Coping with Stigma: Challenges and Opportunities

Draft Discussion Paper — Day 2

Annenberg Conference on Risk, Media, and Stigma

Philadelphia, Pennsylvania

March 23–24, 1997

Howard Kunreuther and Paul Slovic

March 24, 1997

1. Introduction

How should we deal with stigma and its impacts? This question would probably seem absurd to an ancient Greek, about to brand someone with a visible mark to signify that this person was immoral or dangerous and thus undesirable, someone to be denigrated and avoided. Stigmatization in ancient Greece was thus a form of risk management. Even today, stigmatization can be a positive force for risk reduction. Food manufacturers or restaurants with lax safeguards against bacterial contamination, for example, deserve to be stigmatized, and the economic costs that stigma may force them to bear may serve as deterrent or punishment. In these situations stigmatization and its consequences may thus be a good thing.

But if stigma were purely beneficial, it is unlikely we would be holding this conference. Stigma is a powerful force in our modern industrial society primarily because science, technology, and communications media interact with the idiosyncrasies of human cognition, perception, and emotion to produce extreme disruption in the lives of industries, products, communities, and people.

In many instances of disruptive stigmatization, we have the sense that the social and economic response is exaggerated, even unwarranted, leading to impacts far more serious than the threat that triggered the response. In such cases, we face the challenge of how to manage stigma and reduce the vulnerability of important products, industries, and institutions to its effects.

This paper examines the causes of stigma and explores ways to manage it better. Section 2 sets the stage for later discussions by briefly presenting three examples of stigmatized products and places. Section 3 describes some of the social and psychological underpinnings of

stigma. Section 4 then discusses some strategies for dealing with stigma in light of the analysis in Section 3.

2. Some Examples of Stigma

Consider the following examples of stigma induced by the association of places and products with risk.

2.1 The Brownfields Problem

Property may be stigmatized when there is a concern that there is contamination of the land that will require a very expensive cleanup under Superfund (administered by EPA). The probability that contamination will be found on the property may often be uncertain. If cleanup is required there may also be considerable uncertainty as to how much this will cost and whether the current property owner will be responsible for covering all or part of the expense. As a result of these factors, the value of the property may decrease to a level that reflects public perception that the land may be contaminated, rather than experts' estimates of the risk of such contamination. In many cities large parcels of land may have no value at all even though the technical analyses conclude that their potential benefits to the owners may exceed the expected cost of cleanup (i.e. the probability that there is contamination multiplied by the average cleanup cost for land of this type).

The term "brownfields" has been used to characterize property that was previously developed but is currently idle because it is either known or thought to be contaminated. At the end of 1995, there were an estimated 500,000 brownfield sites nationwide. Many cities are concerned with their future development due to the stigma associated with having a large amount of industrial land vacant or inactive within their boundaries.

2.2 Not in My Backyard

Residents in a community may be concerned that locating a noxious facility (e.g. landfill, hazardous waste disposal plant, or radioactive waste repository) in their vicinity may stigmatize the area because of risks associated with the wastes that are stored there. This concern may be associated both with potential negative health effects from exposure to radiation or toxic substances and with negative economic impacts such as decreases in property values or reduced business activity.

Even if analysts offer scientific evidence that the risks are very low, these concerns are unlikely to be allayed. For example, residents living near Operating Industries, Inc. (OII) landfill in the Los Angeles, CA metropolitan area were told by experts that the health risks associated with odors from the landfill were harmless. A survey conducted by the California Department of Health found no statistical differences between the OII area and control communities in terms of mortality or incidences of cancer and liver disease. Yet many residents in the OII community believed that the landfill posed serious health risks to them and this concern adversely affected property values in the community (McClelland, Schulze, & Hurd, 1990).

2.3 British Beef

In many cases it is not easy to tell whether or not the stigmatization response is justified. This was illustrated dramatically in the United Kingdom, where the hint that eating beef might lead to a fatal brain disease had a catastrophic impact upon the British beef industry and threatened the very economic and political stability of Britain itself. The widespread publicity given to the deaths of a dozen young people from a mysterious disease that looks similar to bovine spongiform encephalopathy (BSE) in cattle and Creutzfeld-Jacob Disease (CJD) in humans led to the destruction of hundreds of thousands of cattle. If this action and the avoidance

of British beef by consumers in the U.K. and throughout Europe prevented an epidemic of this gruesome and fatal human disease, then the response could be considered appropriate—a public health miracle perhaps. If there was really little or no danger from eating British beef, the response was wildly exaggerated and destructive. At this date, the science is incomplete, the jury still out.

