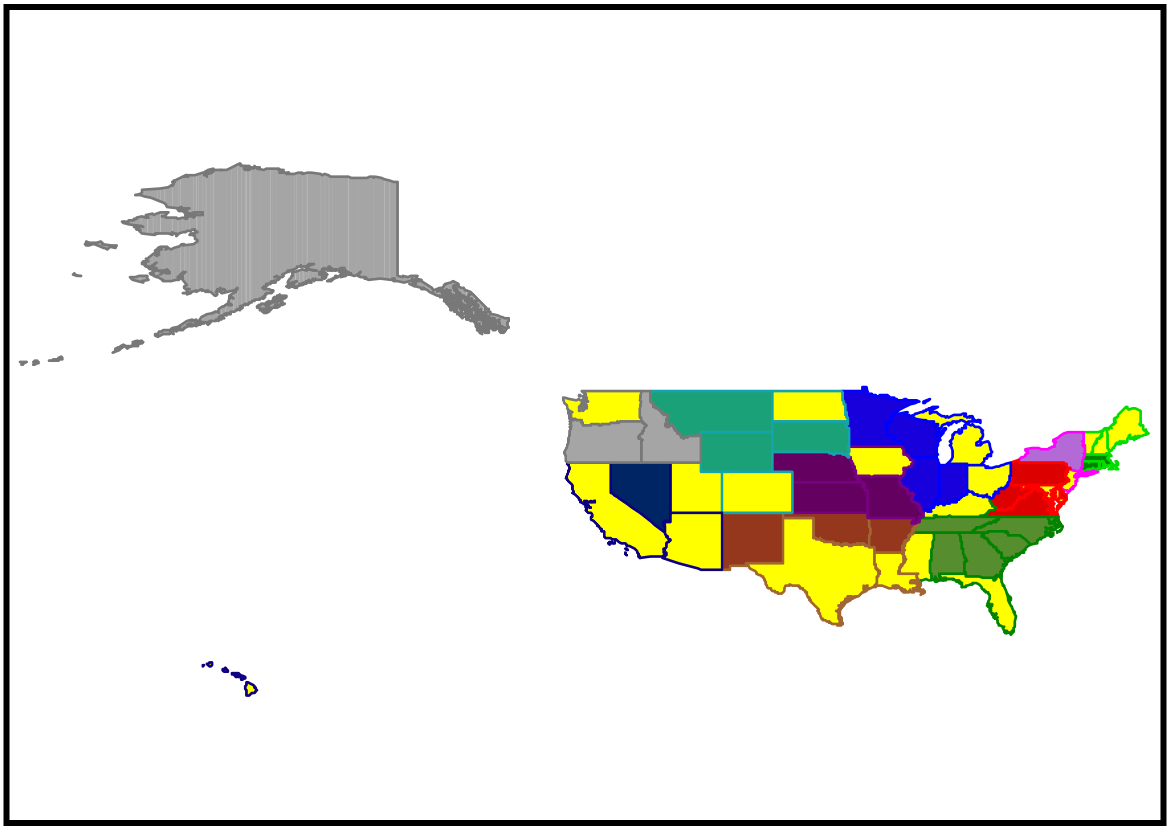

Figure 4.1 States with Comparative Risk Reports Used in Study
Note: States in yellow indicate that the Comparative Risk Report for that state was used in this study. The ten EPA regions are represented by a different color outline.
(Compiled by Author using ArcView)

Table 4.2 State Comparative Risk Reports Used in Study

State Name	Project Name	Year Completed	Agency Responsible	Number of Problems Ranked
Arizona	Arizona Comparative Environmental Risk Project	1995	Department of Environmental Quality	14
California	California Comparative Risk Project	1994	Environmental Protection Agency	24

(Table 4.2 continued)

Colorado	Colorado Environment 2000 Project	1990	Department of Public Health and Environment	30
Florida	Comparing Florida's Environmental Risks: Risks to Florida & Floridians	1995	Florida Center for Public Management	12
Hawaii	Hawaii Environmental Risk Ranking	1992	State Department of Health	16
Iowa	Iowa Comparative Risk Project	1999	Department of Natural Resources	6
Kentucky	Kentucky Outlook 2000: A Strategy For Kentucky's Third Century	1997	Natural Resources and Environmental Protection Cabinet	9
Louisiana	Louisiana Environmental Action Plan	1991	Department of Environmental Quality	33
Maine	Maine Environmental Priorities Project	1996	Maine Environmental Priorities Project	12
Maryland	Maryland Environment 2000 Project	1996	Department of the Environment	22
Michigan	Michigan's Environmental and Relative Risk	1992	Department of Environmental Quality	24
Mississippi	Comparative Environmental Risks in Mississippi	1997	Department of Environmental Quality	23
North Dakota	North Dakota Comparative Environmental Issues	1996	Department of Health	11

(Table 4.2 continued)

New Hampshire	New Hampshire Comparative Risk Project	1998	The Jordan Institute	55
New Jersey	New Jersey Comparative Risk Project	1998	Department of Environmental Protection	88
Ohio	Ohio Comparative Risk Report	1995	Environmental Protection Agency	45
Texas	State of Texas Environmental Priorities Project	1997	Natural Resource Conservation Commission	27
Utah	Utah's Environment: The Twenty-First Century	1995	Department of Environmental Quality	21
Vermont	Environment 1991: Risk to Vermont and Vermonters	1991	Agency of Natural Resources	17
Washington	Washington Environment 2010	1989	Department of Ecology	23

(Compiled by Author)

Structure of Risk-Ranking Committees

The structure of the committee that compiled each state's comparative risk reports were in many cases similar, but there were differences. Differences in structure of the committees include absence of public participation, absence of various groups of stakeholders in the risk ranking process, absence of a technical committee, or absence of a public advisory committee. The following table will identify whether the report was compiled by a technical committee, by public participation or by both. It will also identify the individuals or agencies making up the technical committee (Table 4.3).

