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Darby A. Kaikkonen  
*The University of Montana*

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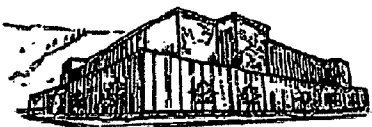
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The Role of Recreancy in Predicting Risk Perception:  
Analysis of a Conceptual and Operational Discrepancy

by

Darby A. Kaikkonen

B.S. Northern Michigan University, Marquette, MI, 2000

presented in partial fulfillment of the requirements

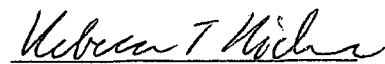
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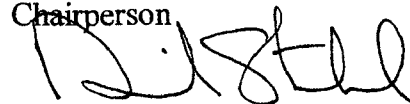
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## The Role of Recreancy in Predicting Risk Perception: Analysis of a Conceptual and Operational Discrepancy

Chairperson: Rebecca T. Richards 

Recreancy is a concept that has been readily used within risk analysis studies. The concept's conceptualization indicates failure of institutional actors to carry out their entrusted duty; yet, research studies that have utilized recreancy as a predictor of risk perception most commonly operationalize it as a unidimensional trust variable. This study attempts to clarify the discrepancy within previous methodological assessments of recreancy by analyzing a replication analysis of one such study. In addressing this discrepancy, this study also sought to solidify an essential part of the concept, which was the identification of perceived recreancy.

This analysis addressed three main questions. First, was the replicated recreancy scale unidimensional? Second, what was the relationship between conceptually established measures of perceived recreancy and trust? And finally, how powerful was recreancy in the given context in predicting risk perception? The first question was addressed using principal components analysis with varimax rotation. The second and third questions were addressed with a series of multiple regression models and the creation of a causal path model, respectively, to determine the significance of the relationships between the measures of perceived recreancy, trust, and risk perception.

The results of these analyses showed that the replicated recreancy scale was not unidimensional and that the dimensions represented differing attitudes of trust in the separate institutions of government and the mining industry. The results of the regression models indicated a significant relationship between the established measures of perceived recreancy and trust for both of the institutions thereby clarifying the conceptual path between institutional failure and individual trust. Finally, the causal path model indicated that the only significant predictor of risk perception was trust in mining; however, because the other variables had a significant relationship with trust in mining, these all had an indirect effect on risk perception. This result indicated that the predictive power of recreancy is dependent on its operationalization as well as on the degree of institutional relevancy in the context of risk management. Hence, since a mine was being proposed, respondent trust in the mining industry carried the most weight in predicting risk perception to the point that it mitigated the effects of other predictors.

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## CHAPTER ONE. THEORETICAL BACKGROUND

The earliest fundamental theory about social trust in relation to modern, complex, hazardous risks arguably derives from the work of Max Weber. Weber lived in Germany in the late 1800s and experienced the unique historical position of seeing the development of industrialization firsthand. During his lifetime, Germany changed from a country of kingdoms to an industrialized nation-state capable of worldwide economic trade. The resulting complex division of labor of specialized occupations in turn changed community relations so that people no longer related to each other in a personal and trusting way but instead in an impersonal and contractual way. Weber claimed that this shift in relationships reflected a decreasing reliance on spiritual power and an increasing dependence on “rational” and systematic understanding of the world. He referred to this dependence as “disenchantment”, a modern phenomenon which could be “measured negatively in terms of the degree to which magical elements of thought are displaced, or positively by the extent to which ideas gain in systematic coherence and naturalistic consistency” (Gerth and Mills 1946:51).

Weber attributed the development of disenchantment to the historical changes in religious beliefs and the social control of knowledge. Before the Industrial Revolution, explanations about the world were controlled by spiritual leaders who possessed charismatic or traditional knowledge. An element of mystery characterized everyday life, and people relied heavily on their faith in the spiritual world to understand otherwise mysterious forces. The Industrial Revolution and the advance of scientific technology led to a new way of thinking and new bodies of knowledge. With increased scientific

knowledge came intellectualization through which all things could essentially be mastered through calculation and reason. Instead of relying on spiritual beliefs and traditional or charismatic religious leaders, people could now rely on their intellect to understand the greatest mysteries of the world through science and technology.

Weber believed this shift from a reliance on the spiritual world to the dependence on science not only resulted in disenchantment but also irrationality because the most important questions in life could still not be answered by science. Religious beliefs were more than just a way of explaining the world; the way of knowing what was right or wrong and what values were important were embedded in these beliefs. Because science did not explain anything about morality or values, the more disenchanted the world became, the more human relations became impersonal, amoral, and devalued.

### **Rationalization**

The advancement of science and technology and the increase in intellectualization created a modern way of thinking. The idea of separating the physical world from the spiritual world is what is referred to as the “philosophical breakthrough.”<sup>1</sup> Once the disenchanted world was no longer in the hands of spirits, it could be empirically explained by scientists and manipulated through reason. This led to the world to becoming systematically “rationalized,” that is, characterized by the tendency to operate efficiently and instrumentally by the rational calculation of means and ends.<sup>2</sup> Weber called this result of the philosophical breakthrough “rationalization.”

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<sup>1</sup> The term “philosophical breakthrough” was introduced by Talcott Parsons as an interpretation of Weber’s idea about the separation of the physical and spiritual worlds (see Collins and Makowsky 1984).

<sup>2</sup> Weber’s discussion of rationalization is intermittent throughout several areas of his work, and the context in which the term is used varies. A specific definition of rationalization is not clear; however, the concept defined here is a general summary of the idea of formal rationality which is most relevant to the current analysis.

The result of industrialization was rationalization, a phenomenon that Weber referred to as “turning a world of peasants, lords, and priests into a buzzing hive of organization, machinery, and movement” (see Collins and Makowsky 1984:132). Weber recognized the advantages of efficiency that industrialization brought to the political and economic systems of the world. He also recognized the complexity of the social interactions that were necessary for industrialization to function, and he sought to identify the factors that were responsible for the international trade in industrialized goods and the eventual globalization of economics. He noted that the market structure in Germany and the rest of the world historically had consisted of peasant farmers who produced and sold their own goods to members of their local community. Weber identified three major reasons why the market was limited to each farmer’s local area: 1) there was a substantial risk of robbery while transporting goods, 2) there was no widespread economic system of money to support a large scale market, and 3) there was a prevalent feeling of distrust about others from outside the community. All three of these factors needed to be overcome before free market transactions and a sophisticated international economic system could emerge to support industrialization.

Previously, people had only trusted those in their group who worshipped the same god. By broadening their religious community and consequently their value system, people could begin to economically interact with others, and this trade “laid the basis for a moral community of trust underlying peaceful commerce...” (see Collins and Makowsky 1984:136). Once this basis of trust was established, communities could interact on a larger scale and create an interdependent economic system. Now businesses could feel confident in producing mass goods because they could sell them for a profit in

a much larger marketplace. Thus, the creation of a widespread economic system was supported for the development of the Industrial Revolution.

### **Bureaucracy**

Weber recognized that political and religious changes played a significant role in the increased division of labor and the move toward rationalization. Once the world had become disenchanted, expanded mutual trust created a free market economy and subsequently industrialization. This historic process was accomplished through the rise of aristocracies that concentrated wealth as they became more powerful. In Europe, the aristocracies first rose from the initial separation of the older traditional religious leaders and the kings. With the eventual merger of the church with the remnants of the Roman Empire, a new class of bureaucratic political and religious leaders emerged in the form of priests. To support this newly rationalized Roman Catholic church, a legal and monetary system was created that in turn supported new technologies that enhanced commerce and trading. These new technologies supported the centralized church organization and produced a vast accumulation of wealth.

Weber believed that this centralized religion played a role in the development of a more rationalized market system, this time by creating the motivation and characteristics of the modern Protestants who developed capitalism. Because a successful capitalist society is one in which a rational progression is made toward dominating an international economy by initially making small scale profits that are reinvested toward the long term goal of a vast large scale profit, capitalism could not be accomplished by greed and an unwillingness to sacrifice. Hence, Weber explained capitalism's success by identifying how Protestants created capitalism as a form of their religious beliefs.

Disenchantment had led to the Protestant disillusionment of centralized prayer and ritual as a means of salvation. Instead, Protestant believers sought to do what they felt God spiritually expected of them in order to assure their predestination. For them, religious salvation and economic success was mutually defined not by the amount of their monetary possessions but rather by their ethic of hard work. The virtue of attaining religious salvation through capitalism replaced a previous dependence on religious rituals as virtues of commitment. Hard work and sacrifice through small profits and savings were therefore the basis for the development of mass production and successful industrial capitalism.<sup>3</sup> Industrial capitalism resulted directly from the increased division of labor, which is defined as a unit of production that is based on the organization of labor and production of goods (Gerth and Mills 1946). Industrial capitalism produced the type of market economy that is driven by a rational calculation of costs and returns. Weber considered this form of capitalism as the pinnacle of rationalization because it depends on a division of labor that is supported by a system of legal-rational political authority.<sup>4</sup>

### **Political Authority**

Weber identified three types of legitimate authority; charismatic, traditional, and rational-legal. Charismatic authority results when people follow a person who is assumed to have special influential power so that the laws that he puts forth are perceived as legitimate. Traditional authority occurs when people serve a leader who comes to power based on sociocultural norms, and the laws that he enforces are legitimized

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<sup>3</sup> This is an interpretation from Weber's *Protestant Ethic and the Spirit of Capitalism*. The original work was interpreted by Talcott Parsons in 1930, and further summarized by Collins and Makowsky in 1984.

<sup>4</sup> Weber identified two types of capitalism: political, and modern industrial or bourgeois capitalism. Political capitalism results when profits depend on preparations for a war or other political expenditure that is engineered by a political entity. Essentially, profits are made by a powerful group exploiting others. Only the second form, industrial capitalism, is discussed here because political capitalism is not relevant since it is not a result of disenchantment and rationalization.

through tradition. Rational-legal authority requires that people follow a body of laws established on the basis of disenchantment so that the resulting laws are legitimized through rationalization. Hence, legal-rational authority is enforced through an impersonal social order, which Weber called “bureaucracy,” and not by any personal loyalty to a traditional or charismatic authority (Gerth and Mills 1946). Bureaucracy characterizes social institutions that not only enforce but replicate rational-legal authority, which in turn supports capitalism. In explaining the historical shift from a local community relations economy to an international market economy, Weber noted that informal good faith was replaced by formal contractual agreements as the rationalized basis for trust in capitalism. Capitalism thus reinforced the increasingly rigid and impersonal relationships between people through bureaucratic enforcement of contracts. The resulting creation of bureaucratic impersonal social control from rationalization is what Weber found problematic.

Weber recognized capitalism’s need for the efficiency that bureaucracy provided, but he was concerned about the displacement of morality and values. Rationalization shifted trust in the traditional social group to a new reliance and dependence on impersonal bureaucratic institutions. Because rule-enforced tasks can be done in an efficient, but dehumanized, manner, bureaucracy promotes capitalism at the expense of individual initiative and mutual trust. The newly emerging bureaucratic institutions created a social system that operated by ensuring that “specialists” would be the most efficient and well-trained personnel responsible for a particular job. In a highly industrialized society, this system works most efficiently when members of an institution rely on training and expertise rather than traditional norms and personal relations in

performing the task at hand. As a result, bureaucratic institutions increasingly came to rely on the technical specialization of impersonal experts rather than the knowledge and experience of members with close personal relationships (see Miller 1963).

### **Implications of Disenchantment and Rationalization**

Now that the world had become disenchanted, the doors had opened for empirical examination through science and intellectualization as opposed to the traditional transmission of knowledge about daily life and faith in mysterious powers. The increased division of labor and subsequent rationalization had reinforced society's dependence on bureaucratic institutions. As the world became more bureaucratic and "rationalized", people came to know less about the everyday functions of the world around them and relied more on institutional representatives who were considered experts in their field.

An example of this reliance on experts is given by Weber in his lecture "Science as a Vocation." In this lecture, Weber explains what he means by "intellectualized rationalization." People now live in a world in which they are unaware of how advanced technology works. They count on technology to function because they trust that an expert of some kind knows how things function, and there is an inherent trust in these experts or institutions. It is now unnecessary to rely on "magical means" because essentially all knowledge can now be mastered by calculation and reason. Rather than knowing more about the world, people understand the role of technical expertise and depend on those possessing the expertise to keep the world functioning.<sup>5</sup>

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<sup>5</sup> This passage is an interpretation of the following excerpt from Weber's lecture "Science as a Vocation"... "Let us first clarify what this intellectualist rationalization, created by science and by scientifically oriented technology, means practically... Unless he is a physicist, one who rides on the streetcar has no idea how the car happened to get into motion. And he does not need to know. He is satisfied that he may 'count' on the behavior of the streetcar... the increasing intellectualization and rationalization do *not*, therefore, indicate an increased and general knowledge of the conditions under which one lives" (see Gerth and Mills 191946:139).



Rationalization thus created a massive economic and political system of interdependence on bureaucracy throughout all of modern society. In order for this bureaucratic, rational-legal system to function, the public had to trust institutions and expert representatives. As bureaucratic institutions emerged and developed, they became more complex and hence the need for a trust in them has become a hegemonic part of everyday life. Weber's observations about rationalization and the dependence on bureaucratic institutions that it creates have remained critical to understanding public reactions to complex post-industrial risks. The advances in technology as a result of industrialization and capitalism have resulted in an increase in health and environmental risks. Weber's observations are crucial to understanding public risk perceptions since these are a function of the inherent public trust in the institutions that are charged with knowledge about the risks. As a result, analysis of postindustrial risk has emphasized the importance of trust and its effect on risk perceptions.

### **Risk Society**

The ideas put forth by Max Weber in the late 1800s continue to have profound significance in postmodern society. Society's dependence on bureaucratic institutions has become more complex in the years as science and technology has advanced following the Industrial Revolution. In 1993, William Freudenburg addressed the problem of institutional dependence by elaborating on Weber's observations about the importance of trust in bureaucratic, rational-legal institutions. Freudenburg noted how increasing rationalization has created a "risk society" and consequently an increase in societal risk perceptions (Freudenburg 2001).<sup>6</sup> Borrowing from Weber, Freudenburg claims that rationalization has made industry more specialized. The accompanying advances in

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<sup>6</sup> The notion of a risk society was first introduced by Ulrich Beck in 1988 (see Beck 1992)

technology have positively impacted our standard of living and extended life while reducing the risk of death and disease significantly over the last century. However, this decline in the risk of mortality has led to an increase in the vulnerability of our dependence on the systems that make these technological advances work, and this dependence has become increasingly problematic as the division of labor has grown more complex. As a result, the complex technological systems that have been created since industrialization are more difficult for experts to understand and control; hence, they require greater regulation by the responsible institutions (Freudenburg 1993, 2001).

Freudenburg argues that although rationalization has increased the quality of life, it has paradoxically caused an increased vulnerability to the possibility of “failure” on the part of the institutions responsible for risk management to carry out their entrusted duty. He contends that risk perception is based on the degree of control that an individual feels over a specific risk and offers Starr’s (1969) comparison of smoking a cigarette versus fearing a nuclear accident as an example.<sup>7</sup> Freudenburg thus shifts the focus of risk perceptions away from the individual’s psyche and places it on the institution or expert actors responsible for managing risks. Rather than assessing individual risk perceptions on the basis of emotion, ignorance, or irrationality, this institutional perspective emphasizes the level of societal trust in the institutions responsible for risk management.

### **Trust as Irrationality: Fear**

The need for a new institutional perspective on risk is supported by studies that have since shown that differing risk perceptions are not attributed to different levels of

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<sup>7</sup> A person has a much higher risk of harm from cigarette smoke than from a nuclear accident; however, nuclear energy is perceived as being extremely hazardous compared to smoking. The degree of control that an individual has over each risk is substantially different in that the individual can control his or her exposure to cigarettes whereas he or she must entrust technical experts and institutions with protection from a nuclear hazard (see Freudenburg 1993).

information. The question of whether people are rational in their perceptions about risk, or are just misinformed, is one that has prevailed throughout the literature regarding science and technology. Priest, Bonfadelli, and Rusanen (2003) describes this question as the “science literacy hypothesis” in which the “science illiterate” person misunderstands or misinterprets scientific data. This misunderstanding is of concern to scientists and other proponents of the positivist paradigm who believe people’s risk perceptions are based largely on misinformation, or plain ignorance, and therefore must be irrational.