Episodes of stigmatization such as the BSE scare are noteworthy because they are textbook examples of what has been called the "social amplification of risk" and they illustrate a new form of societal vulnerability. Whereas human health was the primary vulnerable commodity in the past, increasing technical and medical sophistication, combined with hypervigilant monitoring systems to detect incipient problems, make such scourges less likely now. But the price of this vigilance, based in no small part upon the incredible ability of modern media to "spread the word," is the impact that this information itself has upon social, political, industrial, and economic systems. Thus we live in a world in which information, acting in concert with the vagaries of human perception and cognition, has reduced our vulnerability to pandemics of disease at the cost of increasing our vulnerability to massive social and economic catastrophes. Is this latter vulnerability inevitable? What might be done to reduce it without losing the benefits of hypervigilant warning systems?

3. Stigma: A Conceptual Framework

3.1 Contentiousness of the Risk

One of the key factors which creates stigma is the contentiousness associated with many risk issues. The science of risk assessment is imprecise and value-laden, as are disciplines such as toxicology and epidemiology upon which risk assessment depends. For example, scientists are limited in their ability to deduce human cancer risks from animal bioassays due to different

sensitivities between humans and animals, different doses and routes of exposure, and many other factors. Furthermore, it is often the case that additional scientific studies and risk assessments fail to clarify the situation (Graham, Green, & Roberts, 1988). A related problem is the difficulty in establishing a causal link between exposure to hazardous materials and the alleged injury or disease. Even for diseases such as asbestosis or mesothelioma where there is greater understanding of causality, it is often difficult to assign blame. For example, did Steve McQueen contract mesothelioma because he worked with asbestos in the shipyards during World War II, or wore an asbestos suit when driving a race car (Viscusi, 1991)?

Given this uncertainty and ambiguity associated with health and environmental risks, there are likely to be considerable differences among the experts on the dangers associated with using a certain product, living on land where there may be ground water contamination, or in a community where there is a nearby facility storing hazardous waste. Citizens groups and public interest organizations are likely to choose their favorite scientific expert to defend their position and broadcast their concerns widely. In the process, a product or community may be perceived to be much riskier by the public than would be implied if one weighed all the scientific evidence.

In our view, a product, place or industry can be stigmatized even when only one expert out of many views a situation as being dangerous and points out what can happen from an adverse incident. Individuals will often focus on the consequences associated with specific events without paying attention to the low probability of the situation occurring. In other words, a large weight is placed on the outcome dimension with little attention given to the chances of its occurrence. Such behavior is consistent with empirical evidence on individual behavior regarding low probability, high consequence events (Camerer & Kunreuther, 1989) and is illustrated by the following example.

Siting LNG Facilities in California

In the 1970s California was considering locating a terminal for receiving liquified natural gas (LNG) and converting it into a gas where it is then distributed through pipelines. Three locations were proposed in the state for locating an LNG terminal. One of the proposed areas was Oxnard, CA, where there was considerable opposition by citizen groups to the facility. One of the opposition groups focused attention on a series of worst-case scenarios developed for them by one of the consulting firms showing the number of fatalities from accidents from vapor cloud explosions *without accompanying probabilities*.

A series of maps of the community were drawn which depicted the impacts of these vapor cloud explosions should the wind be blowing in different directions. Any resident of Oxnard could find their house covered by a vapor cloud on at least one of the maps. This study was used by citizen groups to claim that an LNG facility would stigmatize Oxnard and decrease property values, even though scientific experts all reported extremely low probabilities of these events occurring.[1] The impact of the opposition was sufficiently strong that the California State legislature passed a new Siting Act which redefined eligible siting areas so that Oxnard was officially excluded because it was viewed as being too dangerous to site a facility there (Kunreuther & Linnerooth, 1982).

---

1 The Federal Energy Regulatory Commission, the principal body at the federal level determining whether a proposed LNG project is in the public interest, indicated that the risk associated with one of the worst case scenarios which caused 130,000 people in Oxnard to die was 1 in 710 septedecillion. A septedecillion has 55 zeros associated with it.