Table 4.3 Committee Structure

State Name	Technical Committee	Technical Committee Members	Public Participation
Arizona	Quality of Life Ecological Human Health	Social scientists from universities, the private sector, and government Attorneys, Economists, Public involvement specialists , other generalist disciplines	Yes
California	Three Technical Advisory Committees		Yes
Colorado	Air Land Water Natural Resources	Governmental agencies; Private sector/industry; Public interest/non-profit organization; Scientific/academic community	No
Florida	Three Technical Advisory Committees	Experts in relevant areas from state agencies and universities	Yes
Hawaii	Technical Committee	Governmental agencies; Private sector/industry; Scientific/academic community	Yes
Iowa	Human Health Ecological Systems Quality of Life Energy Choices Public Advisory Committee	General Public; Governmental agencies; Private sector/industry; Public interest/non-profit organization; Scientific/academic community	Yes

(Table 4.3 continued)

Kentucky	Human Health Ecological Health Quality of Life Public Advisory Committee	General Public; Governmental agencies; Private sector/industry; Public interest/non-profit organization; Scientific/academic community	Yes
Louisiana	Technical Committee Public Advisory and Steering Committee	Representatives from the ten state agencies w/some environmental authority	Yes
Maine	Ecological Health Human Health Quality of Life	Individuals with expertise in areas such as ecology, public health, planning, education, economics and others	Yes
Maryland	Human Health Ecology Quality of Life Steering Committee	Governmental agencies; Private sector/industry; Public interest/non-profit organization; Scientific/academic community	No
Michigan	Three multi-disciplined committees	Scientists, citizens, and representatives of governmental agencies	Yes
Mississippi	Public advisory committee	Organizations representing environmental concerns, business, local governments, agriculture, public health, academia, environmental equity, DEQ	Yes

(Table 4.3 continued)

New Hampshire	Public advisory group	Businesses, Environmental Organizations, Public Health Experts, Citizens, Political Leaders, State and Local Government Officials	Yes
New Jersey	Human Health Ecological Quality Socioeconomic	Experts from government, business, academia and nonprofit organizations	No
North Dakota	Telephone survey	NDSU NDSU Extension service State Parks & Recreation Dept State Game & Fish Dept State Health Dept Citizens Nonprofit organizations Special interests	Yes
Ohio	Human Health Ecosystems Quality of Life	Individuals representing local governments, public health organizations, agriculture, business and industry, small businesses, fisheries, environmental advocacy, conservation organizations, colleges and universities, petroleum industries, public utilities, recreation, and others	Yes

(Table 4.3 continued)

Texas	Ecological Human Health Socioeconomic Public Advisory Committee	Governmental agencies; Private sector/industry; Public interest/non-profit organization; Scientific/academic community	No
Utah	Project core staff	UDEQ scientists and engineers, assisted by experts from the Utah Departments of Health, Agriculture and Natural Resources and from Utah State, Weber State, and Brigham Young Universities and the University of Utah	Yes
Vermont	Health Work Group Ecosystems Work Group Quality of Life Work Group Public Advisory Committee	General Public; Governmental agencies; Private sector/industry; Public interest/non-profit organization; Scientific/academic community	Yes
Washington	Technical Advisory Committee Public Advisory Committee	General Public; Governmental agencies; Private sector/industry; Public interest/non-profit organization; Scientific/academic community	Yes

(Compiled by Author from state Comparative Risk reports)

Contextual Characteristics of the States: Independent Variables Scores

Descriptive statistics were compiled to show the range of responses from states in terms of the independent variables that were used in the study. The following tables will show the Total Green Index score, Green Policy score, Green Conditions score, air pollution score, natural resource GSP, income, and education data that were compiled for each state (Table 4.4 and Table 4.5).

Table 4.4 Green Index Data

State Name	Total Green Index Score	Green Conditions Score	Green Policy Score	Air Pollution Score	Natural Resource GSP %
Arizona	7342	4540	2802	412	5.5
California	4931	4167	764	432	4.3
Colorado	6110	2330	3780	355	6.8
Florida	6320	4716	1604	426	4.2
Hawaii	5522	2239	3283	220	2.9
Iowa	6541	1841	4700	475	13.2
Kentucky	7694	2625	5069	526	11.5
Louisiana	8383	5739	2644	464	24.7
Maine	4892	3646	1246	387	5.5
Maryland	5585	1660	3925	476	1.4
Michigan	6297	4745	1552	509	2.5
Mississippi	8299	5283	3016	483	12.0
North Dakota	6833	4071	2762	331	25.2
New Hampshire	5803	3749	2054	523	2.1

(Table 4.4 continued)

New Jersey	5790	4640	1150	492	.7
Ohio	7411	5401	2010	666	2.9
Texas	8197	2659	5538	476	15.6
Utah	7122	4234	2888	495	7.3
Vermont	4921	1578	3343	252	6.0
Washington	5473	1606	3867	356	6.6

(Compiled by Author from *Green Index*)

Table 4.5 Income and Education Data

State Name	Income	Education
Arizona	13461	13.3
California	16409	15.3
Colorado	14821	27.0
Florida	14698	12.0
Hawaii	15770	22.9
Iowa	12422	16.9
Kentucky	11153	13.6
Louisiana	10635	10.5
Maine	12957	12.7
Maryland	17730	26.5
Michigan	14154	10.9
Mississippi	9648	9.7
North Dakota	11051	13.5

(Table 4.5 continued)

New Hampshire	15959	16.4
New Jersey	18714	16.0
Ohio	13461	11.1
Texas	12904	20.3
Utah	11029	15.4
Vermont	13527	24.3
Washington	14923	22.9

(Compiled by Author from 1990 Census)

Descriptive statistics were also compiled for each of the independent variables to determine the mean, median, standard deviation, variance and range of the compiled data. The following table provides this analysis for each of the independent variables (Table 4.6).

Table 4.6 Independent Variable Descriptive Statistics

	Total Green Index Score	Green Policy Score	Green Conditions Score	Air Pollution Score	Natural Resource GSP	Per Capita Income	Bachelor's Degree
N	20	20	20	20	20	20	20
Mean	6473.30	2051.50	4421.80	437.80	8.045	13771.30	16.560
Median	6308.50	2032.00	4387.00	469.50	5.750	13494.00	15.350
Std. Deviation	1140.552	650.939	730.366	101.503	7.0718	2421.127	5.5038
Variance	1300859.91	423721.842	533434.063	10302.905	50.0100	5861856.5	30.2920
Range	3491	2252	2456	446	24.5	9066	17.3

(Compiled by Author using SPSS)

Risk Rankings of Third-Generation Environmental Problems

The purpose of the third research question was to identify which states ranked third generation environmental problems, to identify the states that ranked third generation environmental problems highly, and to determine if states that ranked third generation environmental problems highly were significantly different from states that did not rank the problems highly, in the following areas: wealth, education, and Green Index data. The third generation environmental problems that were considered for the purposes of this paper were global warming, ozone depletion, and acid rain. The problem of global warming includes problems identified by individual states as global climate change, climate change, or global warming. Ozone depletion includes problems identified by states as ozone depletion, ozone-depleting substances, stratospheric ozone depletors, stratospheric ozone depletion, or greenhouse gases.