An example of this positivist assumption about irrationality is given by Freudenburg, Frickel, and Dwyer (1998) who cites risk analysts Gross and Levitts’ argument that questions that arise about technology are irrational because they reflect an inability to understand the complexity of technical applications. Gross and Levitt express concern for what they see as a decline in public faith in science and technology. However, Freudenburg et al. (1998) believe the reason for this decline in faith may be more attributable to the public’s lack of trust than to the public’s ignorance.

A decline in the public’s trust in technology does not necessarily result from the public’s decline in the faith in technology; rather it could result from the historical behavior of those responsible for managing the technology. The development of institutions responsible for managing risks related to technological advances has created the potential risk of failure by those institutions due to human error. An alternative perspective proposed by Freudenburg shifts the focus away individual “irrationality” to societal rationality as a result of the risk related implications of disenchantment and rationalization previously identified by Weber (Freudenburg 1993).

### **Trust as Rationality: Recreancy**

Trust is a concept readily used in risk perception assessments; however, the concept as described by Freudenburg (1993) implies a morality of a personal nature that may not adequately describe the actions of an institution. After considering alternative words to describe this conceptualization dilemma, Freudenburg coined the term "recreancy" to mean "the failure of institutional actors to carry out their entrusted duty with the degree of vigor necessary to merit the societal trust they enjoy" (Freudenburg 1993:909). The term comes from the Latin roots *re* meaning to go back, and *credere*, meaning to entrust. Freudenburg uses the term to describe the failure of any actor or institution that holds a position of any type of obligatory duty to the collectivity to follow through with an entrusted duty. Recreancy does not mean that a failure necessarily results from an intentionally deviant act on the part of a responsible institution; rather, it implies that the behaviors of the responsible actors or institutions may or may not be counted on based on their historical performance. This definition by Freudenburg thus implies that in describing the behavior of an institution, recreancy is a unidimensional concept.

### **Operationalization of Recreancy**

Freudenburg's conceptualization of recreancy is based on the notion of trust in institutions in that if an institution fails to follow through on its entrusted duty, an overall lack of trust will result. In his conceptualization, Freudenburg borrowed two distinctly separate but equally important dimensions of trust from Bernard Barber (1983). According to Barber, trust implies an expectation of some kind so that trust functions to maintain social order by providing the basis for interaction. Barber identified two

dimensions of trust that are related to the result of an institutional failure: technical incompetence and fiduciary irresponsibility. Barber contends that because trust is linked to social control, trust is an issue of power. By entrusting institutions and their representatives with technical competence and fiduciary responsibility, the public is relinquishing power with the expectation that those entrusted will use it for the good of society.

The trust dimension of technical competence is based on the expectation that the responsible party or parties have knowledge and expertise. Because most people do not understand the technical aspects of an industry, they must hold someone else accountable for managing it. In a highly technologically advanced society, the expectation of technical competence is commonplace and such competence is entrusted to the expert parties responsible for technological risks from the practice of medicine to the maintenance of a vehicle. The second dimension of trust, fiduciary responsibility, refers to the “expectation that some others in our social relationship have moral obligations and a responsibility to demonstrate a special concern for other’s interests above their own” (Barber 1983:14). This dimension extends beyond technical competence in that because most people do not understand the technical aspects of an industry, they must hold someone else responsible for budgeting *as well as* managing it.

In borrowing Barber’s two-dimensional conceptualization of trust as the basis for recreancy, Freudenburg suggests that if recreancy has occurred, the lapse could involve a failing in technical competence, fiduciary responsibility, or both. Despite his argument that recreancy consists of these two distinct and independent dimensions, Freudenburg (1993) claims that as a broad (and hence unidimensional) concept, recreancy is open to

different interpretations and may be subjectively assessed as to when it has occurred or has the potential to occur. Freudenburg also claims that because his conceptualization is broad, various objective approaches to operationalizing recreancy may be used to measure the concept. In his analysis, Freudenburg operationalized recreancy as a unidimensional variable of “trust.” In doing so, Freudenburg did not distinguish either of the two dimensions of trust in his indicators nor did he clearly denote the various institutions that each dimension would arguably encompass.

In his 1993 study, Freudenburg hypothesized that levels of concern about siting a nuclear waste facility could be predicted by levels of recreancy. The way in which Freudenburg measured recreancy in this study design was to ask the respondents the following questions (Freudenburg 1993:919).<sup>8</sup>

“What is your level of trust in:”

1. Current scientific and technical ability to build safe, efficient nuclear waste disposal sites [trust in science and technology]
2. The ability of private enterprise to develop cost-effective, safe disposal sites in the United States [trust in business capability]
3. National government agencies to safely administer a system of nuclear waste sites [trust in federal government]

These three indicators of trust were considered “recreancy variables,” and were cross tabulated with respondents’ levels of concern about siting a nuclear waste facility. The results were then compared to a second cross tabulation of sociodemographic and ideological variables in order to assess which explanatory variables were significant. All three recreancy variables demonstrated significant differences in explaining levels of concern, and the levels of significance were greater than those for predicting concern by sociodemographic and ideological variables.

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<sup>8</sup> Note that Freudenburg chose to separate the various institutions that might be encompassed in the realms of science and technology, business capability, and federal government. This indicates that Freudenburg felt the level of recreancy could vary depending on the institutional function involved in the risk.

Although results from Freudenburg's (1993) initial test of recreancy appeared significant, the inconsistency in measuring the dimensions of trust that he specified in his conceptualization make his empirical test problematic. Freudenburg defined recreancy as the failure of an institution to carry through its entrusted duty. By measuring recreancy through **individuals'** levels of trust but generalizing the findings to **institutional** behavior, Freudenburg demonstrated the fallacy of reductionism. Nevertheless, since 1993, both Freudenburg's concept of recreancy as well as variations of his inconsistent operationalization of recreancy have been used extensively in research studies on risk perceptions and risk management. The next chapter describes this literature on trust and risk perceptions and the different ways in which researchers have measured recreancy as it relates to the concept of trust and the institutions responsible for risk management.

## CHAPTER 2. LITERATURE REVIEW

Freudenburg defined recreancy as a bidimensional concept that could characterize the behavior of an institution in terms of technical competence and fiduciary duty, but he measured it as unidimensional variable of trust with individuals as units of analysis. In doing so, he assumed that people's levels of trust are based on the historical performance of institutions responsible for risk management. As demonstrated in the previous chapter, this assumption is flawed because of reductionism: measuring individuals' levels of trust does not reflect the failure of an institution to carry out its duty. Moreover, Freudenburg's conceptualization of recreancy as based on the two dimensions of technical competence and fiduciary responsibility suggests that his unidimensional operationalization of trust fails to measure the concept as he defined it. An examination of the literature in which trust has served as an indicator of risk perception demonstrates that these two methodological problems of conceptualization and operationalization have since prevailed.

### **Trust**

Numerous studies have examined the role of trust in institutions in determining risk perceptions. These studies cover a wide range of technologies such as nuclear energy, bioengineering, hazardous waste disposal, chemical plants, and food irradiation. In each of these contexts, trust is often a factor that is included in an analysis of predicting risk perceptions. Usually, the trust items either refer to a particular institution, or institutions, that are responsible for managing the risks associated with the technology or to the government in general.



**Credibility.** Although the concept of trust as a predictor of risk perception is common throughout the literature, how the concept actually affects risk perception is uncertain. For example, social psychological theories would predict that people are more accepting of information they receive about risk if the source is credible. In constructing a trust index that measured the credibility of sources, Williams and Hammitt (2001) hypothesized that trust would affect the acceptance of information given by sources on food safety. Based on the significance levels of the trust index in predicting risk perceptions of food safety, they concluded that people were more accepting of food safety information received from sources that they deemed as credible. Therefore, trust in this context reflects the credibility of information sources.

**Dimensionality.** In general, risk perception researchers have recognized that trust is such a broad concept that several studies have examined the importance of identifying different dimensions of trust. In two separate studies, Poortinga and Pidgeon (2003) and Frewer, Scholderer, and Bredahl (2003) examined the dimensionality of trust. Poortinga and Pidgeon's (2003) study described two distinct dimensions of trust that represented competence and accountability. The dimension of accountability also represented an element of credibility and was hence similar to the unidimensional operationalization of Williams and Hammitt (2001).

In contrast to Williams and Hammit (2001) and Poortinga and Pidgeon (2003), Frewer et al. (2003) examined the limitations of trust as a predictor of risk perception regarding genetic modification in food production. They argued that trust could play a mediating role between an individual's risk perception and her preexisting attitude toward the technology creating the risk, but they claimed that trust was not necessarily a

significant predictor by itself. Like Williams and Hammitt (2001) and Poortinga and Pidgeon (2003), Frewer et al. (2003) conceptualized trust to mean trust in information sources. In constructing this argument, they identified two underlying dimensions of trust that they determined represented expertise and trustworthiness. Frewer et al.'s findings suggest that an individual's preexisting attitude toward genetic modification technology is the strongest predictor of risk perception since those individuals who initially favored genetic modification technology were more likely to trust the source providing the information materials.

**Preexisting Attitude Toward a Technology.** Frewer et al.'s (2003) finding that an individual's preexisting attitude toward a technology is the underlying factor in explaining his trust or distrust in a source of information suggests that preexisting attitudes toward, rather than trust in, a technology comprise the primary determinant of whether or not people will accept a technology and its accompanying risks.

In attempting to assess a preexisting attitude toward a technology as the major explanatory variable in risk perception, Priest et al. (2003) used trust as an indicator of attitude and loosely defined it as "doing a good job for society." They examined support for biotechnology by individuals' levels of knowledge about biotechnology and the "trust gap", i.e., the difference between levels of trust in government and levels of trust in environmental groups. Priest et al. (2003) concluded that one, the relationship between an individual's knowledge about biotechnology and his support for it cannot be determined because of his preexisting attitudes toward the technology, and two, the trust gap is a significant predictor of support for biotechnology.

Although Priest et al. (2003) found a predictive relationship between support for biotechnology and the trust gap, their findings should be interpreted somewhat differently than those from other studies that examined trust. In contrast to other studies, they measured trust by assessing the discrepancies between trust in government and trust in environmental groups. Consequently, it was not the general concept of trust that was significant; rather, the magnitude of the difference in the level of trust between government and environmental groups (the trust gap) was the significant predictor of support for biotechnology.

Priest et al. (2003) concluded that the relationship between knowledge and support about biotechnology could not be determined because of the fact that someone with a preexisting attitude who initially favors biotechnology will actively seek out information about it. Thus, a preexisting attitude toward a technology may only be an intervening factor that makes any conclusions about the role of the “trust gap” unclear. The claim that an individual’s preexisting attitude towards a technology is an intervening variable that overrides her levels of trust as a significant predictor was presented by both Priest et al. (2003) and Frewer et al. (2003).

**Limitations of Trust as a Predictor.** Researchers not only lack consensus about the dimensions of trust and its relationship to preexisting attitude, they also fail to agree on the distinctions between trust and confidence. Siegrist, Earle, and Gutscher (2003) argue that trust and confidence are conceptually different since trust represents a willingness to become vulnerable to the judgment of others with similar values, but confidence reflects reliance and ability based on the past performance of the parties responsible for risk management.

Viklund (2003) argues that trust is not as powerful a predictor of risk perception as the previous literature has contended. He claims that trust and risk are related on a conceptual level because trust is essentially an attitude that allows one to take risks. Viklund (2003), like Frewer et al. (2003) and Priest et al. (2003), concludes that there is a conceptual overlap between preexisting attitude and trust because it is unclear which comes first, and consequently it is unclear which of the two is the actual predictor in assessing risk perception. Viklund's results varied across different contexts regarding the effect of trust as a strong predictor of risk, and he suggests that the strength of the effect depends on what type of risk is being assessed.

Risk perception studies that have explored the concept of trust as a predictor have thus employed different means of conceptualizing and operationalizing trust. In most cases, if not all, and despite the variations in how trust has been conceptualized, trust has generally demonstrated a significant effect on risk perceptions. However, the *causal* relationship of trust and risk perception has only been indirectly addressed. For example, studies have demonstrated the indeterminacy of establishing causal connections between individuals' preexisting attitudes towards a technology and their trust in the technology.

This lack of causal explanations can be explained because of the literature's ubiquitous methodological design of measuring **individuals'** levels of trust in institutions' ability to manage risk rather than measuring actual **institutional** failures to fulfill risk related responsibilities. Arguably, individuals' levels of risk perception are more likely to be affected by actual institutional failures rather than their levels of trust that potential failures will or will not be averted.

Freudenburg (1993) coined recreancy to mean the failure of an institution to carry out its entrusted duty. Thus, as defined, the concept of recreancy establishes the link between individuals' trust in institutions and her level of risk perception. Freudenburg (1993) contends that the behavior of an institution charged with managing risks has a direct effect on whether or not people will trust those institutions, and hence their evaluation of risk. Since Freudenburg (1993) first conceptualized recreancy, only a few studies have empirically measured recreancy and specifically addressed how it occurs, why it occurs, and what its implications are for risk perception. The following section describes a framework for examining how recreancy may affect trust in institutions.

### **Recreancy**

One way that institutions have historically handled sensitive issues of technological failure is by "diversionary reframing" (Freudenburg et al. 1998:19). In the most basic terms, diversionary reframing means changing the subject. This is accomplished by redirecting the attention from the institution and focusing it either on the economic benefits of a particular technology or on the unreasonableness of concerned citizens. When used by political actors, this reframing tactic creates an immense potential for recreancy in that it creates an uncertainty about events and diffuses responsibility for them. The eventual result is a massive distrust in public institutions (Freudenburg et al. 1998). Hence, frame analysis is a methodologically useful means of analyzing recreancy (see Benford and Snow 2000). In addition, frames reflect worldviews and affect risk perceptions in that "when there is inconsistency between an organization and its contextual worldview...then there are struggles to define what the problems are and who is to blame for the problems" (Lodwick 1993:152). In the

following examples, it is clear to see how shifts in worldviews and subsequent discrepancies in frames create recreancy.

An example of recent recreant institutional behavior occurred in the Love Canal residential area in Niagara Falls, NY. The Love Canal incident was historically significant because it resulted in state and federal environmental legislation based on the lack of response from the institutions responsible for public safety. Hooker Electrochemical Company had deposited chemical waste in the manmade canal in the community of Love Canal near Niagara Falls. In 1954, the government purchased company land and proceeded to build homes and a school on it; in 1978, the first evacuation of pregnant women and children under age two was recommended. When the homeowners began to react to the emerging contamination problems at Love Canal, they were confronted with different frames about the chemical waste in the media, from the responsible government agencies, and from Hooker Electrochemical Company (Robinson 2000).

The Love Canal community claimed that the government had demonstrated recreant behavior in that the New York State Department of Health and the New York State Department of Environmental Conservation had kept important information from the citizens and neglected their responsibility of protecting public health. The state agencies tried to blame the contamination problem on the company, but the company countered that it had revealed the possible dangers in advance through meetings and communications with the state agencies. The discrepancy between the two frames resulted in a community-wide belief that recreancy had occurred, and consequently,

recreancy created the beginning of community members' distrust in the institutions charged with protecting public health (see Robinson 2002).