3.2 The Role of Imagery and Affect

To create and evaluate strategies for dealing with the destructive effects of stigma we must understand something of its nature. Building upon the work of a large number of behavioral scientists, we propose a model in which stigma is based upon negative imagery that has become associated with places, products, technologies and, of course, people.

The eminent learning theorist, Hobart Mowrer (1960a, b), for example, concluded that human behavior is guided and controlled in a generally sensible and adaptive manner by conditioned emotional responses to images that could be viewed as "prospective gains and losses." More recently Damasio (1994) argues that human thought is made largely from images, broadly construed to include perceptual and symbolic representations. Through experience, these images become "marked" by positive and negative feelings (Mowrer and other learning theorists would call this conditioning) and these feelings motivate action. When a negative marker is linked to an image it sounds an alarm and motivates avoidance. When we think of the prime targets for stigmatization in our society, members of minority groups, the aged, homosexuals, drug addicts, and persons afflicted with physical deformities and mental disabilities, we can appreciate the affect-laden images that, rightly or wrongly, are associated with such individuals.

Empirical support for the proposed relationship between images, affect, decision making and stigma has come from a program of research at Decision Research (Slovic, Flynn, & Layman, 1991; Slovic et al., 1991; Slovic, Layman, & Flynn, 1993; Slovic, Layman, & Flynn, 1990). This work was motivated by a practical question: "What is the potential for a high-level nuclear waste repository at Yucca Mountain to stigmatize the city of Las Vegas and the State of Nevada, thus producing significant economic impacts in those places?"

Building upon previous research linking images and behavior, the studies were designed to develop a measure of environmental imagery, assess the relationship between imagery and choice behavior, and describe economic impacts that might occur as a result of altered images and choices.

Specifically, research was designed to test the following three propositions: (1) Images associated with environments have diverse positive and negative affective meanings that influence preferences (e.g., in this case, preferences for sites in which to vacation, retire, find a job, or start a new business); (2) A nuclear-waste repository evokes a wide variety of strongly negative images, consistent with extreme perceptions of risk and stigmatization; and (3) The repository at Yucca Mountain and the negative images it evokes will, over time, become increasingly salient in the images of Nevada and of Las Vegas. If these three propositions are true, it seems quite plausible that, as the imagery of Las Vegas and of Nevada becomes increasingly associated with the repository, the attractiveness of these places to tourists, job seekers, retirees, and business developers will decrease and their choices of Las Vegas and Nevada within sets of competing sites will decrease. Table 1 illustrates the results obtained by asking one respondent to associate to each of four cities and, later, to rate each image affectively. An overall affective score is obtained for each stimulus city by summing the individual ratings. The cities in this example produce a clear affective ordering with San Diego being perceived most favorably and Los Angeles most negatively. The research showed that image scores such as these were highly predictive of expressed preferences for living, working, and vacationing in

different places (see Table 1). In one study we found that the image score predicted the location of actual vacations taken over the next 18 months.[2]

Table 1. Images, Ratings, and Summation Scores for Respondent 132

Stimulus	Image no.	Image	Rating	Stimulus	Image no.	Image	Rating
SAN DIEGO	1	very nice	2	DENVER	1	high	2
SAN DIEGO	2	good beaches	2	DENVER	2	crowded	0
SAN DIEGO	3	zoo	2	DENVER	3	cool	2
SAN DIEGO	4	busy freeway	1	DENVER	4	pretty	1
SAN DIEGO	5	easy to find way	1	DENVER	5	busy airport	–2
SAN DIEGO	6	pretty town	2	DENVER	6	busy streets	–2
		Sum =	10			Sum =	1
LAS VEGAS	1	rowdy town	–2	LOS ANGELES	1	smoggy	–2
LAS VEGAS	2	busy town	–1	LOS ANGELES	2	crowded	–2
LAS VEGAS	3	casinos	–1	LOS ANGELES	3	dirty	–2
LAS VEGAS	4	bright lights	–1	LOS ANGELES	4	foggy	–1
LAS VEGAS	5	too much gambling	–2	LOS ANGELES	5	sunny	0
LAS VEGAS	6	out of the way	0	LOS ANGELES	6	drug place	–2
		Sum =	–7			Sum =	–9

Note: Based on these summation scores, this person's predicted preference for a vacation site would be San Diego. Source: Slovic et al., 1991.