Of the twenty states that were considered only Florida, Kentucky, and North Dakota did not rank any of the three third generation environmental problems that were considered. Fifteen of the twenty states ranked global warming, five states ranked acid rain, and twelve states ranked ozone depletion. The following table will identify the problems ranked by each state and how each problem was ranked (Table 4.7).

Table 4.7 State Rankings for Third Generation Environmental Problems

State Name	Problem	Rank
Arizona	Global Climate Change	Low
	Stratospheric Ozone Depletors	Low
California	Greenhouse Gases	Medium
	Stratospheric Ozone Depletors	High
Colorado	Acid Deposition	Low
Florida	No Third Generation Environmental Problems Ranked	
Hawaii	Global Climate Change	Lower
Iowa	Global Climate Change	Highest priority for immediate attention

(Table 4.7 continued)

Kentucky	No Third Generation Environmental Problems Ranked	
Louisiana	Global Warming	High
	Stratospheric Ozone Depletion	High
Maine	Global Climate Change	Medium
	Stratospheric Ozone Depletion	Medium
Maryland	Greenhouse Effect	High-Medium
	Acid Deposition	Low-Medium
	Stratospheric Ozone Depletion	Low-Medium
Michigan	Global Climate Change	High-High
	Ozone Depletion	High-High
Mississippi	Acid Rain	Moderate-Lower
North Dakota	No Third Generation Environmental Problems Ranked	
New Hampshire	Stratospheric Ozone Depletion	28 of 55
	Climate Change	18 of 55
New Jersey	Greenhouse Gases	Low-Medium Low
	Acid Precipitation	Medium Low
Ohio	Ozone Depleting Substances	High
Texas	Stratospheric Ozone Depletion	Very High
	Global Climate Change	Medium

(Table 4.7 continued)

Utah	Global Warming	Low-Issue of Special Concern
	Stratospheric Ozone Depletion	Low-Medium Low-Issue of Special Concern
Vermont	Global Climate Change	Very High
	Depletion of the Ozone Layer	High
Washington	Global Warming and Ozone Depletion	Medium
	Acid Deposition	Medium-Low

(Compiled by Author from state Comparative Risk reports)

Possible Influences on Rankings of Third-Generation Environmental Problems

The difference of means analysis for third generation environmental problems revealed trends in the data that may suggest the reasons why individual states ranked third generation environmental problems differently. The following tables will give the difference in means for each ranking (0-3) of the dependent variables.

The data from the table for global warming (Table 4.8) seems to suggest that as the ranking goes from 1 to 3 that the Green Conditions scores increase, meaning that the states that rank the problem of global warming higher received a lower Green Condition rating from the Green Index. The states that ranked global warming higher have a higher air pollution score (more air pollution problems) which suggests that those states are more concerned about air pollution problems because they have more air pollution problems. States with a higher risk ranking for global warming have a higher natural resource GSP and a lower per capita income. This suggests that as states rank the risk associated with global warming higher, a higher percentage of their economy is from natural resources and those states have a lower per capita income.

Table 4.8 Global Warming

Score	Green Index Score	Green Policy Score	Green Conditions Score	Air Pollution Score	Natural Resource GSP	Per Capita Income	Bachelor's Degree
3	6255.00	1888.17	4366.83	449.83	8.317	14071.17	17.58
2	6067.50	1718.83	4348.67	439.67	6.667	14489.33	17.10
1	6432.00	2520.50	3911.50	316.00	4.200	14615.50	18.10
0	7111.17	2391.17	4720.00	464.50	10.433	12472.00	14.48

(Compiled by Author using SPSS)

The data from the ozone depletion table (Table 4.9) suggests that states that have more air pollution problems (those with a higher air pollution score) ranked the problem of ozone depletion higher. This suggests that states with air pollution concerns realize the high risk involved with ozone depletion as compared to states with fewer air pollution concerns. Also, Green Policy scores are better for states that have a higher ranking for ozone depletion. This suggests that states that view the problem of ozone depletion as a high risk are those states that have more "Green" policies.

Table 4.9 Ozone Depletion

Score	Green Index Score	Green Policy Score	Green Conditions Score	Air Pollution Score	Natural Resource GSP	Per Capita Income	Bachelor's Degree
3	6690.00	1867.83	4822.17	466.50	9.333	13515.00	15.40
2	5775.00	1890.80	3884.20	447.40	4.580	14519.60	18.78
1	7342.00	2802.00	4540.00	412.00	5.500	13461.00	13.30
0	6638.63	2195.88	4442.75	413.50	9.563	13534.63	16.45

(Compiled by Author using SPSS)

Although only five states ranked acid rain as an environmental problem facing their state, the data (Table 4.10) suggest that those states that ranked acid rain have a lower natural resource GSP than states that did not rank the problem or ranked it low. Also, states that ranked the problem of acid rain have a higher per capita income than states that did not rank acid rain as a problem. This suggests that wealthier states and states with a smaller portion of their economy devoted to natural resources are the states that ranked acid rain.

Table 4.10 Acid Rain

Score	Green Index Score	Green Policy Score	Green Conditions Score	Air Pollution Score	Natural Resource GSP	Per Capita Income	Bachelor's Degree
3							
2	6286.75	1858.00	4428.75	451.75	5.175	15253.75	18.77
1	6110.00	2330.00	3780.00	355.00	6.800	14821.00	27.00
0	6547.27	2084.53	4462.73	439.60	8.893	13306.00	15.27

(Compiled by Author using SPSS)

The data in the table (Table 4.11) for the combined rankings of third generation environmental problems suggests that states that ranked third generation environmental problems higher had a lower Green Policy score meaning that those states have better or more "Green" policies. Also, states with a higher combined ranking have a higher Green Condition score meaning that states with "worse" Green Conditions ranked these problems higher or as problems that need the most attention. The Air Pollution score is higher (worse) for states that ranked third generation environmental problems higher suggesting that these states are addressing their air pollution concerns with these rankings. Also, natural resource GSP is higher for states that rank third generation environmental problems higher. This suggests that states that perceive third generation environmental problems as high risk have a higher portion of their economy that comes from natural resources.