The Oak Ridge nuclear reservation provides another case in which frame analysis has revealed recreancy. Cable, Shriver, and Hastings (1999) examined community quiescence (inaction) in the wake of a revelation of recreancy on the part of the Department of Energy (DOE). A mercury leakage accident at Oak Ridge revealed that the laboratory grounds were more dangerous than the DOE had previously indicated. Because Oak Ridge was established by the government for nuclear activity, workers were required to maintain high security and secrecy. The patriotism and job dependence that the workers felt compelled them to accept the frame presented by the government that the work they were doing was important and not harmful (see Cable et al. 1999). This government-driven frame allowed recreant behavior by the DOE to go unnoticed until the mercury leakage accident occurred. This incident was confirmed in 1990, and it presented contradictory evidence to the DOE's frame. The individual reaction of the residents was to confront the DOE and try to get answers about what was really happening. The DOE engaged in diversionary framing by exercising various methods of social control. The agency manipulated community meetings and controlled the flow of information about the issue. This behavior created the illusion of community inaction to the outside public, but within the community, citizens contended that the DOE's collusion was cause for great concern. The DOE, which was responsible for regulating risk, apparently could not regulate itself, and this dilemma allowed the agency to behave in a recreant manner.

A third example of recreancy is displayed by the behavior of the Environmental Protection Agency (EPA) regarding the Woonasquatucket River in Rhode Island. In this case, the residents near the river were fully aware that local industries had been using the river as a waste dump. The frame that the residents adopted was that contamination was a part of living in the area. Thus, when actual dangerous levels of contamination were found in 1996, it was difficult to determine if residents perceived the responsible agencies as behaving in a recreant manner or not because of the pre-existing expectations of the community. However, community concerns about contamination had been expressed since the 1960s, and the EPA and other agencies displayed recreancy by minimizing those concerns over that time. In the 1990s, the EPA took action on resident concerns and created the impression that the agency was managing the problem with “routinized monitoring mechanisms” (see Zavetoski et al. 2002). In the meantime, local citizens learned that the EPA had had knowledge about the levels of contamination prior to 1990 that was not disclosed. The revelation of EPA’s prior knowledge without public disclosure caused a disruption in the existing frame that most residents had adopted. They no longer trusted the EPA information that they were given and consequently had higher risk perceptions about the river.

A situation similar to Woonasquatucket occurred at Rocky Flats at the Colorado plutonium nuclear trigger and processing plant. Mistrust began when initial declarations of safety were contradicted by subsequent accidents or incidents. The responsible company (Dow Chemical Company) had violated public expectations that it was adequately competent to handle the facility when an explosion occurred after the company had consistently assured residents that the facility was safe. This incident



brought into question the technical competence of the company, and the public began to feel less trust in the company due to its recreant performance (see Lodwick 1993).

Similarly, in an incident in Carver Terrace, TX, a land buyer financed by Carver Terrace, INC purchased chemically contaminated land for the purpose of building reasonably priced residences for upwardly mobile African-Americans. The city of Texarkana rezoned the land from “industrial” to “residential” in order to allow the homes to be built. The government displayed clearly recreant behavior by essentially “dragging their heels” on every development concern that the residents brought forward (see Capek 1999:153). This behavior not only led to a decrease in the residents’ confidence in science and the government but also made them feel that the development was a racially motivated plan. They felt they were not being treated fairly because they were African-American, and this led to collective action on their part. This incident shows how recreancy can not only cause a decrease in public trust that in turn affects risk perceptions but how it can also lead to “environmental racism” (Capek 1999:159).

All of these instances of environmental contamination were caused by a failure of institutionally controlled technology and are clear examples of recreancy. The institutions responsible for maintaining and monitoring public safety failed to protect people with the degree of vigor necessary. The consequence was public distrust, and the following studies demonstrate the implications of that distrust on those very institutions.

### **Practical Implications of Recreancy**

Until now, this review has discussed trust, the dimensionality of trust, and the impacts of recreancy on individuals’ risk perceptions. Freudenburg’s (1993) concept of recreancy extends the broad concept of trust by arguing how the action of a responsible

institution causes feelings of trust or mistrust, and how mistrust in turn causes an increase in risk perception. The failure of an institution to follow through with its entrusted duty can cause people to become skeptical about the reliability of responsible institutions, and the implications on public policy can be large. This is especially true when it comes to particularly hazardous technological risks such as those associated with hazardous waste repository sitings. The consequences of recreancy in the hazardous waste industry are generally perceived as detrimental. The perceptions of residents in an area proposed for hazardous waste facility siting are very important because most repository sitings depend on the support of residents. In this case, the opposition to a facility because of mistrust in a responsible agency can be assumed to be a result of recreancy. However, because recreancy describes an action and not a perception, the only assumption that can be made is that opposition is based on *perceived* recreancy.

For example, researchers who investigated the DOE's proposal for placing the nation's first nuclear waste repository at Yucca Mountain, NV studied public hearings regarding the proposed repository to gain insight into the community's attitudes toward the siting as well as levels of trust in the DOE (Kraft 1991). They argued that the perceived trustworthiness of the DOE has been affected by historical context including the past recreant behavior of the agency since the public response to the DOE's siting recommendation was highly negative (see Kraft 1991).<sup>9</sup> The public extensively criticized DOE's technical competence, and because of the low levels of trust in DOE, the public was opposed to the siting. Additionally, Kunreuther et al. (1990) found that trust in the

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<sup>9</sup> The DOE's historical background of failure includes contamination incidents at Three Mile Island, the Hanford site, and the Fernald Plant in Ohio (see Shulman, Hardert, D'Antonio, and Sheak and Cianciolo), in addition to the previously mentioned Rocky Flats (Lodwick) and Oak Ridge Reservation (Cable, Shriver, and Hastings).

federal government's ability to manage the repository was crucial to predicting public perceptions of safety. These and subsequent analyses of the potential siting for the first national nuclear repository at Yucca Mountain display the importance of trust in public perceptions and support. As the Office of Technology Assessment notes: "the most formidable problem confronting the nation's efforts to develop nuclear waste repositories was the level of distrust among concerned parties, and...this distrust threatened to lock the waste disposal effort in a state of virtual and continual paralysis" (see Dantico, Mushkatel, Pijawka 1991:750).

The major implication of the Yucca Mountain studies is that siting largely depends on residents' perceptions of risk and perceptions of the institutions in charge of those risks. Thus, residents must exhibit a high level of trust in the responsible institutions to agree to allow a nuclear waste depository. Because opposition to a hazardous waste facility by citizens can have the impact of blocking federal programs for nuclear waste storage, the implications of public trust in institutions are enormous. This brief analysis demonstrates how the DOE has been caught in a struggle with citizen opposition because of its historical recreant behavior. Moreover, these studies demonstrate how one can *assume* that distrust results from recreancy.

### **Operationalization of Trust**

Risk perception studies have examined trust as a unidimensional concept as well as a multidimensional concept, but the basic dimensionality of trust has not been clearly established. Additionally, some studies have suggested that other intervening variables may override trust as a predictor of risk perception.

Williams and Hammitt (2001) used exploratory factor analysis on a set of attitudinal indicators to determine which items loaded together to form a trust index. This index was then summated into a single item measure of trust for use in a regression model to predict risk perception about food safety. Similarly, Poortinga and Pidgeon (2003) explored the dimensionality of trust by using principal components analysis. They identified two underlying dimensions of trust, general and skeptical, which he concluded were measuring separate and distinct constructs. The general trust factor was associated with items related to competence, fairness, and openness. In contrast, the skeptical trust factor was more representative of items that assessed the validity of the ways in which policy is enacted. Poortinga and Pidgeon (2003) categorized these two dimensions as representing different dimensions of competence and accountability.

Like Poortinga, Frewer et al. (2003) defined trust as the willingness to accept information from an expert, and their factor analysis on trust indicators produced two separate dimensions of expertise and trustworthiness. Both of these dimensions were assessed in their overall analysis. However, Frewer et al. (2003) concluded that trust was a mitigating factor in risk perception, and preexisting attitude toward the technology involved was the main component as determined by estimates of direct and trust-mediated attitude change effects in a multi-sample structural equation model.

In addition to trust, Siegrist et al. (2003) examined confidence as a predictor of risk perception as well. Using structural equation modeling, they employed a dual-mode model of social trust and confidence by using both variables as separate dimensions to predict risk perception. Siegrist et al. distinguished between trust and confidence by conceptualizing trust as value-laden and confidence as the past performance of a

responsible party. They define trust as the willingness to become vulnerable to the judgment of others and confidence as a reflection of feelings about ability, reliance, and the use of technology to solve problems. Citing Freudenburg's 1993 article in their paper, these authors conclude that recreancy is the same construct as confidence.

In contrast to Siegrist et al.'s (2003) conceptualization of trust as value-laden, Priest et al. (2003) defined trust as "doing a good job for society." Rather than measuring the overall level of trust in institutions, they operationalized trust as the gap between the level of trust in government and the level of trust in environmental groups. Priest et al. (2003) used regression analysis to explain the significance of the trust gap as a predictor of risk perception.

Finally, Viklund (2003) argued that trust was not a particularly powerful predictor of risk perception because results varied across four different countries. Viklund concurred with Frewer et al. (2003) that an attitudinal component of trust should be considered, but it is unclear which of the two comes first: the preexisting attitude or trust. He identified two dimensions of trust that he called general and specific. Viklund's specific trust dimension was measured using a list of risks and asking how much respondents trusted authorities to manage these risks. This general trust dimension did not include indicators of competence or morality, but it was more predictive of risk perception than the specific trust dimension.

In conclusion, the consistent theme in all these studies is that trust as a general concept does not always predict risk perception because of mitigating factors. Additionally, specific separate dimensions have been used to define and measure trust as

well as define the general concept of trust in institutions alone. However, these dimensions should be clearly operationalized and measured separately.

Operationalizing recreancy is more complicated than operationalizing trust since recreancy has been defined as an action that has taken place as illustrated in the studies on Love Canal (Robinson 2000), Oak Ridge (Cable, Shriver, and Hastings 1999), Woonasquatucket (Zavetoski et al 2002), Rocky Flats (Lodwick 1993), and Carver Terrace (Capek 1999). Such studies have described recreancy as the failure of the responsible institution to adequately protect the health and welfare of the citizens of a risk-impacted community. The range of recreant failures has varied from subtle impression management to severe outright deceit.

No particular operationalization of recreancy has yet been quantitatively defined and subsequently measured since all these studies have been “after the fact” qualitative analyses. Robinson (2002) used content analysis of newspapers and historical documents to construct a framework of recreancy for the Love Canal incident in New York. Cable et al. (1999) examined community quiescence in the wake of Oak Ridge recreancy through in-depth interviews of residents and document analysis. Zavetoski et al. (2002) and Lodwick (1993) carried out content analysis of newspaper articles, EPA press releases, and other official documents to determine recreancy at Woonasquatucket, RI and Rocky Flats, CO respectively. Capek’s (1999) documentation of recreancy at Carver Terrace, TX relied on a content analysis of newspapers over a two-year period as well as in depth interviews with residents.

Similarly, perceptual recreancy also has been determined through qualitative analysis techniques. However, the one indicator used for determining perceptual

recreancy has been level of trust in institutions, and this trust indicator was defined in ways similar to that of earlier quantitative studies that used trust as an explanatory variable. This level of trust in institutions was measured by Kraft (1991) through content analysis of hearings held in conjunction with the second round of repository siting under the U.S. Nuclear Waste Policy Act of 1982. The Department of Energy had assessed several hundred sites for a possible siting and then narrowed the field to 20 possibilities. Of these 20 sites, Kraft (1991) chose four in which to examine the public hearings. He found that content analysis proved more useful than survey analysis because of the depth of the public's attitude.

In contrast, Dantico et al.'s (1991) study consisted of collecting two different sets of survey data through interviews. For the purpose of comparing the differences in risk perceptions over time, one survey was conducted in 1988 and the other in 1989. The questions addressed the level of trust in specific agencies, such as the DOE, EPA, Congress, and the state legislature. The conceptualization of trust was different for each survey in that in 1989 the trust indicator was "trust to protect the public safety" while the 1988 indicator was "trust to do the right thing" (Dantico et al. 1991). These trust indicators were then grouped to represent the overall levels of trust in the federal government, trust in responsible agencies, and trust in local government. These sets of trust items formed additive scales and were used to compare associations with risks.

Dantico et al.'s (1991) procedure of separating and creating additive scales by is similar to Freudenburg's (1993) measurement process for recreancy. Freudenburg (1993) used three sources of survey data that included questions about the level of trust in science and technology, business capability, and the federal government. The dependent

variable was a question that asked about the level of concern a citizen would have if a low level radioactive waste facility were to be located near her. Freudenburg concluded that these recreancy variables provided substantially higher explanatory power than any of the sociodemographic or ideological variables.

### **Recreancy versus Trust**

Although Freudenburg's initial conceptualization of recreancy appeared to have great potential in explaining risk perception, his operationalization of trust as recreancy was arguably fallacious. As a concept, recreancy has remained particularly ambiguous because Freudenburg operationalized recreancy as level of trust, and chose to categorize different institutions based on their level of responsibility within risk in order to measure recreancy. Additionally, Freudenburg identified the two dimensions of trust, technical competence and fiduciary responsibility, that could be related to recreancy and claimed that a failure to follow through on an entrusted duty could involve a failing along either dimension or both. Freudenburg's initial identification of these dimensions of trust has not been subsequently measured in any of the studies previously discussed. Moreover, several studies have established the need to measure trust in the context of such separate constructs as knowledge, preexisting attitude, credibility, and confidence in explaining risk perceptions. Despite these attempts to measure trust as a predictor of risk perceptions, no measurement of individual trust can assess the behavioral failure of an institution to carry through with its entrusted duty. Freudenburg states that recreancy describes the behavior of an institution while trust reflects a personal belief about that institution. Previous studies describing recreancy have justifiably relied on archival and



media content analysis to determine recreant performance because institutional failure is not a concept that can be adequately determined through attitudinal survey data.

Thus, Freudenburg's (1993) conceptualization and operationalization of recreancy are incongruent. Subsequent quantitative studies examining individuals' trust in institutions reflect this incongruence while qualitative studies that have focused on recreant behavior reflect Freudenburg's original conceptualization of the concept by examining actual institutional failure. This methodological discrepancy in the literature has resulted from researchers' lack of attention to not only trust as a result of recreancy but also to recreancy as a multidimensional concept in definition and measurement.

In order to assess the possible operationalization problems associated with Freudenburg's conceptualization of recreancy, I will examine data from a study that conceptualized recreancy similarly to that of Freudenburg. The data derive from a replication of a study conducted by Spies et al. (1998) in which recreancy served as an explanatory variable in a logistic regression model predicting intended voting behavior regarding the possible siting of a hazardous waste facility. The study aimed to identify whether or not levels of risk perception were related to the degree of support for siting the waste facility and if these levels differed between residents of an area proposed for a hazardous waste facility siting and leaders of the area. The dependent variable of risk perception was measured by asking the question, "If an election were held today, I would vote in favor of having a waste facility located in our area."

The concept of recreancy was introduced as a scalar independent predictor, or index, comprised of multiple questions regarding trust and confidence in various institutions. Four questions measured the level of confidence that the respondents had in

technology and in those experts who design and operate waste facilities. In addition, the level of trust was assessed for a list of relevant governmental agencies. The responses on these items were summed to form a single scalar variable.

In this article, Spies et al. briefly referenced Freudenburg (1993), and indicated that their scale was created by drawing on his work. However, the Spies et al. operationalization of recreancy clearly differs from Freudenburg since Freudenburg did not include the construct of confidence in his definition, nor did he sum indicators from three separate groups of institutions (science and technology, business capability, and federal government) to obtain a scalar recreancy indicator. Spies et al. also indicated that their scale attempted to measure both dimensions of trust as identified by Freudenburg (1993), namely, technical competence and fiduciary responsibility. Most importantly, Spies et al. identified the recreancy scale as a measurement of *perceived* recreancy. This distinction is essential in addressing my first research question of what is actually measured when one operationalizes the concept of recreancy.

Hence, the focus of this thesis is to assess whether recreancy can be adequately conceptualized, operationalized, and measured through survey methodology as an explanatory variable in predicting risk perception while avoiding the methodological flaws that have characterized previous studies. Specifically, this thesis addresses three main research questions:

1. Does operationalizing recreancy as a unidimensional general trust variable, measured by specific levels of trust and confidence, accurately reflect its conceptualization as defined by Freudenburg in 1993? Or is recreancy more adequately distinguished as a bidimensional construct?