In sum, the research pertaining to Yucca Mountain supported the three propositions that the study aimed to test: Images of cities and states, derived from a word-association technique, exhibited positive and negative affective meanings that were highly predictive of preferences for vacation sites, job and retirement locations, and business sites (Proposition 1). The concept of a nuclear-waste storage facility evoked extreme negative imagery (Proposition 2) indicative of stigmatization. Dominant associations to a repository were "dangerous," "death," "pollution,"

---

2 The role of imagery in relocation decisions is illustrated by a Seattle friend's comment to one of the authors in a recent letter: "Ed's saying Montana may be the answer to middle age contentment. I think Montana has too many movie stars and militia, and too many creeps in cabins. I refuse to cross state lines in an Easterly direction."

"bad," "undesirable," and "somewhere else." The nuclear-weapons test site, which has been around far longer than the Yucca Mountain nuclear-waste project, was found to have led to a modest amount of nuclear imagery becoming associated with the state of Nevada. This provided indirect evidence for Proposition 3, which asserts that nuclear-waste related images will also become associated with Nevada and Las Vegas if the Yucca Mountain Project proceeds. Moreover, nuclear imagery, when present in a person's associations to Nevada, was found to be linked with much lower preference for Nevada as a vacation site, indicative of a stigmatization response.

3.3 The Social Amplification of Risk and Stigma

Stigmatizing images are created through direct experiences such as bad odors, ugly landscapes, accidents, illnesses, etc. But the greatest contributor to stigma, by far, is the news media, which play a major role in the process labeled "social amplification of risk" (Kasperson et al., 1988). Social amplification, as schematized in Figure 1, is triggered by the occurrence of an adverse event, which could be a major or minor accident, a discovery of pollution, an incident of sabotage, and so on. Risk amplification reflects the fact that the adverse impacts of such an event sometimes extend far beyond the direct damages to victims and property and may result in massive indirect impacts such as litigation against a company or loss of sales, increased regulation of an industry, and, of course, stigmatization. In some cases, all companies within an industry are affected, regardless of which company was responsible for the mishap. Thus, the event can be thought of as a stone dropped in a pond. The ripples spread outward, encompassing first the directly affected victims, then the responsible company or agency, and, in the extreme, reaching other companies, agencies, or industries. In addition to the British beef incident mentioned earlier, other well-known examples of events resulting in extreme higher-order

impacts include the chemical manufacturing accident at Bhopal, India, the disastrous launch of the space shuttle Challenger, the nuclear-reactor accidents at Three Mile Island and Chernobyl, the adverse effects of the drug Thalidomide, the Exxon Valdez oil spill, and the adulteration of Tylenol capsules with cyanide. An important feature of social amplification is that the direct impacts need not be too large to trigger major indirect impacts. The seven deaths due to Tylenol tampering resulted in more than 125,000 stories in the print media alone, and inflicted losses of more than $1 billion upon the Johnson & Johnson Company, due to the damaged image of the product (Mitchell, 1989).

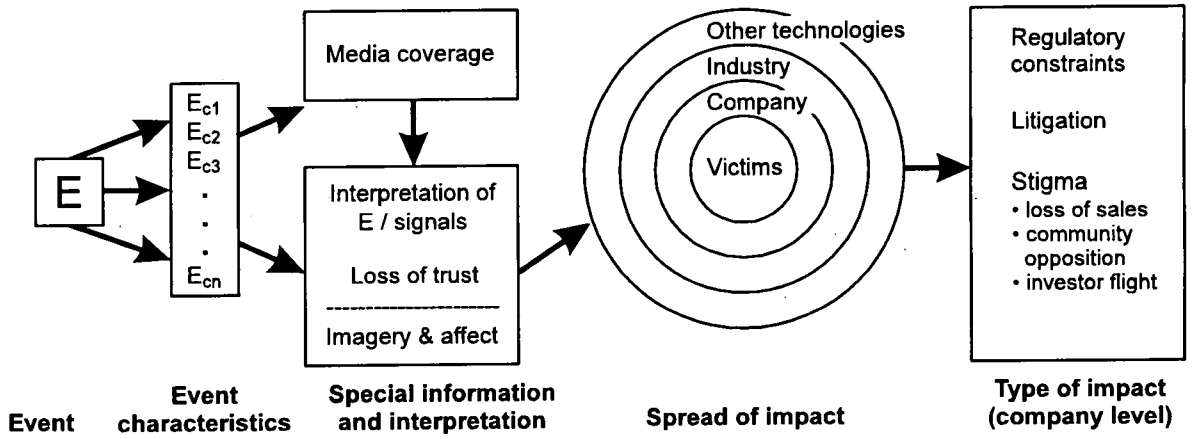

Figure 1. A preliminary model of social amplification of risk and stigma impacts. Development of the model will require knowledge of how the characteristics (E_c) associated with a hazard event interact to determine the media coverage and the interpretation or message drawn from that event. The nature of the media coverage and the interpretation is presumed to determine the type and magnitude of ripple effects.