Table 4.11 Third Generation Environmental Problems Combined Rankings

Score	Green Index Score	Green Policy Score	Green Conditions Score	Air Pollution Score	Natural Resource GSP	Per Capita Income	Bachelor's Degree
3	6452.11	1862.44	4589.67	474.78	8.078	14133.44	16.91
2	6315.20	1981.20	4334.00	442.60	6.420	13454.20	15.34

(Table 4.11 continued)

1	6324.67	2457.00	3867.67	329.00	5.067	14684.00	21.06
0	6949.00	2330.33	4618.67	427.67	13.633	12300.67	13.03

(Compiled by Author using SPSS)

Natural Resource-Based Problems

To address the issue of natural resource based problems the following questions were asked: which states ranked natural resource based problems, which states ranked the problems highly, and were there significant difference between the states that ranked natural resource based problems highly than the states that did not rank the problems highly, in the following areas: wealth, education, Green Index data, and the percent GSP from natural resources. The natural resource based problems considered were alteration or degradation of ecosystems, coastal or inland wetland loss, habitat alteration or loss, loss of species diversity, loss of wildlife habitat, and other closely related problems. Each state ranked natural resource based problems and only North Dakota and Kentucky gave their natural resource based problems a "medium" ranking. If a state's rankings were divided into Ecosystems, Quality of Life, and Human Health and the natural resource based problem had a different ranking for each, the problem was given the highest ranking (3) in the analysis. The following table will list each of the natural resource based problems ranked by each state as well as the ranking of the problem (Table 4.12).

Table 4.12 State Rankings of Natural Resource Based Problems

State	Problem	Rank
Arizona	Physical alteration of ecosystems	High
	Biological alteration of ecosystems	Medium

(Table 4.12 continued)

California	Alteration of aquatic habitats	High
	Alteration of terrestrial habitats	High
Colorado	Loss of wetlands and riparian zones	Very High
	Aquatic habitats	High
	Soil erosion	High
	Critical wildlife habitat	Medium-High
	Forest issues	Medium-High
	Special ecologic and natural resources	Medium-High
	Threatened and endangered species habitat	Medium
	Plains issues	Low
Florida	Alteration/loss of ecosystems	High
Hawaii	Overfishing	Higher
	Nonpoint source pollution: soil erosion/sedimentation	Higher
	Vegetation and soil removal	Higher
Iowa	Animal production	Highest priority for immediate attention
	Soil erosion	
	Overuse of nonrenewable resources	
Kentucky	Biodiversity/Habitat loss	High
	Land quality – forests and silviculture	Medium
Louisiana	Coastal wetland loss	Very High
	Inland wetland loss	High
	Habitat Loss	High

(Table 4.12 continued)

Maine	Terrestrial ecosystems	High
	Land and agricultural resources	Medium
Maryland	Habitat modification and landscape change	Highest
Michigan	Biodiversity/habitat change	High
Mississippi	Degradation of aquatic ecosystems	Higher
	Degradation of terrestrial ecosystems	Higher
North Dakota	Loss of ag land	6 of 10
New Hampshire	Loss of land habitat caused by development	3 of 55
	Physical alteration of water and shoreline habitat	4 of 55
	Loss of water habitat by filling or draining wetlands	5 of 55
	Degradation of forest habitat by fragmentation	10 of 55
New Jersey	Habitat fragmentation	High
	Habitat loss	High
	Land use change	High
Ohio	Loss of species diversity	Medium-High
	Loss of wildlife habitat	Medium-High
Texas	Habitat alteration	Very High
	Loss of biodiversity	Very High
	Soil Loss	Low
Utah	Alteration and destruction of ecosystems	High

(Table 4.12 continued)

Vermont	Alteration of Vermont's ecosystems	Very High
	Pollution of lakes and ponds	Medium
	Pollution of rivers and streams	Medium-Low
	Visual and cultural degradation of Vermont's built and natural landscape	Medium-Low
	Loss of access to outdoor recreation	Low
Washington	Nonchemical impacts on agricultural land	High
	Nonchemical impacts on forest land	High
	Wetlands loss/degradation	High
	Nonchemical impacts on recreational land	Medium
	Nonchemical impacts on range land	Medium-Low

(Compiled by Author from state Comparative Risk reports)

Possible Influences on Rankings of Natural Resource-Based Problems

The difference of means analysis revealed trends in the data that may suggest the reasons why individual states ranked natural resource based problems differently. The following table will give the difference in means for each ranking (0-3) of the dependent variable natural resource based problems.

The data from the natural resource based problems table (Table 4.13) shows that states ranking natural resource based problems higher have better (lower) scores for Green Index, Green Policy, and Green Conditions. This suggests that states ranking natural resource problems as high risk already have better "green" policies and conditions. It also shows that states that ranked these problems "high" (3) have a higher (worse) Air Pollution score. The natural resource GSP for states ranking natural resource based problems is also much lower for states that ranked these problems as “high” (3) risk than for those states that ranked the problems as “medium” (2) risk. This suggests that states that perceive natural resource based problems as high risk have a smaller portion on their state income that comes from natural resources. Per capita income and education levels are higher for states that ranked natural resource based problems higher. This suggests that states that perceive natural resource based problems as high risk are both wealthier and better educated.

Table 4.13 Natural Resource Based Problems

Score	Green Index Score	Green Policy Score	Green Conditions Score	Air Pollution Score	Natural Resource GSP	Per Capita Income	Bachelor's Degree
3	6385.50	1980.17	4405.33	438.83	6.900	14067.89	16.89
2	7263.50	2693.50	4570.00	428.50	18.350	11102.00	13.55
1							
0							

(Compiled by Author using SPSS)

Additional Analyses: Pearson Correlations

There was only one significant correlation between a third-generation environmental problems and an independent variable. There was an inverse correlation between concern for global warming and the Green Policy score (Pearson r = -.394; $p \leq .05$). This means that as the risk ranking for global warming went up, the Green Policy score went down. The fact that there was only one correlation is not surprising given the relatively small sample size, but a trend in these data is suggested by the results of the difference of mean comparisons. There was also a significant positive association between the combined rankings of third generation environmental problems and the Air Pollution score taken from the Green Index (Pearson r = .491; $p \leq .05$). This indicates that as the combined risk ranking for third-generation environmental problems went up, the Air Pollution score also went up. The Pearson correlation also identified a significant inverse association between natural resource based problems (dependent variable) and natural resource GSP (Pearson $r = -.498$; $p \leq .05$). This indicates that as the risk ranking for natural resource-based problems went up, the natural resource GSP went down.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Risk Ranking Process

The process of preparing State Comparative Risk reports is unique because it took a significant amount of time to accomplish. The collected individual reports were prepared over a wide range of time (from 1989 to 1998). To understand the process for the preparation of Comparative Risk reports, the following paragraph will be devoted to providing an overview of the ranking process. Not all states followed this exact procedure, but variations were slight in most cases.

A list of environmental problems was compiled to reflect the issues that posed a level of environmental risk in that specific state. The list of problems from *Unfinished Business* was a starting point, but states were able to formulate lists based on state-specific problems. States formed both Technical Advisory Committees and Public Advisory Committees to obtain the risk perceptions from both experts and the general public. In most instances, the technical advisory committees were composed of three subcommittees, including a human health subcommittee, an ecological health subcommittee, and a quality of life subcommittee. Each subcommittee was responsible for ranking the list of problems according to the risk posed by that problem to human health, ecological health or quality of life. The rankings were then integrated to provide one overall ranking of environmental problems for that state.