2. Consequently, are individuals' levels of general trust in institutions a function of recreancy, or more specifically, perceived recreancy?
3. How powerful is recreancy as a predictor of risk perception empirically in a given context?

The specific goal and direction of the research will be outlined in the following methodology chapter.

### CHAPTER 3. METHODOLOGY

The data that I will examine derive from a replication study based on the Spies et al. (1998) study. In 1998, near Lincoln, MT, a multi-community survey was conducted in the Blackfoot River Watershed to assess resident and leader support for construction of a proposed cyanide heap-leach gold mine (see Richards and Davis 1998). The survey questionnaire replicated items from Spies et al. (1998) because of the potential similarities between a hazardous waste facility siting and a gold mine siting, i.e. both types of projects seek community support, require permits from responsible agencies, and most importantly, involve environmental risks. This replication study provided another context in which recreancy could be assessed as a variable in predicting levels of risk perception. Using unobtrusive measures, I will therefore address the following research objectives:

**Research Question 1: Does operationalizing recreancy as a unidimensional general trust variable, measured by specific levels of trust and confidence, accurately reflect its conceptualization as defined by Freudenburg in 1993? Or is recreancy more adequately distinguished as a bidimensional construct?**

**Objective 1:** Is the replicated recreancy scale unidimensional?

**Objective 2:** If the scale is not unidimensional, what do the separate dimensions represent?

**Research Question 2: Are individuals' levels of general trust in institutions a function of recreancy, or more specifically, perceived recreancy?**

**Objective 3:** Are there other items in the data that provide conceptually clearer and/or more direct measures of perceived recreancy than levels of general trust in predicting level of risk perception?

**Objective 4:** Consequently, what is the relationship between perceived recreancy and general trust?

**Research Question 3: How empirically powerful is recreancy as a predictor of risk perception in a given context?**

**Objective 5:** How significant are levels of general trust in predicting the established measure of risk perception in this specific context relative to perceived recreancy?

### **Data and Methods**

**Data Collection.** The sample for the survey was randomly selected from citizens of the communities that would be most affected by the proposed mine. Five distinct rural communities comprised the study area and two subsamples, one representing residents and one representing leaders, were drawn from each community. The resident sample was randomly selected by using a map of household residences and a survey questionnaire was dropped off for a member of the household who was 18 years or older to complete. The questionnaire was picked up within two days. The resident sample had a response rate of 80 percent for all of the communities (see Richards and Davis 1998, Richards and Brod 2004).

The leader sample was drawn using a snowball sampling method. An initial list of community leaders was compiled based on interviews with community members and through local records, and this list was continually generated until the same people were

confirmed through the interviews. The survey questionnaire was sent to available leaders after they were contacted by the survey team leader and then mailed back after completion. This sample yielded a 76 percent response rate (Richards and Davis 1998, Richards and Brod 2004).

**Data Analysis.** In 2004, the 1998 survey data were analyzed following the most parsimonious logistic regression model of Spies et al. (1998) by Richards and Brod (2004). In their replication analysis, Richards and Brod (2004) created a recreancy scale comprised of two subsets of items following Spies et al. (1998). The first set measured the level of trust in various agencies and institutions, and the second set of items measured the level of confidence in various aspects of the mining industry. This scale was initially replicated as analogous to that of Spies et al. (1998) but was refined to reflect agencies that were more relevant to the mine study and to increase reliability. Additionally, the items measuring trust in the EPA, local volunteer citizen groups, and university scientists were excluded because an initial factor analysis indicated they were weak items.<sup>10</sup>

The final recreancy scale that was used by Richards and Brod (2004) for analysis was comprised of six items that asked the respondent (on a scale of one to five) what his level of trust was in the Montana DEQ, the governor's office, the state legislature, the county government, private mine companies, and the state mining association.

In addition, four questions asked the respondent's level of confidence in how environmental quality would be protected by mine management in correcting problems,

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<sup>10</sup> These latter two items should not have been included in either (Spies et al. 1998) or (Richards and Brod 2004) analyses because theoretically they do not represent the type of responsible agencies that Freudenburg referred to when he conceptualized recreancy.

mine engineers in designing the mine, mine engineers and construction personnel in constructing the mine, and mine operations personnel in monitoring the mine.

These items were then summed to form a single item scalar variable that comprised 10 items and had an alpha reliability of .92.

## **Methods**

The following methods will be used to explore the research questions and specific objectives.

**Objective 1: Is the replicated recreancy scale unidimensional?**

**Objective 2: If the scale is not unidimensional, what do the separate dimensions represent?**

The conceptualization of recreancy as measured by items of trust and confidence in the Richards and Brod analysis implies that the recreancy concept is a unidimensional measure of the failure of an institution to carry through with its entrusted duty. An empirically appropriate way to determine if the recreancy scale is an adequate unitary measure of recreancy is to apply principal components analysis to determine the unidimensionality of the scale. If the results produce more than one dimension of the ten-item recreancy scale indicated by multiple components with eigenvalues greater than one, varimax rotation will be used to clarify which items load significantly onto which components. The items that load the highest together onto each component will then be summed to create new indices that will represent separate measures of trust and or confidence.<sup>11</sup>

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<sup>11</sup> Previous literature has contended that the conceptually different constructs of trust and confidence should be separated in analyses. However, this analysis is an examination of a pre-established recreancy scale that included items of both trust and confidence together in one scale. Consequently, all of the items will be analyzed together and the PCA will analytically determine which items are significantly different.

**Objective 3: Are there other items in the data that provide conceptually clearer and/or more direct measures of perceived recreancy than levels of trust and confidence in predicting levels of support?**

This objective requires a theoretical examination of other questionnaire items in the survey. In previous studies, measuring an individual's level of trust or confidence in an institution was considered an inadequate measure of institutional failure because the concepts of trust and confidence are attitudes while an institution's failure may be the result of an action or *perceived* action. Based on Freudenburg's original definition of institutional failure, two items in the data set will be considered measures of perceived recreancy. The first asks the question, "On a scale of 1 to 5, how satisfied are you with the effectiveness of county government?" The second asks the question, "To what degree do you agree or disagree with the statement, agencies responsible for public health and safety are capable of responding to mine accidents in ways that will ensure public safety." These two items will represent perceived recreancy in the separate institutions of government and the mining industry, respectively.<sup>12</sup>

**Objective 4: Consequently, what is the relationship between perceived recreancy and trust and confidence?**

Previous literature suggests that an individual's level of trust can be affected by institutional failure; more simply, trust (or lack of trust) can follow recreancy, or the perception of recreancy. To assess this particular objective, two separate bivariate regression models will be constructed. The first will include the item identified as a

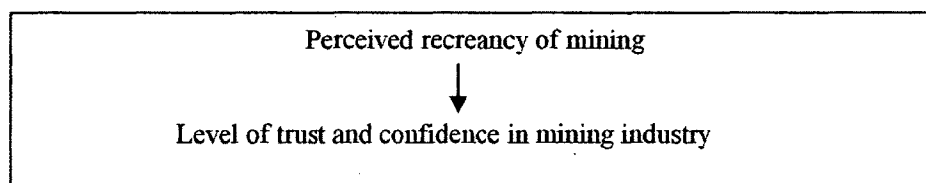
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<sup>12</sup> In Freudenburg's initial operationalization he identified and separated for his analysis three different types of institutions (science and technology, business, and federal government) that were relevant within the context of nuclear waste management. Consequently, this study will follow Freudenburg's initial methodological procedure by identifying and separating those types of institutions that are relevant in the context of a cyanide heap-leach mine, which are government and the mining industry.



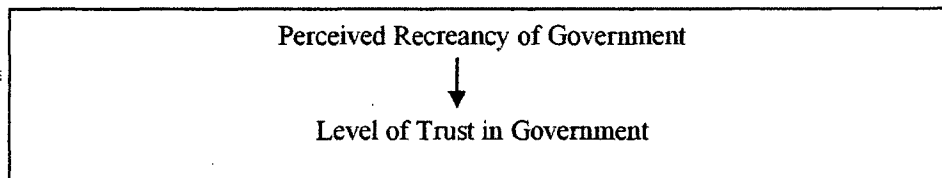
measure of perceived recreancy of the mining industry as a predictor variable of the anticipated separate index that may be constructed from the items of trust and confidence in mining in the Richards and Brod (2004) recreancy scale. The second model will include the item identified as perceived recreancy of government as a predictor variable of the anticipated separate index of trust in government constructed with items from the Richards and Brod (2004) recreancy scale. Therefore,

**Hypothesis 1 (H1)** = the *perceived recreancy of mining* item will significantly impact respondent trust and confidence in mining. The hypothesized path is as follows:



Additionally,

**Hypothesis 2 (H2)** = the *perceived recreancy of government* item will significantly impact respondent trust in government. The hypothesized path is as follows:



**Objective 5: How significant are levels of institutional trust and confidence in predicting the established measure of risk perception in this specific context relative to perceived recreancy?**

The final hypotheses address the general research question that inquires how significant recreancy is in the specific context of the Blackfoot Watershed mine proposal. The separate measures of perceived recreancy identified in Objective 3 will be used in a multiple regression model to predict risk perception. Additionally, the principal components analysis conducted in Objective 1 is projected to produce more than one dimension of trust and confidence, and if so, will empirically derive separate independent measures of trust and confidence. As described in Objective 2, if obtained, these separate measures will be summed to create new indices that will also be included in the multiple regression model. Therefore, while controlling for the effects of other predictors,

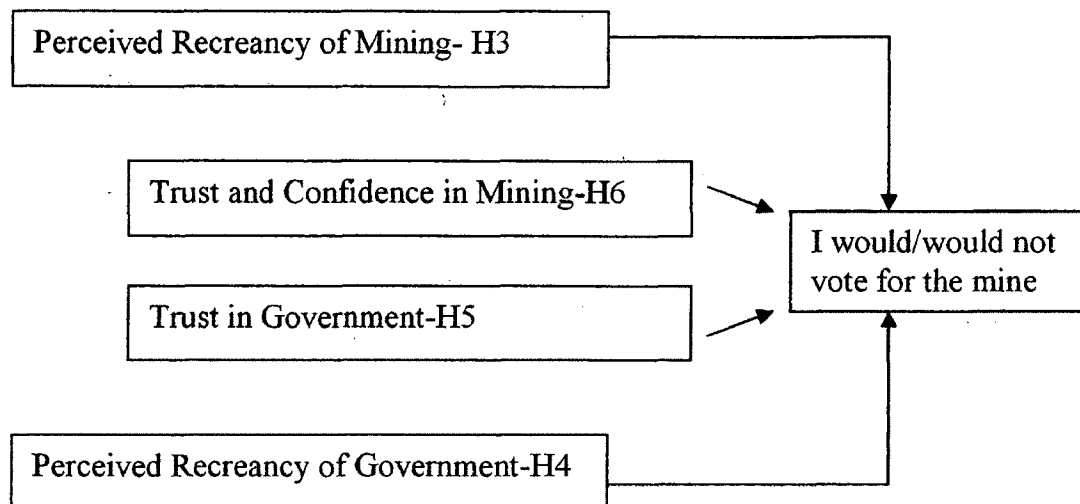
**Hypothesis (H3)** = the perceived recreancy of mining item will significantly predict risk perception

**Hypothesis (H4)** = the perceived recreancy of government item will significantly predict risk perception

**Hypothesis (H5)** = the index of trust in government will significantly predict risk perception

**Hypothesis (H6)** = the index of trust and confidence in mining will significantly predict risk perception, and will provide the most explanatory power in the model.

The model will be produced using the enter method and the anticipated path model for the incumbent analysis will appear as demonstrated in Figure 1.



**Figure 1. Regression Model for Predicting Level of Risk Perception**

## CHAPTER 4. ANALYSIS AND RESULTS

The following results of the analysis are described specifically according to each of the previously stated objectives.

### Objective 1: Is the replicated recreancy scale unidimensional?

#### Initial Assessments

The 10 items comprising the replicated recreancy scale were first assessed using descriptive statistics and then further assessed using the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity to determine if the number of items should be condensed and if principal components analysis was appropriate. Results for the first assessment, descriptive statistics, are shown in Table 1 and indicate no abnormalities or missing values.<sup>13</sup>

**Table 1. Descriptive Statistics for the Ten Items in the Replicated Recreancy Scale**

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
'Montana DEQ'	165	1	5	2.80	1.185	1.405
'Governor's Office'	165	1	5	3.05	1.248	1.559
'State Legislature'	165	1	5	2.45	1.090	1.188
'County Government'	165	1	5	2.67	1.067	1.138
'Private Mine Companies'	165	1	5	2.27	1.255	1.575
'State Mining Association'	165	1	5	2.52	1.203	1.446
'Mine mgt can solve dangers'	165	1	5	2.64	1.406	1.977
'Mine engineers can design safe'	165	1	5	2.64	1.542	2.377
'Mine construction protect envir'	165	1	5	2.58	1.514	2.294
'Mine monitoring can protect envir'	165	1	5	2.90	1.425	2.032
Valid N (listwise)	165					

The next assessments, the KMO and Bartlett's tests, were a prerequisite for the multivariate principal components analysis (henceforth referred to as PCA). These tests

<sup>13</sup> The small number of missing values in the raw data were computed using the regression method of Missing Values Analysis.

determined whether PCA was appropriate by testing the null hypothesis that the variables in the population correlation matrix are uncorrelated (Stevens 2002:388). These assessments are necessary because the purpose of PCA is to condense highly correlated variables and create uncorrelated components; hence, if the variables are initially uncorrelated then PCA is inappropriate. The tests assessed the correlation matrix of the ten items shown in Appendix A. The KMO value of .900 indicated strong sampling adequacy and the Bartlett's test was significant with a p-value of .000. These results demonstrate that PCA is appropriate for these data.

### **PCA Assessment**

Following the initial assessments of the data, PCA was applied to the 10 items.

Results of the PCA are shown in Table 2.

**Table 2. Varimax-Rotated Component Analysis Factor Matrix for the Ten Item Replicated Recreancy Scale**

<b>Items</b>	<b>Component 1 Loadings</b>	<b>Component 2 Loadings</b>	<b>Communality</b>
Private Mine Companies (trust)	<b>0.839</b>	0.211	0.749
State Mining Association (trust)	<b>0.761</b>	0.261	0.648
Mine mgt can solve dangers (confidence)	<b>0.910</b>	0.210	0.871
Mine engineers can design safe (confidence)	<b>0.916</b>	0.169	0.867
Mine construction protect env. (confidence)	<b>0.929</b>	0.186	0.898
Mine monitoring can protect env. (confidence)	<b>0.891</b>	0.205	0.835
Montana DEQ (trust)	0.221	<b>0.728</b>	0.579
Governor's Office (trust)	0.307	<b>0.803</b>	0.739
State Legislature (trust)	0.355	<b>0.779</b>	0.734
County Government (trust)	-0.020	<b>0.826</b>	0.683
<b>Eigenvalue</b>	<b>5.85</b>	<b>1.75</b>	
<b>Percent Variance Explained</b>			
Component 1	<b>58.50</b>		
Component 2	<b>17.52</b>		
<b>Total Percent Variance Explained</b>	<b>76.02</b>		

Since the communalities for each of the 10 items were all above .500, the extracted components accounted for at least 25 percent of the variance for each individual item. This is important because the items that load highly together within each component should have a significant amount of shared variance in order to create new indices that represent different dimensions of a concept. Since the communalities demonstrate significantly strong relationships among the items, the items can be condensed based on the results of the PCA.