This process was designed to get an accurate picture of environmental problems and their associated risks from both technical experts and citizens. However, not all states allowed citizen participation in the risk ranking stage of the project. Colorado, Maryland, New Jersey, and Texas did not utilize citizen participation. In some cases, citizens were able to participate only after the risk ranking was completed and in other cases, citizens were not asked to participate in any aspect of the project.

In the past, EPA's priorities have been more closely aligned with public opinion than with the estimated risks by the agency professionals. How the public perceives the seriousness of different environmental problems is very important to the setting of EPA priorities. (EPA, 1987) To ensure a proper place for Comparative Risk in developing environmental priorities, the strongest possible foundation of individual risk assessments must be built. (Cleland-Hamnett, 1993)

Cleland-Hamnett (1993) gives three basic guiding principles to build this foundation that are important to this research. The first is the characterization of risk. Characterizing individual risks must be done using straightforward, consistent terminology identifying uncertainties and data gaps so that both experts and citizens can more easily compare one risk to another. The second principle is the need to bring varied expertise into the risk assessment process from the earliest stage. The work of agency professionals needs to be exposed to the critical eye of independent experts, peers, and colleagues in their fields. This will both enhance the quality of the work and maximize the number of people who understand what the work attempts to accomplish. The third guiding principle that must be observed is the need for basic research and state of the environment data. Facts and hard conclusions from data are better than estimates based on extrapolations and interpolations. If the preparation of Comparative Risk reports follows these guiding principles, then the quality of the report will be evident and support for the Comparative Risk process will grow. However, without careful consideration of these three principles, Comparative Risk reports will lack the strength necessary to stand up under analysis and the foundation for Comparative Risk will not be sufficient to withstand critics of the Comparative Risk process.

Research Intent

The purpose of this research was to examine state-level risk orientation through the use of State Comparative Risk reports. The reports were prepared to address the areas of environmental problems that pose a risk to human health, ecological health, and quality of life and to identify those problem areas as high, medium or low risk. The intent was to identify the high-risk problems and to work toward reducing the risk that they posed to the environment. The two groups of environmental problems considered were third-generation environmental problems and natural resource- based problems.

Influences on State's Rankings of Third-Generation Environmental Problems

In analyzing the data from the risk rankings of each state, significant associations were found between states ranking third-generation environmental problems "high" and the air pollution score that the state received from the Green Index. As the air pollution score (a higher score indicating a higher level of air pollution problems) increased so did the combined ranking of third-generation environmental problems. This indicates that states with higher levels of air pollution realized the necessity of addressing those concerns with their Comparative Risk rankings and did so.

In analyzing the data for natural resource-based problems, significant associations were found between states ranking natural resource-based problems "high" and the air pollution score from the Green Index. States with a "high" ranking for these problems received a higher (worse) air pollution score from the Green Index. These results suggest that there is a relationship between natural resource-based problems and air pollution scores.

Recommendations

Looking at the final risk rankings for each state (Appendix 1), there is no "cookie cutter" approach on a national level that can sufficiently address the variety of environmental problems faced by individual states. There is an obvious need to provide assistance on a state-by-state basis so that each state may work toward decreasing the severity of the environmental problems that pose the highest risk to that state and its citizens.

The EPA has developed its environmental policies piecemeal as a result of specific statutes, with each problem addressed separately and without sufficient reference to other problems or to overall effects, risks, and costs. Rarely has the agency evaluated the relative importance of pollutants or environmental media – air, land, and water, or assessed the combined impacts on whole ecosystems and human health. (Riley, 1991) However, Comparative Risks reports do assess the combined impacts on whole ecosystems and human health and a careful analysis of those reports may be able to provide the foundation necessary for the EPA to begin developing environmental policies from a systems perspective.

Future Research

Although there were twenty State Comparative Risk reports utilized in this research, locating all of the reports that have been completed would provide a more complete analysis of the associations between environmental problems. It would also provide a more accurate picture of the differences between states in terms of the risk ranking process. Comparative Risk reports were completed for EPA regions, states, cities and watersheds. Further research in this area might involve comparisons between the reports of individual states and the report for the EPA region of that state.

Another area for future research would involve analysis of the quality and validity of the Comparative Risk reports of individual states. This research would provide insight into how future Comparative Risk reports should be structured so that the results of the reports will be sufficient to provide information that is pertinent and information that can be used to determine where future resources should be directed. Reports that are incomplete, reports that do not have adequate basis in science, reports that do not involve adequate technical representation, and reports that do not involve adequate public participation need to be identified so that those preparing future reports can be certain that all of the necessary steps are taken to provide reports that can be beneficial and excellent representatives of the financial resources that were necessary to prepare them.

It is difficult to identify the significance of state Comparative Risk reports on a state-by-state basis. If a state uses its Comparative Risk report to identify where resources should be directed to reduce the environmental problems that pose the highest risk, then the financial and technical resources that were used to complete the report will have been well spent. For example, New Hampshire revised their first Comparative Risk report (1998) by publishing a second edition in 2002. The state has used the report to shape the environmental agenda for New Hampshire. (Hartnett and Foss, 2002) Because of the wide range of participation form both technical experts and concerned citizens, other states would be well advised to use the Comparative Risk report as a way to address the environmental problems that pose the highest risk to the state and its citizens.

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APPENDIX – STATE RISK RANKINGS

Arizona

Very High
Outdoor air quality

High
Degradation of the built and cultural environment
Ground water contamination
Physical alteration of ecosystems

Medium
Biological alteration of ecosystems
Food and water contamination
Indoor air quality
Land and soil contamination
Surface water contamination

Low
Accidental releases
Global climate change and stratospheric ozone depletion
Natural hazards
Radiation
Workplace and consumer exposure to hazardous materials

California

Human Health

High

Environmental tobacco smoke
Inorganics
Persistent organochlorines
Ozone
Particulate matter
Radionuclides (natural sources)
Radon
Volatile organics

Medium

Carbon monoxide
Lead
Microbiological contaminants
Pesticides-agricultural use
Pesticides-non agricultural use

Low

Alteration of acidity, salinity or hardness of water
Radionuclides (anthropogenic)
Sox and Nox
Total suspended solids, biological oxygen demand, or nutrients in water

Social Welfare

High

Alteration of aquatic habitats
Alteration of terrestrial habitats
Environmental tobacco smoke
Greenhouse gases
Lead
Ozone
Particulate matter
Pesticides-agricultural use
Pesticides-non agricultural use Radionuclides
Stratospheric ozone depletors
Volatile organics

Medium

Asbestos
Inorganics
Microbiological contaminants
Non-native organisms
Oil and petroleum products
Persistent organochlorines
Radon
Sox and Nox

Low

Alteration of acidity, salinity or hardness of water
Carbon monoxide
Thermal pollution
Total suspended solids, biological oxygen demand, or nutrients in water

Ecological Health

High

Alteration of aquatic and wetland habitats
Alteration of terrestrial habitats
Inorganics
Non-natice organisms
Ozone
Sox and Nox

Medium

Alteration of acidity, salinity, or hardness of water
Greenhouse gases
Lead
Persistent organochlorines
Oil and petroleum products
Pesticides-agricultural use
Pesticides-non agricultural use
Total suspended solids, biological oxygen demand, or nutrients in water

Low

Microbiological contaminants
Particulate matter
Volatile organics

Colorado

Category 1
Criteria air pollutants (including the Brown Cloud)
Loss of wetlands and riparian zones
Nonpoint source surface water pollution
Pesticides

Category 2
Active and inactive mining and milling sites
Aquatic habitats
Damages from changes in water quantity
Environmental lead
Ground water contamination
Indoor air pollution/indoor radon
Open space
Soil erosion

Category 3
Critical wildlife habitat
Forest issues
Hazardous and radioactive waste management
Hazardous and toxic air pollutants
Inactive hazardous and radioactive waste sites
Recreation opportunities
Solid waste management
Special ecologic and natural resources

Category 4
Accidental releases of hazardous materials
Point source surface water pollution
Threatened and endangered species habitat
Underground storage tanks
Urban issues

Category 5
Acid deposition
Natural and geologic hazards
Noise pollution
Plains issues
Visibility degradation in rural and pristine areas

Florida

Critical Risks
Alteration/Loss of ecosystems
Patterns of development
Surface water quality
Water quantity

Serious Risks
Ambient air quality
Ground water quality
Indoor air quality

Some Risks
Food quality
Loss of scenic, historic & cultural resources
Soil Quality
Transportation/Storage of hazardous materials & wastes
Use & management of public lands

Hawaii

Higher
Alien species
Human crowding/overfishing
Nonpoint source pollution: nutrients/biochemical oxygen demand
Nonpoint source pollution: soil erosion/sedimentation
Nonpoint source pollution: toxic chemicals
Vegetation and soil removal

Lower
Explosives
Fire
Global climate change
Heat
Noise/light
Water diversion

Iowa

Highest priority for immediate attention
Water quality
Housing safety
Soil erosion
Animal production
Global climate change
Overuse of non-renewable resources

Kentucky

High
Air quality – toxic air releases
Biodiversity – Habitat loss
Lead and chilodren's health
Water quality – pollution from agriculture, urban areas, mining
Water quality – sewage

High to Medium
Waste – illegal and open dumps

Medium
Drinking water – safe drinking water
Land quality – forest and silviculture

Medium to Low
Waste – Brownfields and Superfund sites (contaminated waste sites)

Louisiana

Class 1: Issues of Highest Statewide Risk
Air toxics
Coastal wetland loss
Industrial wastewater discharges
Municipal wastewater
Nonpoint source pollution
Groundwater contamination
Lack of land use management/planning
Indoor air pollution
Pesticides
Aesthetics losses

Class 2: Issues of High Statewide Risk
Inactive and abandoned sites
Wastes from oil & gas production sites
Habitat losses
Accidental releases
Deepwell injection
Drinking water
Solid waste sites
Hazardous waste sites
Inland wetland loss
Flooding
Ozone
Worker exposure
Global warming
Seafood contamination
Hazardous materials transportation
Airborne lead
Naturally occurring radioactive material

Class 3: Issues of High localized Risk and/or Continuing Concern
Consumer exposure
Exposure to radiation
Medical waste
Stratospheric ozone depletion
Particulate matter
Storage facilities
Mercury
Sulfur dioxide

Maryland

Highest Residual Risk Environmental Problems
Criteria air pollutants
Habitat modification and landscape change
Nonpoint source pollution

High-Medium
Greenhouse effect
Hazardous waste at inactive sites
Lead poisoning

Medium
Drinking water quality and quantity
Groundwater contamination
Indoor air pollution
Municipal and industrial solid waste
Sewage treatment

Low-Medium
Accidental chemical releases
Acid deposition
Hazardous air pollutants
Hazardous waste at active sites
Industrial point sources
Radon
Stratospheric ozone depletion

Lowest
Dredging
Ionizing radiation
Noise
Storage tank releases

Maine

High Risk
Drinking water and domestic use water
Freshwater and marine ecosystems
Indoor air
Outdoor air
Surface water and sediments
Terrestrial ecosystems

Medium Risk
Global climate change
Land and agricultural resources
Solid, special, and hazardous waste
Stratospheric ozone depletion

Low Risk
Ground water (not used for drinking water or domestic use)
Radiation (other than radon)

Handled Throughout the Ranking Report
Food safety
Patterns of development (Maine's built and natural landscape)

Not Ranked
Exposure to toxins in the work place

Michigan

High-High
Absence of Land Use Planning
Urban Environment Degradation
Energy Producion and Consumption
Global Climate Change
Lack of Environmental Awareness
Ozone Depletion
Alteration of Surface/Groundwater Hydrology

High
Point Source Dischargers
Air Toxics Deposition
Biodiversity/Habitat Changes
Indoor Air Pollutants
Non-point Source Dischargers
Trace Metals in Ecosystem
Low Level Radioactive Waste

Medium-High
Contaminated Sites
Contaminated Sediments
Hazardous Waste
Photochemical Smog
Solid Waste
High Level Radioactive Waste

Medium
Accidental Releases and Responses
Acid Depostion
Criteria Air Pollutants
Electromagnetic Field

Mississippi

Human health

Higher Risk
Indoor Air Pollution
Lead
Radon

Moderate Risk
Acid Rain
Air Toxics
Drinking Water
Hazardous Waste
Non-point Sources of Water Pollution
Ozone and Carbon Monoxide
Particulate Matter
Pesticides
Septic Tanks
Storage Tanks
Superfund Sites
Wastewater Discharges

Lower Risk
Groundwater Contamination
Nonpermitted Releases
Radiation
Solid Waste Disposal

Not Ranked
Degradation of Aquatic Ecosystems
Degradation of Terrestrial Ecosystems
Odor and Noise
Water Quantity

Ecosystems

Higher Risk
Degradation of Aquatic Ecosystems
Degradation of Terrestrial Ecosystems