### **Varimax Rotation**

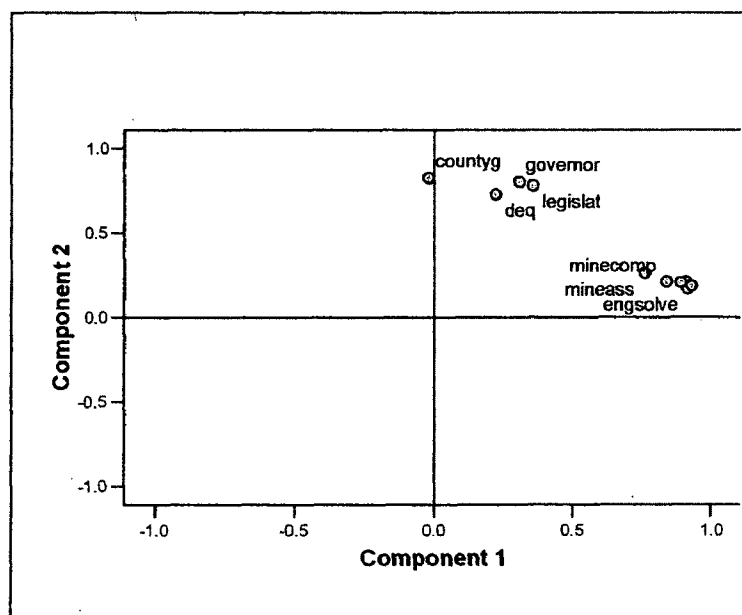
The PCA extraction resulted in two components each with an eigenvalue greater than one. Varimax rotation was then used to clarify those items for which loadings were significantly high on each component. Because varimax rotation is an orthogonal rotation, the components remain uncorrelated once rotated. This occurs because the rotation iterates until the orientation of the factor axes is such that each item has a high loading on one primary component while the loadings on the other components are as close to zero as possible. By utilizing a rotation matrix that will maximize the total column variance of the communalities, varimax rotation ensures that the maximum amount of variance in each component is accounted for (Lattin, Carroll, and Green 2003).

The first extracted component explained 58.5 percent of the variance, and the items with the highest loadings included the two trust items regarding the mining industry and all four of the confidence items regarding the mining industry. Consequently, this component is henceforth referred to as “mining industry.” The remaining four trust items regarding various government agencies loaded highly on the second component, so this component is henceforth referred to as “government agencies.” Because PCA produced

two components with significant sources of variation, these results show that the original recreancy scale is not unidimensional.

**Objective 2: If the recreancy scale is not unidimensional, what do the separate dimensions represent?**

The PCA separation of the government agencies from the mining industry suggests that there is a difference between the levels of trust in government agencies as compared to the levels of trust and confidence in the mining industry. The analysis also demonstrated that insufficient variation in the responses between the different items measuring trust and confidence in the mining industry prevented creating an *empirical* separation of these *conceptually* different constructs. Additionally, the component loadings for all six of the mining items were high and loaded on the first component, which accounted for more than half of the variance among all of the



**Figure 2. Plot of the Component Loadings for the Ten Items of the Replicated Recreancy Scale in Rotated Space**

items. The correlation coefficient between the factor scores of each component was zero, and the distinct separation between government agencies and mining industry components after rotation is shown in Figure 2.

### Item Variance Within Each Component

One way to determine how well the PCA components were derived is to analyze item collinearity. In a regression model, collinearity is problematic because each independent indicator should provide explanatory power by itself and not share any variance with the other indicators. However, because the purpose of PCA is to combine those items with shared variance, collinearity is a desired attribute among each of the items that load significantly together on the components. Hence, if each set of items is to create a single scalar variable that represents the same concept, each item within the scale should not contribute a significant amount of unique variance.

The degree to which each item within the two sets contributed unique variance was assessed utilizing the dependent variable of “risk perception” to gain partial correlation coefficients and tolerance levels as shown in Table 3. The tolerance levels for the government agencies are all below .700, which is a common threshold for collinearity.

**Table 3. Collinearity Assessment for the Components of Mining Industry and Government Agencies**

<b>Mining Industry</b>	<b>Tolerance</b>	<b>Zero-Order Coefficient</b>	<b>Partial Coefficient</b>
1	0.311	0.710	0.155
2	0.393	0.629	0.112
3	0.160	0.750	-0.080
4	0.115	0.818	0.298
5	0.100	0.807	0.096
6	0.217	0.753	0.099
<b>Government Agencies</b>			
1	0.642	0.295	0.076
2	0.417	0.410	0.129
3	0.432	0.453	0.256
4	0.646	0.186	-0.119



The partial correlation coefficients are also low and drop in value from the zero-order correlation coefficients, which indicates that the items consistently measure the same concept because each item lends little predictive power once the others are held constant. The same is true for the mining industry items. The tolerance levels for these items are very low and the partial correlation coefficients drop significantly from the zero-order correlation coefficients. These six items are clearly strong measures of the same concept, and if they were all included in a regression model as independent predictors, there would be significant multicollinearity.

### **Separate Indices of Trust**

PCA and collinearity assessments have indicated two significantly different sources of variation exist within the original 10-item recreancy scale. All of the government agency items loaded together in contrast to the mining industry items. Based on these results, two separate indices were constructed to represent these different dimensions of the concept of trust. Where all 10 of these government agency and mining industry items were originally summed to form a single multi-item measure of recreancy, the two new indices will represent one, a single measure of “trust in government” and two, a single measure of “trust in mining.”<sup>14</sup>

### **Reliability and Additivity Tests**

To finalize the measurement validity of constructing two such indices, both the consistency and completeness of the separate index items had to be assessed. This was done through reliability and additivity analyses. Reliability analysis determined how consistently the items in the index measure the same construct. The Cronbach Alpha

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<sup>14</sup> The mining items are comprised of indicators of both trust and confidence, but for simplicity and comparability, this index will be referred to as only “trust in mining.”

reliability procedure reflects internal consistency and is based on the average inter-item correlation. The alpha coefficients were .953 and .830 for the mining industry index and the government agencies index, respectively. Both alpha coefficients are sufficiently high to suggest that two indices can be constructed for the two sets of items.

Three separate additivity tests were conducted for each set of items: the non-additivity test, Hotelling's t-squared test, and Tukey's estimate. The results of each test showed that neither set of items were additive. Results for the test of non-additivity were significant for both sets, and support rejection of the null hypothesis that the set of items is additive. The Hotelling's t-squared test, which produced a multivariate test for the null hypothesis that all items in the index have the same mean, also showed a significant p-value for both the mining industry and the government agencies and thereby supported rejecting additivity. Finally, the Tukey's estimate, which produced a test of the assumption that there is no multiplicative interaction among the items, is close to zero for both indices where for additivity, this value should be close to one.

The solution to non-additivity is standardization before summation. Once the items were standardized, they were acceptable for summation since they had the same mean and standard deviation. Table 4 shows the reliability and additivity statistics before and after standardization.

**Table 4. Reliability and Additivity Statistics for the Mining Industry Index and the Government Agencies Index Before and After Standardization**

	Unstandardized		Standardized	
	Mining Industry	Government Agencies	Mining Industry	Government Agencies
Cronbach Alpha	0.953	0.830	0.953	0.830
Non-Additivity sig.	0.000	0.026	0.720	0.619
Hotelling's T-square sig.	0.000	0.000	1.000	1.000
Tukey's estimate	-0.034	0.088	1.012	1.002

Once the items were standardized and summed, it was necessary to manipulate the values

to reflect the original five-point scale in order to make meaningful comparisons within the regression models. This was accomplished by multiplying each Z-score by the group standard deviation and adding the group mean to produce two new indices that were both reliable and additive. These two new indices are henceforth referred to as “trust in mining” and “trust in government.”

**Objective 3: Are there other items in the data that provide conceptually clearer and/or more direct measures of perceived recreancy than levels of general trust in predicting risk perception?**

As argued in Chapter 3, two items were identified as clear and concise measures of perceived recreancy as conceptualized by Freudenburg (1993) as institutional failure. The first item asked the question, “On a scale of one to five, how satisfied are you with the effectiveness of county government?” The second item asked, “To what degree (scale of one to five) do you agree or disagree with the statement, agencies responsible for public health and safety are capable of responding to mine accidents in ways that will ensure public safety.” Theoretical conceptualization (see Freudenburg 1993) and statistical support for the operational separation of the mining industry from government agencies indicate that these two items arguably represent the variables “perceived recreancy of government” and “perceived recreancy of mining,” respectively.

**Objective 4: Consequently, what is the relationship between perceived recreancy and trust and confidence?**

A bivariate regression model was constructed to assess the relationship between perceived recreancy of mining and trust in mining. This model tested hypothesis 1 (H1), which stated that perceived recreancy of mining will significantly influence respondent

trust in that industry, as measured by the trust in mining index (scalar variable). The bivariate regression analysis produced a high positive correlation between these two variables of .726, which meets the assumption of linearity. This value was also equal to the beta coefficient in the model, which produced a significant t-test. The r-square (coefficient of determination) for the model was .527, which indicates that more than 50 percent of the variance in the dependent variable is attributable to the independent variable. Table 5 displays the model summary for this analysis.

**Table 5. Bivariate Regression Model for Trust in Mining by Perceived Recreancy of Mining**

Coefficients <sup>a</sup>					
Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	.946	.136		6.938
	Perceived recreancy of mining	.580	.043	.726	13.469

a. Dependent Variable: Trust in mining

These results suggested that the identified variable of perceived recreancy of mining has a significant impact on respondents' levels of trust in the mining industry. The model's r-square value showed a strong relationship, and the residual statistics met the assumption of normality for multiple regression (see Appendix B). The relationship between these two variables will be further examined in the final model in which both variables are used as predictors of risk perception. At this point, it appears **H1** should not be rejected.

A second bivariate regression model was constructed to evaluate the relationship between the perceived recreancy of government variable and the trust in government index (scalar variable). This model tested a similar hypothesis (**H2**) to **H1** which stated

that there would be a significant relationship between these two variables. Table 6 gives the model summary for this analysis. The residual statistics for this model also met the assumptions for regression (see Appendix C). However, in contrast to the previous model involving the mining industry, the correlation (.168) between these two government variables was rather low. Consequently, the r-square value for this model was .028, which demonstrated a very low percent of variance explained in the dependent variable by the independent variable.

The t-test and f-test values for this model were both significant at the .05 level. These results demonstrated that even though H2 was not rejected based on the significant t-test, there was not a substantive amount of variance explained between the variables of perceived recreancy of government and trust in government based on the low r-square value. This relationship and the relationship between these variables and risk perception will also be further assessed in the final model.

**Table 6. Bivariate Regression Model for Trust in Government by Perceived Recreancy of Government**

Coefficients <sup>a</sup>					
Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	2.396	.170		.000
	Perceived recreancy of government	.123	.057	.168	.031

<sup>a</sup>. Dependent Variable: Trust in government

**Objective 5: How significant are levels of institutional trust and confidence in predicting the established measure of risk perception in this specific context relative to perceived recreancy?**

This final objective assessed the general research question that tests the significance of the concept of recreancy in this specific context. A multiple regression path model was created using the simultaneous enter method. This type of model assessed the level of unique explained variance that each independent variable contributed while holding the effects of the other variables constant. This model included the variables of trust in mining, trust in government, perceived recreancy of mining, and perceived recreancy of government as independent predictors of the dependent variable of risk perception. The results of the multiple regression model are shown in Table 7.

**Table 7. Multiple Regression Model for Risk Perception by Recreancy**

Coefficients <sup>a</sup>										
Model		Standardized				Correlations			Collinearity Statistics	
		Standardized Coefficient	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	VIF
1	(Constant)	-.622	.330		-1.883	.062				
	Perceived recreancy of government	-.041	.075	-.025	-.547	.585	-.152	-.043	-.024	.896
	Perceived recreancy of n	.094	.077	.080	1.229	.221	.640	.097	.054	.458
	Trust in government	.043	.116	.020	.372	.711	.413	.029	.016	.689
	Trust in mining	1.114	.100	.756	11.174	.000	.828	.662	.493	.425

<sup>a</sup>. Dependent Variable: "Election today, I would vote"

The statistics in the table provide insight into the relationships between each independent variable and the dependent variable as well as between the independent variables. The beta coefficients show the change in the standardized dependent variable for every one unit change in the standardized independent variable. The beta coefficients for the three variables of perceived recreancy of mining, perceived recreancy of government, and trust in government were all near zero. Additionally, the t-tests for each of these three variables produced insignificant p-values. These indicated that each variable provided no predictive power for the dependent variable. The results of the multiple regression model suggested that the only variable that was a significant predictor

of risk perception was trust in mining. The r-square value for this model was .689 (adjusted r-square value was .681), a value which was significant in that the model accounted for almost a 70 percent reduction in error in predicting the dependent variable. However, one variable alone provided the source for this large amount of variation, and the residual statistics for the model showed no violations of the assumptions (see Appendix D).

As stated in the earlier objectives, the relationships between the pairs of perceived recreancy and trust variables were examined in the model with risk perception as the dependent variable. One way in which these relationships was assessed was through an examination of the change in zero-order correlation coefficients to the partial correlation coefficients. A partial coefficient is a representation of the relationship of an independent variable (X) with the dependent variable (Y) while the effects of the other variables are held constant. If the change is significant, it indicates that the other variables in the model are contributing to the original correlation between X and Y. For the perceived recreancy of government variable, there was only a small change, which indicated little or no interaction with the other variables. Additionally, the level of tolerance for this variable was high, which means that if this variable contributed any explained variance in the dependent variable, it was highly unique. For the variable trust in government, there was a drop from the zero-order correlation coefficient to the partial coefficient, and this variable had a high level of tolerance; however, it was not quite as high as the perceived recreancy of government variable. This result suggested this variable may have a relationship with one of the mining variables in the model. Finally, the lack of a relationship between the two government variables in the model further demonstrated

that not only is there little predictive relationship between the two, there was also no interacting relationship when predicting risk perception.

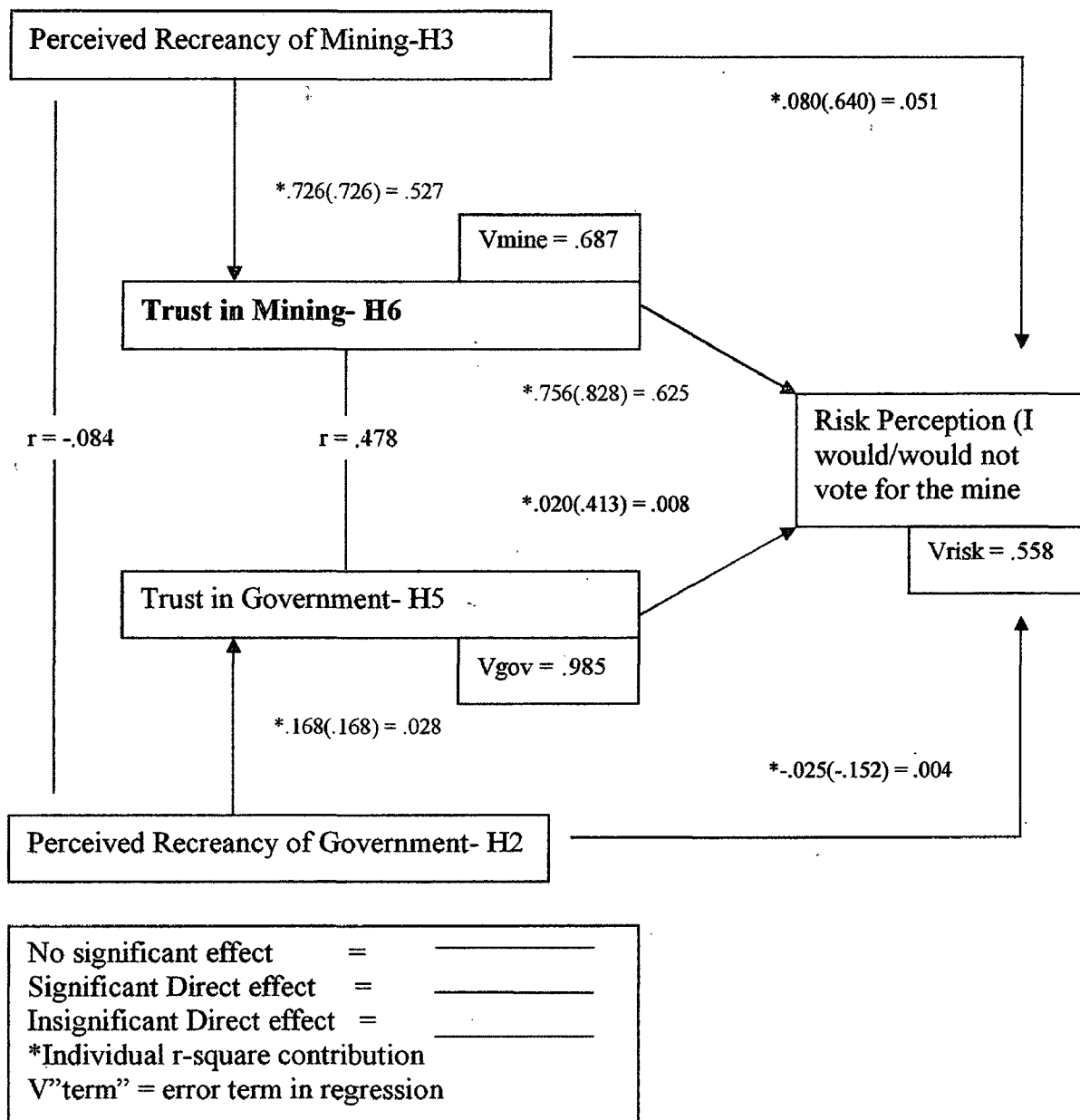
However, the statistics showed a different pattern for the two mining variables. Recall from the bivariate regression model for these two variables that a significant relationship was found when trust in mining was used as the dependent variable. This relationship was further exemplified in this multiple regression model. The largest difference in the zero-order and partial correlation coefficients for any of the four variables occurred in the perceived recreancy of mining variable. This correlation dropped from a .640 to .097 while the trust in mining variable dropped only about two tenths. Additionally, the levels of tolerance for these two variables are in the .400 range, which is well below the common threshold level for multicollinearity. Thus, a significant relationship was found in the bivariate model by demonstrating that these two variables are in fact a function of one another, a finding which further justifies failing to reject hypothesis 1.<sup>15</sup>