Moderate Risk
Lead
Non-point Sources of Water Pollution
Nonpermitted Releases
Pesticides
Septic Tanks
Solid Waste Disposal
Wastewater Discharges

Lower Risk
Acid Rain
Hazardous Waste
Ozone and Carbon Monoxide
Particulate Matter
Radiation
Superfund Sites
Water Quantity

Not Ranked
Air Toxics
Drinking Water
Groundwater Contamination
Indoor Air Pollution
Odor and Noise
Radon
Storage Tanks

Quality of Life

Higher Risk
Degradation of Aquatic Ecosystems
Degradation of Terrestrial Ecosystems

Moderate Risk
Acid Rain
Groundwater Contamination
Lead
Non-Point Sources of Water Pollution
Nonpermitted releases
Pesticides
Solid Waste Disposal
Superfund Sites
Wastewater Discharges
Water Quantity

Lower Risk
Air Toxics
Drinking Water
Hazardous Waste
Indoor Air Pollution
Odor and Noise
Ozone and Carbon Monoxide
Particulate Matter
Radiation
Radon
Septic Tanks
Storage Tank

New Hampshire

1. Degradation of surface water habitat caused by development
2. Airborne Particulate Matter (PM 10, 2.5), "soot" and tiny aerosols from gases
3. Loss of land habitat caused by development
4. Physical alteration of Water and shoreland habitat
5. Loss of Water habitat by filling or draining wetlands
6. Acid Deposition by rain, snow, and fog
7. Environmental tobacco smoke
8. Ultraviolet radiation, or sunlight
9. Ingested Lead in food, paint, etc.
10. Degradation of forest habitat by fragmentation
11. Allergens and other non-infectious biological irritants
12. Non-native organisms in surface water
13. Ground level ozone ("smog")
14. Persistent Organochlorine (DDT, PCB, dioxin)
15. Food contamination
16. Arsenic in groundwater
17. Non-native organisms on land
18. Stratospheric ozone depletion
19. Waterborne communicable disease
20. Mercury in surface water and on land
21. Pesticides
22. Carbon Monoxide indoors
23. Environmentally mediated diseases (Rabies, Lyme)
24. Petroleum in Groundwater (spills, etc.)
25. Nitrogen oxides (by-product of fuel combustion)
26. Hazardous wastes (Non-petroleum hydrocarbons) in groundwater
27. Infectious diseases in wildlife and fish
28. Climate change
29. Radon indoors
30. Sulfur oxides (by-product of fuel combustion)
31. Lead in soil and sediment, ingested by wildlife and fish
32. Nuclear reactors and associated high-level radioactive wastes
33. Airborne environmentally mediated disease (TB)
34. Volatile organic compounds indoors
35. Nitrates (in surface and ground water)
36. Petroleum in surface water
37. Soil loss from wind, water erosion
38. Air toxics
39. Chlorination byproducts in water supply
40. Non-reactor sources of low-level radioactive wastes
41. Other metals in surface water sediment, or on land
42. Road salt impact on adjacent land
43. Asbestos in indoor air
44. Road salt impact on groundwater
45. Carbon Monoxide outdoors
46. Extreme weather
47. Food additives and preservatives
48. Sludge and septage
49. Other metals in water supply
50. Volatile organic compounds outdoors
51. Polycyclic Aromatic Hydrocarbons (PAH) in surface water
52. Asbestos in groundwater
53. EMF radiation
54. Fluoride
55. Earthquakes

New Jersey

Human Health

High
Lead
Ozone (ground level)
Particluate matter
Polychlorinated biphenyls (PCBs)
Radon Secondhand tobacco smoke

Medium-High
Carbon monoxide (Co)-indoor
Doixins/funrns
Indoor asthma inducers
Pesticides-indoor
Radium
Volatile organic compounds (VOCs)-carcinogenic

Medium
1,3-butadiene
Acrolein
Arsenic
Benzene
Chromium
Disinfection byproducts
Endocrine disruptors
Formaldehyde
Legionella
Mercury
Nitrogen oxides (NOx)
Pesticides-food
Pesticides-outdoor
Pesticides-water
Ultraviolet radiation
Waterborne pathogens-recreational water

Medium-Low
Airborne pathogens
Carbon monoxide (CO)-outdoor
Cryptosporidium-recreational water
Sulfur oxides (SOx)/sulfates
Volatile organic compounds (VOCs)-noncarcinogenic

Low
Cadmium
Cryptosporidium-drinking water
Extremely low frequency/Electro magnetic radiation
Greenhouse gases
Hanta virus
Indoor microbial air pollution
Lyme disease
Methyl tertiary butyl ether (MTBE)
Nickel
Nitrogen pollution (water)
Noise
Pfiesteria
Polycyclic aromatic hydrocarbons (PAHs)
Radionuclides Waterborne pathogens-drinking water
West Nile virus

Socioeconomic

High
Land use change
Lead

Medium-High
Arsenic
Deer
Indoor asthma inducers
Particulate matter
Pesticides
Petroleum spills
Phosphorus
Polychlorinated biphenyls (PCBs)
Secondhand tobacco smoke
Ultraviolet radiation

Medium
Dioxins/furans
Endocrine disruptors
Inadvertent animal mortality
Indoor microbial air pollution
Invasive plants

Noise
Ozone (ground level)
Polycyclic aromatic hydrocarbons (PAHs)
Radon
Sulfur oxides (SOx)
Water overuse

Medium-Low
1,3-butadiene
Acid precipitation
Acrolein
Catastrophic radioactive release
Chromium
Dermo and MSX parasites in oysters
Extremely low frequency/Electro magnetic radiation
Floatables
Formaldehyde
Greenhouse gases
Hemlock woolly adelgid
Light pollution
Mercury
Methyl tertiary butyl ether (MTBE)
Volatile organic compounds (VOCs)
Waterborne pathogens

Low
Asian longhorned beetle
Benzene
Brown tide
Cadmium
Carbon monoxide (CO)
Copper
Cryptosporidium
Disinfection byproducts
Dredging
EHD virus in deer Geese
Genetically modified organisms (GMOs)
Green/red tides
Hanta virus
Legionella
Nickel
Nitrogen oxides (NOx)
Nitrogen pollution (water)
Off-road vehicles
Overharvesting (marine)
Pets as predators
Pfiesteria
QPX parasite in shellfish
Radium
Road Salt
Starlings
Thermal pollution
Tin
West Nile virus
Zebra mussels
Zinc

Ecological

High
Habitat fragmentation
Habitat loss

Medium-High
Hemlock woolly adelgid
Increase in impervious surface
Mercury
Pesticides –historical use
Ultraviolet radiation