In the multiple regression model, perceived recreancy of mining was an insignificant predictor of risk perception while trust in mining was a significant predictor. Because of the significant relationship between these two variables established through the previous bivariate regression model, it is concluded that perceived recreancy of mining had an *indirect effect* on risk perception. The relationship between these two variables may be significant in a different model in which trust in mining was not present to counter the effects. Figure 3 displays the multiple regression model and the statistical relationships between each of the independent variables and the dependent variable.

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<sup>15</sup> Further analysis on this model showed a significant interaction effect between the two independent variables of perceived recreancy of mining and trust in mining. However, because perceived recreancy of mining is not significant, this interaction is not problematic.





**Figure 3. Multiple Regression Path Model for Direct Effects of Recreancy on Risk Perception**

### Indirect Effects on Risk Perception

There are two observations within this path model that suggest underlying relationships between each of the recreancy variables. The first observation is the significant positive correlation between the two variables trust in mining and trust in government. This correlation suggests that even though the PCA indicated that the group

of variables related to the mining industry represented a different dimension of the concept of trust apart from the group of variables related to government agencies, there is still an empirical relationship between them. Alternatively, the second observation to note is the non-significant negative relationship between the variables perceived recreancy of mining and perceived recreancy of government. This indicates that not only is there no conceptual relationship between “institutional failure” of the mining industry versus the government, there is also no empirical relationship. Although there is no relationship between the perceived recreancy variables, both proved to have significant relationships with the respective trust variables; hence, since the trust variables have a significant relationship with each other, there may be some indirect effects of perceived recreancy leading toward risk perception.

To briefly assess these relationships, two additional multiple regression models were constructed from left to right. These models followed the path model (Figure 3) that resulted from the initial multiple regression model. It has been established that there is no relationship between the two perceived recreancy variables. Consequently, the first multiple regression model assessed the possible indirect effects on risk perception by including both perceived recreancy variables as independent variables and trust in government as the dependent variable. These relationships were assessed because not only had a significant relationship between perceived recreancy of government and trust in government been identified in the previous bivariate regression model, a significant correlation between perceived recreancy of mining and trust in government had also been identified.

The results of the model are shown in Table 8. The r-square value for this multiple regression model was .250 (adjusted r-square value was .241). Both items showed significant t-tests, and there was an increase between the zero-order correlation coefficients and the partial coefficients for both variables that indicated that less perceived recreancy in both mining and government was related to greater trust in government. These increases while holding the other perceived recreancy variable constant demonstrate that each perceived recreancy variable acts as a suppressor on the other's effect on trust in government.

**Table 8. Multiple Regression Model for Trust in Government by Perceived Recreancy of Mining and Perceived Recreancy of Government**

Coefficients <sup>a</sup>								
Model		Standardized		t	Sig.	Correlations		
		nstandardized Coefficient	Coefficients			Zero-order	Partial	Part
1	(Constant)	1.593	.189	8.411	.000			
	Perceived recreancy of government	.153	.050	.208	.003	.168	.232	.207
	Perceived recreancy of mi	.254	.037	.473	.000	.455	.478	.471

<sup>a</sup> Dependent Variable: Trust in government

The other multiple regression model that can lend some insight into the possible indirect effects of these recreancy variables included perceived recreancy of mining, perceived recreancy of government, and trust in government as independent variables with trust in mining as a dependent variable. This analysis further assessed the indirect effect of perceived recreancy of mining on risk perception as well the possible indirect effects of perceived recreancy of government on risk perception and trust in government on risk perception. Table 9 shows the results of this analysis. The r-square value for this model was .575 (adjusted r-square value was .567), and each of the three variables produced a significant t-test which means that all the variables contribute significant predictive power for trust in mining. That is, the greater the perceived recreancy in

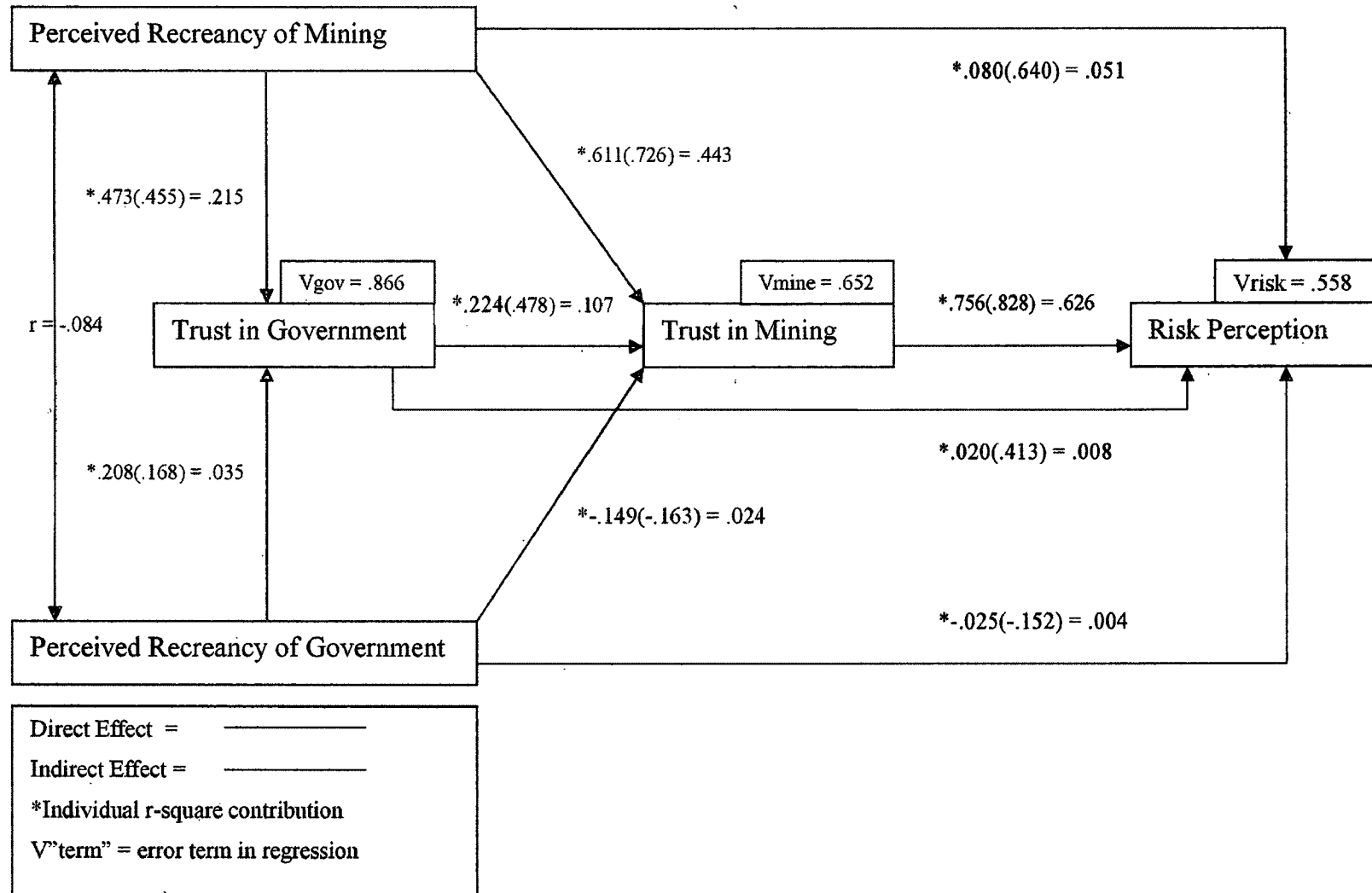
government and trust in government, but the lower the perceived recreancy in mining, the greater the trust in mining.

**Table 9. Multiple Regression Model for Trust in Mining by Perceived Recreancy of Mining, Perceived Recreancy of Government, and Trust in Government**

Coefficients <sup>a</sup>									
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	.748	.254		2.939	.004			
	Trust in government	.333	.088	.224	3.782	.000	.478	.286	.194
	Perceived recreancy of government	-.162	.058	-.149	-2.806	.006	-.163	-.216	-.144
	Perceived recreancy of mini	.488	.047	.611	10.410	.000	.726	.634	.535

<sup>a</sup>. Dependent Variable: Trust in mining

These two additional multiple regression models suggest that while trust in mining was the only variable with a direct effect on risk perception, each of the other recreancy variables have an indirect effect on risk perception because of their significant effects on trust in mining. The final path model shown in Figure 4 exhibits the conceptual and empirical framework that integrates each of these direct and indirect effects. The implications of these effects will be discussed in the subsequent chapter.



**Figure 4. Multiple Regression Path Model of Direct and Indirect Effects of Recreancy on Risk Perception**

## CHAPTER FIVE. DISCUSSION AND CONCLUSIONS

The concept of recreancy as argued by William Freudenburg in 1993 has deep sociological roots beginning with Max Weber in the 1800s. The ideas that Weber brought forth at that time had a direct impact on Freudenburg's conceptualization of recreancy. Weber observed the emergence of rationalization as a result of disenchantment and the subsequent reliance on empirical and systematic ways of understanding the world. With rationalization came an important change in the trust relations between groups that had previously interacted with only those who worshipped the same god. Trust relations were now contractually established so different communities could now trust each other in a business sense. This change in economic trust relations created the opportunity for economic development and consequently catalyzed the Industrial Revolution.

The Industrial Revolution encouraged advancement in the realms of science and technology, which resulted in greater rationalization of the world. The more advanced science and technology became, the more people relied on the idea of intellectualization which requires reliance on empirical fact and creates the notion that everything can be mastered through calculation. Thus, disenchantment and rationalization created an industrialized world, which required a systematic and rational way of functioning enforced by an efficient and rational authority, a type of authority Weber called "legal-rational" (see Gerth and Mills 1946). An institution that functions under this type of authority is characterized by a formal and strict hierarchal social order, a bureaucracy. Weber found bureaucratic authority problematic because it was too impersonal and

required too much social dependence on the expertise of “specialists” who were considered authorities. Thus, people became less knowledgeable about the functions of their daily lives while becoming more dependent on the knowledge and expertise of institutional representatives.

### **William Freudenburg and the Introduction of Recreancy**

Weber’s concern about increasing societal dependence on those responsible for the intellectual functioning of society created the basis for William Freudenburg’s concept of recreancy. Freudenburg (1993) noted the paradoxical relationship between the decrease in mortality and the increase in dependence on technological systems. Although advancements in science and technology have decreased the risk of death and disease, they have also increased society’s vulnerability to the institutions and actors responsible for managing their associated risks. Following Weber, Freudenburg contends that the more specialized an industry becomes, the less the average person is aware of and connected to that particular technology. Consequently, there is a hegemonic trust in specialized industries responsible for protecting the public and that they will not fail to carry out their entrusted duty.

Freudenburg contended that more advanced technologically industries became, the greater the public’s general risk perception. The industry that Freudenburg chose as an exemplar is the nuclear waste industry. Nuclear waste technology has the potential for mass destruction, yet most people know nothing about nuclear energy and the waste it generates. Hence, scientists tend to regard the public as “scientifically illiterate” and question the rationality of individual risk perceptions. Freudenburg argued that individual risk perceptions results from rationalization and thus focused on the

institutions responsible for risk management and how the actions of these institutions can influence individual perceptions about risk. In doing so, Freudenburg conceptualized recreancy as the institutional failure of institutional actors to carry out their entrusted duty.

Recreancy, as defined as institutional failure, implies a unidimensional concept of behavior. However, when Freudenburg conceptualized recreancy, he defined it as a possible bi-dimensional concept based on individual's level of trust in the technical competence and fiduciary responsibility of an institution. Moreover, Freudenburg failed to adequately operationalize institutional failure as well as establish a causal connection between institutional failure and individual level of trust.

These discrepancies in conceptualizing and operationalizing recreancy consistently and systematically have pervaded subsequent research studies that have utilized Freudenburg's recreancy concept analyses of risk perceptions. While some researchers have measured trust in lieu of recreancy in predicting risk perceptions through quantitative assessments, others have used qualitative methods to assess recreancy "after-the-fact," which is consistent with Freudenburg's definition of recreancy as institutional failure because clearly one cannot describe a behavior or the influence of that behavior until *after* it has occurred. Additionally, a few researchers have attempted to assess the "perception" of recreancy and how it impacts individual level of trust in various institutions. The inconsistency in Freudenburg's initial assessment of recreancy as well as the methodological inconsistencies throughout the literature created the framework for the major research question of this study.



## **Analysis of a Conceptual and Operational Discrepancy**

To address the conceptual and operational discrepancies that have continued to compromise the validity of recreancy as a predictor of risk perceptions, I examined a replication of a study that operationalized recreancy in the same manner as Freudenburg (1993), that is, as individuals' levels of trust in various institutions responsible for risk management. In doing so, I addressed three main research questions. The first was whether operationalizing recreancy as a unidimensional general trust variable accurately reflects Freudenburg's original conceptualization. The first objective created from this research question required a statistical analysis to determine whether or not the replicated recreancy scale was unidimensional. Principal components analysis determined that the replicated scale was not unidimensional in that there were two separate and significant sources of variation within the data. The results showed that all of the items relating to the mining industry accounted for the greatest amount of variation and that these items were significantly different from the rest of items that all related to government agencies. This analytical separation informs the second objective of the first research question, which inquires what the differing dimensions represent.

## **Dimensionality Assessment**

The importance of assessing dimensionality in attitudinal survey data was exemplified in previous research studies. As described in Chapter Two, risk perception studies have been characterized by using varying dimensions of the general concept of trust which in turn have reflected different attitudinal constructs as being representative of trust. A significant number of sub concepts are *related* to trust, but these are not the *equivalent* of trust. For example, Poortinga and Pidgeon's (2003) principal components

analysis produced two dimensions of trust, general and skeptical, that represented different attitudinal constructs of competence and accountability. Additionally, Frewer et al. (2003) used factor analysis to uncover two trust dimensions of expertise and trustworthiness. Finally, the two dimensions of trust that are included in Freudenburg's concept of recreancy, technical competence and fiduciary responsibility, are the ones suggested by Barber (1983). Freudenburg (1993) contended that a failure of trust resulting from recreancy could occur along either dimension or both. These studies support my contention that there are varying dimensions of trust as well as related concept clusters such as confidence that demonstrate the need for assessing concept dimensions when using attitudinal survey data.