Medium
Cadmium
Catastrophic radioactive release
Deer
Endocrine disruptors
Geese
Inadvertent animal mortality
Invasive plants
Lead
Nitrogen pollution (water)
Overharvesting (marine)
Petroleum spills
Phosphorus
Phthalates
Polychlorinated biphenyls (PCBs)
Starlings

Medium-Low
Acid precipitation
Arsenic

Brown tide
Chromium
Copper
Dioxins/gurans
Dredging
Greenhouse gases
Nickel
Noise
Off-road vehicles
Pesticides-present use
Polycyclic aromatic hydrocarbons (PAHs)
Tin
Water overuse
West Nile virus
Zinc

Low
Asian longhorn beetle
Blue-green algae
Channelization
Dermo parasite in oysters EHD virus in deer
Extremely low frequency magnetic radiation
Floatables
Genetically modified organisms (GMOs)
Green/red tides
Light pollution
MSX parasite in oysters
Ozone (ground level)
Pets as predators
Pfiesteria
QPX parasite in shellfish
Road salt
Thermal pollution
Volatile organic compounds (VOCs)
Zebra mussels

North Dakota

High
Drinking Water-Adequate Quantity/Quality
Surface Water
Groundwater
Indoor Air

Medium-High
Chemicals-Urban & Rural Use
Loss of Agricultural Land (including erosion)
Solid Waste
Plants & Animal Resources

Medium
Hazardous Waste
Air
Parks

Ohio	Human Health	Ecosystem	Quality of Life
<u>Issues Placed in Human Health Group A</u>			
Abandoned industrial sites	A	B	A
Drinking water at the tap	A	NA	A
Exposure from consumer unawareness	A	A	A
Inadequate infrastructure	A	B	B
Indoor air quality	A	NA	B
Industrial/commercial wastewater discharges	A	A	B
Mobile source emissions	A	B	A
Municipal waste disposal facilities	A	B	A
Ozone-depleting substances	A	A	A
Unregulated/abandoned hazardous waste facilities	A	A	A
<u>Issues Placed in Both Ecosystem Group A And Quality of Life Group A</u>			
Filling/diking/draining of wetlands	C	A	A
Loss of species diversity	B	A	A
Loss of wildlife habitat	B	A	A
Population change	B	A	A
Uncontrolled development	C	A	A
<u>Issues Placed in Both Human Health Group B And Either Ecosystem Group A or Quality of Life Group A</u>			
Combustion by-products	B	C	A
Mining activities	B	A	B
Nonpoint source/agricultural runoff	B	A	B

Pesticide spraying	B	B	A
Regulated hazardous waste facilities	B	B	A
Stationary air emissions (utilities, industrials and commercial)	B	C	A

Issues Placed in Human Health Group B

Abandoned water wells	B	C	B
Natural food toxins	B	NA	C
Oil and gas exploration	B	B	B
Pesticide residues on foods	B	NA	C
Tire management	B	C	B
Underground storage tanks	B	C	B

Issues Placed in Either Ecosystem Group A or Quality of Life Group A

Channelization of streams and rivers	C	A	B
Disposal capacity	C	C	A
Floods	C	C	A
Litter	NR	NR	A
Stormwater runoff from non-agricultural areas	NR	A	B

Issues Placed in Either Ecosystem Group B Or Quality of Life Group B

Construction and demolition debris	NR	C	B
Construction of dams	C	B	B
Fugitive dust	C	C	B

Harvesting natural resources	C	B	B
Illegal dumping	NR	C	A
Municipal wastewater discharges	C	B	A
Overconsumption of natural resources	NR	NR	B
Recreation	C	C	B
Sludge disposal	C	C	B
Spills and accidental releases	C	B	B
Transportation of waste	C	C	B
<u>Issues Placed in Human Health Group C</u>			
Other natural hazards	C	C	C
Yard Waste	C	C	C

Texas

Very High
Ground-level ozone (smog)
Habitat alteration
Lead contamination
Loss of biodiversity
Particulate matter

High
Air toxics
Ground water quality
Pesticide contamination
Surface water quality
Waste handling & disposal

Medium
Abandoned sites & spills
Flooding
Global climate change
Indoor air pollution
Water availability

Low
Atmospheric deposition
Food safety
Lawn chemicals
Public drinking water quality
Radiation
Soil erosion

Very Low
Electromagnetic fields
Noise pollution
Odor pollution
Pests
Toxics in home

Utah

High
Alteration and destruction of ecosystems
Drinking water quality
Ground water quality
Hazardous air pollution
Outdoor air quality
Surface water quality
Water reuse and conservation

Medium
Hazardous waste generation and disposal
Indoor air quality including radon
Leaking under/above ground storage tanks
Radioactive waste disposal activities
Releases from unique chemical and biological storage facilities
Solid waste disposal activities general
Spills or releases of hazardous materials or wastes general
Uncontrolled waste and Superfund sites

Low
Global climate change general
Ionizing radiation
Medical waste general
Non-ionizing radiation
Stratospheric ozone

Vermont

A
Alteration of Vermont’s ecosystem
Global climate change
Indoor air pollution

B
Air pollution
Depletion of the ozone layer

C
Drinking water at the tap
Pollution of lakes and ponds
Toxics in the household
Toxics in the workplace

D
Hazardous and radioactive waste
Pollution of rivers and streams
Solid waste
Visual and cultural degradation of Vermont’s built and natural landscape

E
Food safety
Groundwater, other than drinking water
Loss of access to outdoor recreation
Pesticides and pests, excluding exotic pests

Washington

Priority Level 1
Ambient air pollution
Nonpoint source discharges to water
Point source discharges to water

Priority Level 2
Drinking water contamination
Nonchemical impacts on agricultural lands
Nonchemical impacts on forest lands
Uncontrolled hazardous waste sites
Wetlands loss/degradation

Priority Level 3
Global warming and ozone depletion
Hydrologic disruptions
Indoor air pollution
Nonchemical impactson recreational lands
Nonhazardous waste sites
Pesticides (i.e. non covered elsewhere)
Regulated hazardous waste sites

Priority Level 4
Acid deposition
Indoor radon
Nonchemical impacts on range lands
Radioactive releases
Sudden and accidental releases

Priority Level 5
Litter
Materials storage
Nonionizing radiation

VITA

Mandy Green was born in Lafayette, Louisiana. She graduated from Lafayette Christian Academy in 1999. In 2002, she received her Bachelor of Science degree in sustainable agriculture from the University of Louisiana at Lafayette. She is currently a candidate for Master of Science in environmental planning and management at Louisiana State University.