Thus, I argue that the risk perception literature has suggested that the concepts of trust and confidence reflect different attitudes that should therefore be separated in an empirical context. For example, the study conducted by Siegrist et al. (2003) employed a dual-model of social trust and confidence when predicting risk perceptions about electromagnetic fields. These authors believed that the separation was important because while trust represents a willingness to become vulnerable, they claimed, confidence is more reflective of reliance and ability based on historical performance. Hence, the first significant finding the results presented in Chapter Four is the failure of the items representing trust and those representing confidence to separate from each other. This lack of separation indicates that the respondents' levels of trust in private mine companies and the state mining association did not significantly differ from respondents' levels of confidence in the abilities of mine engineers, mine management, and mine operations personnel. Consequently, this indicates that the multidimensionality of the

data was not attributable to the separate constructs of trust and confidence, but rather to a different type of variation.

### **Mining Industry vs. Government Agencies**

In the specific context of the Blackfoot River Watershed communities, the separation of items within the PCA analysis did not support previous contentions about the unidimensionality of attitudinal constructs. Alternatively, the difference in dimensionality may reflect a difference in citizen's general attitude toward the mining industry as compared to citizen's general attitude toward various government agencies, regardless of their level of trust or levels of confidence. The mean scores of all of the items show that in general, government agencies enjoy a slightly higher level of public trust than the mining industry. Whether or not these different levels of trust in government versus the mining industry are directly related to perceived recreancy will be addressed in the following discussion.

### **Relevant Institutions**

The separation of the mining industry items from the government agency items supports Freudenburg's initial (1993) operationalization of recreancy. Not only did Freudenburg not include the construct of confidence, but he also separated various institutions representing science and technology, business, and government to measure recreancy on three different levels. Freudenburg recognized that levels of trust might vary depending on the level of institutional responsibility within the risk, yet this distinction was not followed by Spies et al (1998).

The importance of distinguishing relevant institutions based on their responsibility for risk management was also recognized by Dantico et al. (1991) who

assessed levels of trust in different institutions including the DOE, EPA, Congress, and the state legislature. The importance of this distinction was also recognized by Richards and Brod (2004) in their replication study. Richards and Brod (2004) had replaced several of the institutions that Spies et al. (1998) had used with ones that were more relevant to the context of a cyanide heap-leach mine in western Montana. However, the separation produced by this analysis indicates a difference in relevancy among the institutions included in the replicated recreancy scale in that attitudes toward the mining industry are the most relevant. The large amount of variation explained by this pool of items within all of the data supports the idea that an individual's level of trust in an institution without a relevant role in risk management in turn has little meaning when it comes to recreancy.

The results for the first research question indicated that the replicated recreancy scale was not unidimensional. The resulting dimensions reflected different types of institutions based on their respective levels of various responsibility for risk management while the different constructs of trust and confidence produced no empirical differences. Because the dimensional differences represented various institutions, it cannot be determined that recreancy is more adequately distinguished as bidimensional. It appears that the number of dimensions that may represent the overall concept of recreancy depends most importantly on the type of risk that is being assessed and how many different types of agencies may be involved.

#### **Actual vs. Perceived Recreancy**

The second research question inquired about the relationship between trust and recreancy, or specifically, perceived recreancy. In examining Freudenburg's (1993)

conceptualization of recreancy, it is clear that he defines recreancy as institutional failure and not lack of trust. Furthermore, it is apparent that institutional failure cannot be adequately assessed through attitudinal survey data. This is because actual institutional failure is somewhat subjective depending on the individual respondents and is usually determined long after a specific incident involving a specific responsible agency. As discussed in Chapter Three, this failure is related to levels of trust through the notion of perceived recreancy.

For example, contamination incidents in places such as the Oak Ridge nuclear reservation (Cable et al. 1999), Rocky Flats (Lodwick 1993), and the Fernald Plant (Sheak and Cianciolo 1993) demonstrated a clear pattern of institutional failure by the DOE. The implication of these failures was evident in Dantico et al.'s (1991) study as well as Kraft's (1993) study on support for the Yucca Mountain project in Nevada. Both studies found an overwhelming lack of trust for the DOE, which resulted in citizen opposition to siting the nuclear waste repository at Yucca Mountain. However, the link between institutional failure and citizens' levels of trust is not clear. An individual arguably makes a judgment regarding an agency that is based on her own perception of the agency's history of protecting the public from certain risks whether or not that history includes failures. Therefore, it is necessary to conceptualize recreancy in a way that captures this perception as a measure of institutional failure. Establishing an adequate measure of perceived recreancy therefore connects the conceptual gap between institutional failure and trust.

## Operationalization of Perceived Recreancy

For the mine data, two different measures of perceived recreancy were identified: one representing the mining industry and one representing government agencies. These items were chosen separately based on Freudenburg's (1993) initial separation of institutions based on their different levels of responsibility within risk management. The item representing perceived recreancy of mining inquired about the capability of agencies responsible for responding to mine accidents. This type of question adequately captures the notion of perceived recreancy because *capability* is an assessment that is made based on historical performance.<sup>16</sup> The item representing perceived recreancy of government asked the respondent their level of satisfaction with the effectiveness of the county government. This item also represents the perception of recreancy, as one would assess the historical performance of the government when deciding how satisfied or unsatisfied they were.

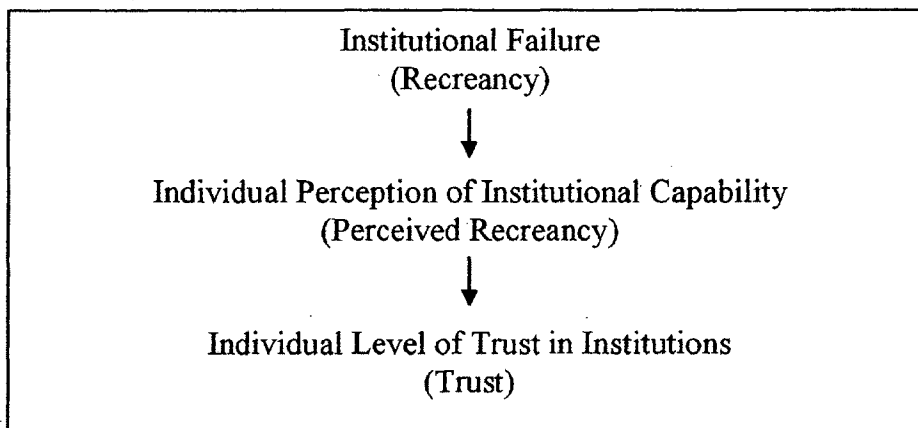
In response to objective three of the second research question, these items are conceptually clearer measures of perceived recreancy than levels of individual trust. The relationship between these items and levels of trust (the conceptual link between institutional failure and individual trust) was addressed in objective four of the second research question.

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<sup>16</sup> This item could arguably represent perceived recreancy of government because those agencies that would respond to a mine accident would include government agencies. However, this item will represent perceived recreancy of mining for three reasons. First, it appeared in the survey at the end of a seven question section specifically addressing mining issues which indicates to the respondent that the question refers to mining agencies. Second, those agencies that would respond to a mine accident must include personnel with the technical competence to handle cyanide, which encompasses an aspect of the mining industry. Third, this item showed no significant correlation with the perceived recreancy of government item which indicates the questions are conceptually different.

### **Relationship Between Perceived Recreancy and Trust**

In order to assess objective four, it was necessary to conduct a series of regression analyses. The first was a bivariate regression model that tested the relationship between perceived recreancy of mining and trust in mining. The results showed that perceived recreancy of mining explained approximately 53 percent of the variation in trust in mining, which is relatively significant. This strong relationship suggests that if respondents did perceive recreancy within the mining industry that perception influenced their level of trust. This conceptual model gives support to the following conceptual map of recreancy.



These empirical results demonstrate the link between recreancy and trust. The relationship between perceived recreancy and trust is further examined with the second bivariate regression model, which assessed the relationship between perceived recreancy of government and trust in government.

The results of this model showed a weak yet significant relationship lending deeper insight into the link between institutional failure and trust. The difference in the predictive results of the two models can be understood by comparing the distribution of

responses for each of the two perceived recreancy variables. For example, 12.1 percent of the respondents indicated that they were extremely dissatisfied with the effectiveness of their government for the perceived recreancy of government item, while for the perceived recreancy of mining item 24.2 percent indicated they strongly disagreed that agencies were capable of adequately responding to a mine accident. Essentially, this means that the respondents did not perceive recreancy in government to the extent that they perceived recreancy in mining. This result also supports the conceptual path of recreancy based on the contention that in order for a lack of trust to occur, there must be a perception of institutional failure. Therefore, in regards to the government agencies, there was no significant perception of failure by the respondents; hence, the item representing perceived recreancy lacked the variability to explain a large amount of variation in trust in government.

In conclusion for objective four, there is a relationship between perceived recreancy and trust. These two models are good examples because in both instances there was a perception of recreancy, which explained a significant amount of variance in the respondents' feelings of trust, yet the level of variation explained was different depending on the level of perceived recreancy. These results provide good support for the link between institutional failure and individual level of trust.

### **Trust vs. Perceived Recreancy as a Predictor of Risk Perception**

The third and final research question asks how significant levels of trust and confidence are compared to perceived recreancy in predicting risk perception. This question addresses the main contention brought forth by Freudenburg in 1993 that recreancy is a highly significant predictor of risk perception. The question was addressed



in the fifth and final objective with a multiple regression model. The model contained the two indices of trust in mining and trust in government as well as the two established measures of perceived recreancy of mining and perceived recreancy of government. The results showed that the model was highly significant because it explained about 68 percent of the variation in risk perception. However, the results show a clear difference in the predictive power of the concept of trust as compared to perceived recreancy as well as a difference in predictive power of the different types of institutions in that trust in mining was the only significant predictor.

As stated in the previous objectives, there is clearly a difference in public opinion regarding the mining industry versus government agencies. As this model demonstrated, trust in government has no direct predictive power on risk perception when trust in mining is accounted for. According to Freudenburg's original operationalization of recreancy (trust), this result demonstrates that recreancy is not as powerful as he originally contended, at least not directly. Conversely, the significant predictive power of trust in mining provides support for this particular operationalization. This significant difference emphasizes the need to separate relevant agencies when assessing recreancy, particularly when operationalizing recreancy as trust. It appears that a scalar indicator of recreancy constructed with level of trust in different types of institutions is not meaningful because of the potential for a large amount of variation as demonstrated by these results.

The most significant result, however, is the inability of the established measures of perceived recreancy to directly impact risk perception. This is important because the measures of perceived recreancy were established based on Freudenburg's initial

conceptualization of recreancy as institutional failure. This insignificant relationship between perceived recreancy and risk perception within both realms of mining and government does not provide support for the contention that recreancy is a direct significant predictor of risk perception. In general, this model provided some support for the power of recreancy as a predictor of risk perception, but only when operationalized as trust (and confidence) and only for the most relevant industry (mining). Consequently, in this context, the concept of recreancy as a strong direct predictor of risk perception is not well supported.

### **Relationship Between Perceived Recreancy, Trust, and Risk Perception**

The above conclusions are based on the first multiple regression model, which identified those variables that could lend significant predictive power of risk perception while all the others were held constant. However, it was determined that even though trust in mining was the only significant predictor of risk perception, there was also a strong relationship between trust in mining and the other three variables. This observation called for a further assessment of the variables and the development of a causal path model. The path model demonstrated that perceived recreancy of government, perceived recreancy of mining, and trust in government were all significantly related to trust in mining. Consequently, if trust in mining is significantly related to risk perception, the other three variables have an indirect effect on risk perception through trust in mining.

Up until this point, these results have been discussed by the way of “strength of relationships” and “predictive power.” After creating the path model, it is now more clear what exactly these relationships indicate. There was no relationship found between

perceived recreancy of mining and perceived recreancy of government. This makes sense because theoretically these two items should not be related because whether or not people feel that responsible agencies are capable of responding to mine accidents has no influence on their level of satisfaction in their local government. It does make sense, however, that these perceptions of capability (perceived recreancy of mining) should influence levels of trust in both government and the mining industry. Those agencies that would respond to a mine accident would encompass both institutions of government and mining, so the fact that higher levels of perceived capability in those institutions resulted in higher levels of trust in government and mining is not surprising. The relationship that perceived recreancy of government had with some of the other variables is nevertheless surprising. Respondents associated a lower level of satisfaction in government with higher levels of trust in mining as well as a higher risk perception. This component of recreancy does not seem to fit well theoretically into the overall assessment of the path model, but there are obviously many factors that could affect this outcome that are not addressed in this analysis.

Essentially, what the results suggest is that the respondents' attitudes about the mining industry carry the most weight as an influential component of their perception of risk. Obviously, this is because a mine is being proposed, and while government agencies are important participants (as shown by the significant relationships between government and mining); they are not the primary industry involved. This finding supports the ideas brought forth by Freudenburg that influenced his concept of recreancy in that the more specialized an industry the greater the need for dependence.

Consequently, the higher the societal dependence the greater an impact any behavior by that industry can have on societal risk perception.

### **Limitations of the Study**

The first limitation to this study is the simple fact that it is a secondary data analysis. The data were not collected with regard to the research questions addressed here, so there are a number of limitations related to this discrepancy. First, two subsamples were collected by Richards and Davis (1998) for the purpose of identifying differences between leaders and residents in the different communities. This difference in position could result in difference in opinion about the various institutions, which in turn could account for the differences in variation for the two subsamples as one larger sample. Thus, the results could be biased in that an undifferentiated sample of citizens overall might produce different variation (see Richards and Brod 2004). Moreover, the subsample of leaders was obtained by means of snowball sampling, which is different from the simple random sampling method used to obtain the resident sample. Since the two subsamples were combined for this analysis, the leader subsample could have reduced the randomness of the data. Additionally, even the combined sample size was rather small ( $n=165$ ) which always affects statistical analysis, especially for multivariate analysis.

Another problem resulting from secondary data analysis involves the perceived recreancy items. For the 1998 study, assessing perceived recreancy was not one of the survey research questions. I chose these two items from the survey to represent perceived recreancy based on my interpretation of Freudenburg's definition of the concept. As Freudenburg noted, he believed that the concept as a whole is open to

varying interpretations and operationalization. Although I established a connection between the concepts of perceived recreancy and trust in this particular analysis, this claim does not prove that there is a true and constant relationship between the concepts. A different researcher could operationalize perceived recreancy somewhat differently, perhaps by utilizing an index rather than a single item, and find no relationship between perceived recreancy and concept of trust. As stated earlier, this particular analysis provides some support to the concept of recreancy as a strong predictor of risk perception. Nevertheless, as Freudenburg observed, because of the subjective nature of perceived recreancy, adequate operationalization may vary depending on the empirical context in which it occurs.

Another limitation to this study involves the replication of the Spies et al. 1998 study. Richards and Brod (2004) created a scalar representation of recreancy based on the scale of Spies et al. (1998), but modified the institutions used in the original scale to create a more relevant pool of items. The most significant finding from this analysis was the clear separation of the items representing the mining industry from the items representing government agencies. This is significant because consequently the trust in mining index had a significant direct effect on risk perception while the trust in government index showed only an indirect impact through trust in mining. These two types of institutions were the only ones available to assess recreancy and its effect on risk perception. Had there been more types of institutions within the pool of survey items, perhaps the specific agency that would have the contract for the mine (Canyon Resources), the U.S. Forest Service, or the U.S. Fish and Wildlife Service, there may have been even more variation in the results.

Finally, a substantial limitation to this study is the inability to assess the dimensions of technical competence and fiduciary responsibility that were first established by Barber (1984) and expanded upon by Freudenburg in 1993. Freudenburg claimed that recreancy could result in a failure along either dimension or both, but he failed to make any sort of distinction in his own analysis of recreancy. Spies et al. (1998) also failed to distinguish these two dimensions, and in fact forced recreancy to be operationalized unidimensionally by combining the institutional dimensions as one scalar variable. Consequently, because Richards and Brod's (2004) study was a replication, there was no distinction in these two dimensions of recreancy in this analysis of the cyanide heap-leach mine project either. Thus, further assessment of the dimensionality of recreancy is still necessary because Freudenburg (1993) included Barber's notion of technical competence and fiduciary responsibility in the original conceptualization.

### **Implications of the Study**

The most important implication of this study is the methodological importance of identifying relevant institutions to assess recreancy and its effect on public perceptions of high-risk projects. This study showed that there was a significant difference in respondent's perceptions about the mining industry as compared to government agencies. These two types of institutions have different responsibilities for risk management, and consequently, there was a significant difference between the two regarding recreancy and risk perception. This result indicates that operationalizing recreancy as a single scalar indicator lacks measurement validity because of the potential for these differences. If one wants to assess institutional failure adequately and the consequent impact on risk perception, it is essential that not only should any possible relevant institutions be

captured within the study, but also their respective levels of perceived or actual recreancy should not be measured unidimensionally as a single indicator, but rather measured multidimensionally.

Another implication of this thesis is the complexity of distinguishing perceived recreancy and trust. Previous studies that have examined recreancy have shown continuously conceptual overlap between institutional failure and trust. It has been demonstrated conceptually and empirically that recreancy is not equivalent to a lack of public trust and that there is an intervening level, perceived recreancy, that needs to be identified. This study provided some evidence for the link between the conceptual relationships between institutional failure, perceived recreancy, and public trust. The varying strength in these relationships as demonstrated in the path analysis here indicates the importance of making these conceptual distinctions.

The varying strength between trust and perceived recreancy within the mining industry compared to government agencies was also exemplified in the assessment of risk perception. When recreancy was operationalized as trust and confidence, a direct effect was found between recreancy (mining) and risk perception. Alternatively, when recreancy was operationalized as institutional capability, there was no direct effect on risk perception but only an indirect effect through trust and confidence in mining. The implication here is that the overall significance of recreancy is dependent on the operationalization of the concept. This is important because in order for there to be meaningful comparisons between different studies that utilize recreancy and a solid basis for further study construction, the operationalization should be similar.

## **Final Conclusions**

The main purpose of this thesis was to address the conceptual and operational discrepancies in the methodological measurement of recreancy in the risk perception literature, and it appears that the discrepancies have significant implications. The main implication is that Freudenburg's recreancy concept as a whole remains quite vague and previous quantitative studies that have used it in their analyses generate more conceptual questions than answers. The results of this study challenge previous contentions about the power of recreancy as a major direct predictor of risk perception, and continuous variations in the operationalization of recreancy in subsequent studies could result in even more confusion.

Future research that should come from this analysis is the obvious need to construct concrete and consistent indicators for an adequate quantitative assessment of recreancy because a quantitative concept is only meaningful when it can be applied to different situations and still produce consistent and comparable results. Recreancy is clearly an important concept to consider in risk perception studies; however, it is not useful in understanding the relationships between institutional failure, public trust, and risk perception unless measurement of it is valid. The link between institutional failure and individual risk perception should be determined by a methodologically sound assessment of causal relationships. The integrity of social science research is essential not only because of the implications that invalid measurement can have on future legislative action, but also because of the importance of understanding complex societal dependence on social institutions and their ability to fulfill their responsibilities.



## 80 Appendix A- Correlation Matrix

Correlations

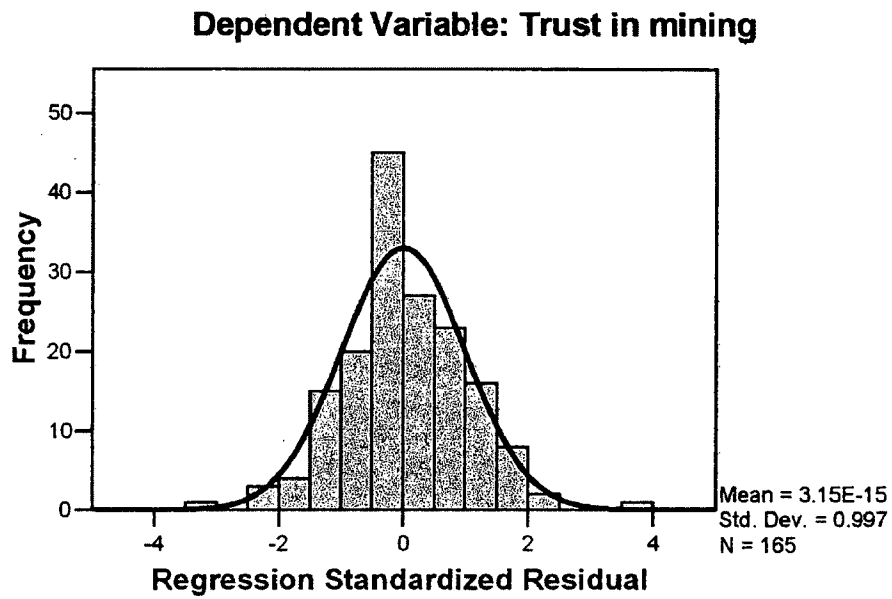
		'Montana DEQ'	'Governor's Office'	'State Legislature'	'County Government'	'Private Mine Companies'	'State Mining Association'	'Mine mgt can solve dangers'	'Mine engineers can design safe'	'Mine construction protect envir'	'Mine monitoring can protect envir'
'Montana DEQ'	Pearson Correlation	1	.546**	.505**	.473**	.290**	.308**	.370**	.334**	.364**	.370**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	165	165	165	165	165	165	165	165	165	165
'Governor's Office'	Pearson Correlation	.546**	1	.727**	.520**	.435**	.430**	.413**	.399**	.420**	.448**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000	.000
	N	165	165	165	165	165	165	165	165	165	165
'State Legislature'	Pearson Correlation	.505**	.727**	1	.530**	.481**	.504**	.459**	.442**	.456**	.427**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000	.000
	N	165	165	165	165	165	165	165	165	165	165
'County Government'	Pearson Correlation	.473**	.520**	.530**	1	.158*	.182*	.203**	.164*	.162*	.174*
	Sig. (2-tailed)	.000	.000	.000		.043	.019	.009	.035	.037	.026
	N	165	165	165	165	165	165	165	165	165	165
'Private Mine Companies'	Pearson Correlation	.290**	.435**	.481**	.158*	1	.741**	.733**	.721**	.755**	.745**
	Sig. (2-tailed)	.000	.000	.000	.043		.000	.000	.000	.000	.000
	N	165	165	165	165	165	165	165	165	165	165
'State Mining Association'	Pearson Correlation	.308**	.430**	.504**	.182*	.741**	1	.703**	.633**	.658**	.650**
	Sig. (2-tailed)	.000	.000	.000	.019	.000		.000	.000	.000	.000
	N	165	165	165	165	165	165	165	165	165	165
'Mine mgt can solve dangers'	Pearson Correlation	.370**	.413**	.459**	.203**	.733**	.703**	1	.885**	.882**	.836**
	Sig. (2-tailed)	.000	.000	.000	.009	.000	.000		.000	.000	.000
	N	165	165	165	165	165	165	165	165	165	165
'Mine engineers can design safe'	Pearson Correlation	.334**	.399**	.442**	.164*	.721**	.633**	.885**	1	.930**	.829**
	Sig. (2-tailed)	.000	.000	.000	.035	.000	.000	.000		.000	.000
	N	165	165	165	165	165	165	165	165	165	165
'Mine construction protect envir'	Pearson Correlation	.364**	.420**	.456**	.162*	.755**	.658**	.882**	.930**	1	.864**
	Sig. (2-tailed)	.000	.000	.000	.037	.000	.000	.000	.000		.000
	N	165	165	165	165	165	165	165	165	165	165
'Mine monitoring can protect envir'	Pearson Correlation	.370**	.448**	.427**	.174*	.745**	.650**	.836**	.829**	.864**	1
	Sig. (2-tailed)	.000	.000	.000	.026	.000	.000	.000	.000	.000	
	N	165	165	165	165	165	165	165	165	165	165

\*\* Correlation is significant at the 0.01 level (2-tailed).

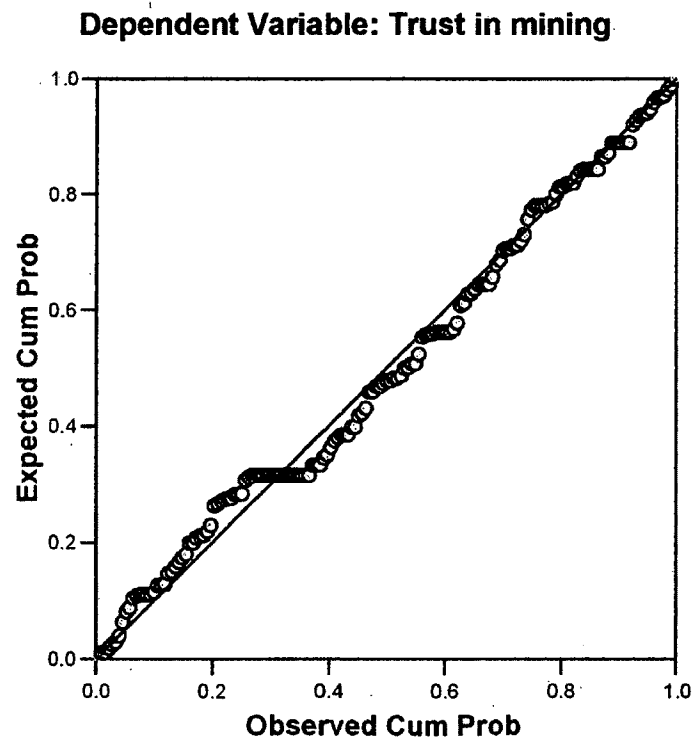
\* Correlation is significant at the 0.05 level (2-tailed).

## Appendix B- Residual Output for Mine Bivariate Model

### Histogram

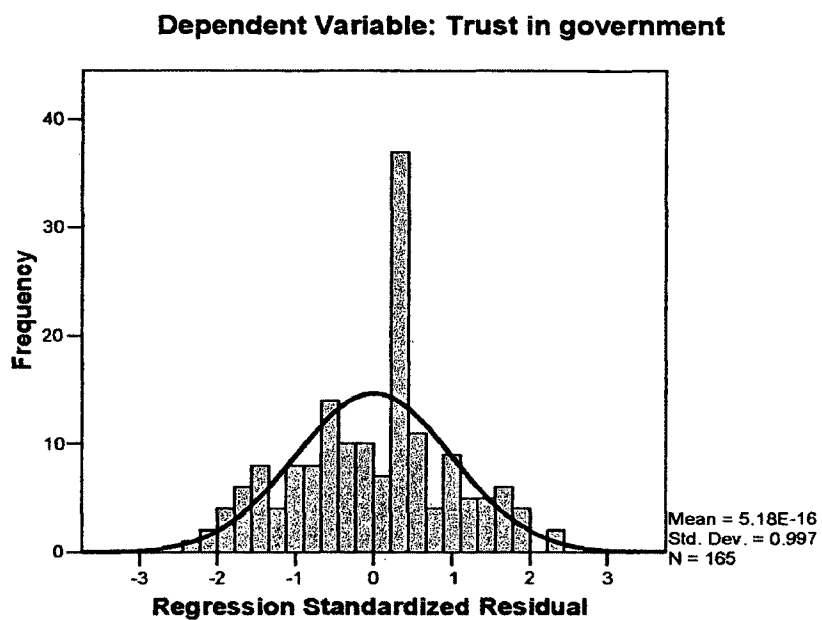


### Normal P-P Plot of Regression Standardized Residual

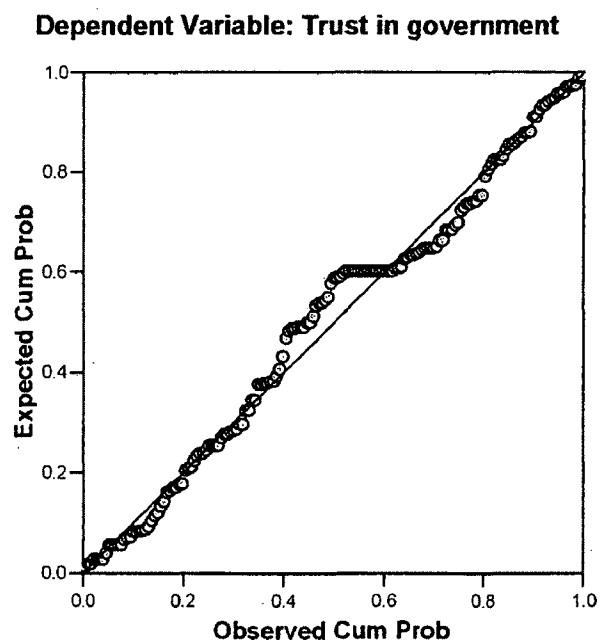


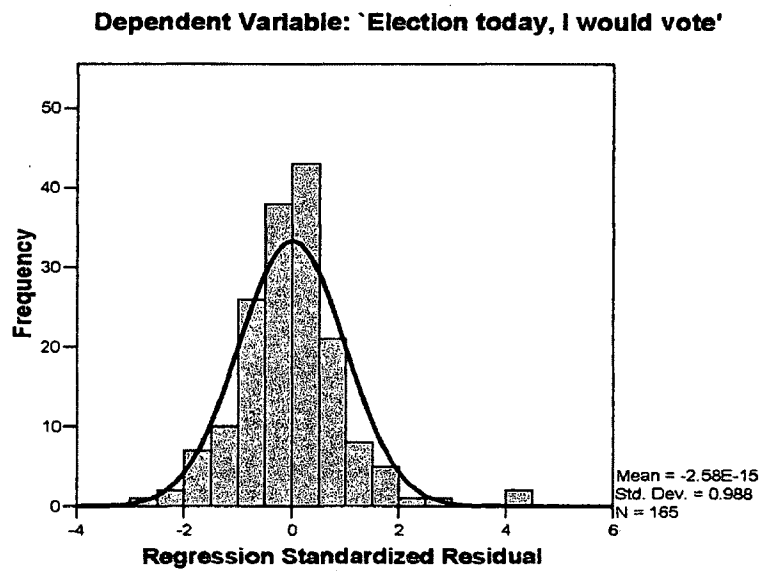
## Appendix C- Residual Output for Government Bivariate Model

### Histogram

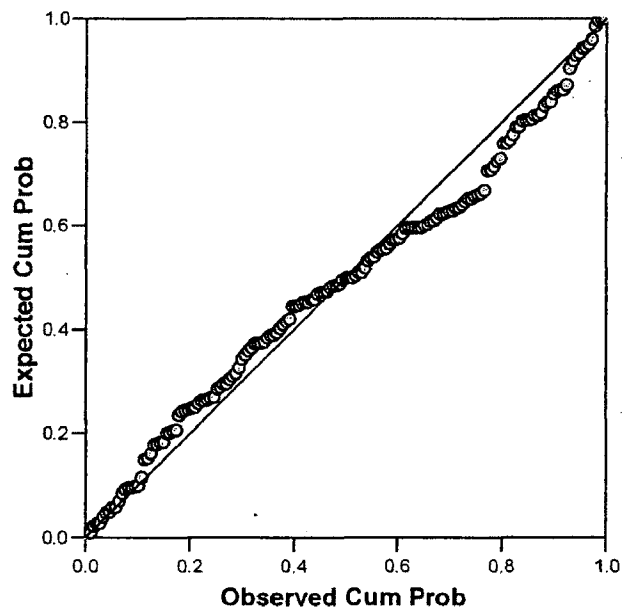


### Normal P-P Plot of Regression Standardized Residual



**Appendix D- Residual Output for Risk Perception Multiple Regression Model****Histogram****Normal P-P Plot of Regression Standardized Residual**

**Dependent Variable: `Election today, I would vote`**



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