paul/coping1.cdr: 3-4-97

It appears likely that multiple mechanisms contribute to the social amplification of risk. First, extensive media coverage of an event can contribute to heightened perceptions of risk, propagation of stigmatizing images, and amplified impacts (Burns et al., 1993). Second, a particular risk or risk event may enter into the agenda of social groups, or what Mazur (1981)

terms the partisans, within the community or nation. The public relations attack on "Alar" by the Natural Resources Defense Council demonstrates the high media profile and important impacts that special interest groups can trigger (Moore, 1989).

A third mechanism of amplification arises out of the interpretation of unfortunate events as clues or signals regarding the magnitude of the risk and the adequacy of the risk-management process (Burns et al., 1993; Slovic, 1987). The informativeness or signal potential of a mishap, and thus its potential social impact, appears to be systematically related to the perceived characteristics of the hazard. An accident that takes many lives may produce relatively little social disturbance (beyond that caused to the victims' families and friends) if it occurs as part of a familiar and well-understood system (e.g., a train wreck). However, a small accident in an unfamiliar system (or one perceived as poorly understood), such as a nuclear-waste repository or a recombinant-DNA laboratory, may have immense social consequences if it is perceived as a harbinger of future and possibly catastrophic mishaps.

The concept of accidents as signals helps explain our society's strong response to mishaps involving nuclear power and nuclear wastes. Because the risks associated with nuclear energy are seen as poorly understood and catastrophic, accidents anywhere in the world may be seen as omens of disaster everywhere there are nuclear reactors and wastes, producing extensive media scrutiny and coverage (e.g., a minor valve failure in a reactor in England was described in a story in the San Francisco Examiner) and "ripple responses" (e.g., increased regulation, stigma) that carry large social and economic costs.

3.4 Innuendo

Besides covering certain hazard or risk stories with obsessive thoroughness, the news media are often accused of covering them in a biased or sensationalist way. This may sometimes

be true, but the fact that the media see themselves as having a responsibility to warn the public about dangers (high signal events) can explain and rationalize much of the coverage. Also, a number of studies have shown that the media often do a good job of reporting a story as it is given to them by scientists or regulators, although they sometimes try to balance a story by giving equal time to opposing views, even when one view is held by relatively few persons. An intriguing social-psychological study titled "Incrimination through innuendo: Can media questions become public answers?" (Wegner et al., 1981) suggests that even the mildest hint of trouble can stigmatize a person (and probably a product or technology as well). The study found that indirect statements or assertions about people, in the form of innuendoes (e.g., "Ginger is not using drugs") were as destructive to a person's image as direct, incriminating statements. It may be that even subtle and indirect associations in the media between stimuli and undesirable characteristics or events can induce stigma. And if subtle hints do this, so might airing the views of a single outlier who believes that the risk of some product or technology is high.

3.5 Carcinogens and Stigma: A Special Problem

Many substances, activities, and technologies have become stigmatized in our society because of their proven or suspected associations with cancer. Chemicals, radiation and radiation technologies (e.g., nuclear power, nuclear-waste storage), asbestos, and electromagnetic fields come quickly to mind in this regard. We shall briefly discuss why this is so and, in subsequent sections, point out its implications for managing stigma.

The pain and drawn-out suffering of cancer make it one of the most dreaded diseases in many societies. The very name, cancer, or the label, carcinogen, evokes dread images and stigmatizing avoidance responses. Avoidance responses to carcinogens are amplified when exposure is perceived as involuntary, when the risks are unfamiliar or viewed as poorly

understood, when the victims are young and innocent, and when the benefits of the activity are small or distributed inequitably across society.

High signal potential and extensive media coverage typically accompany events or scenarios involving exposure to carcinogens. One of the most dramatic examples of media-amplified stigmatization of a product occurred in the spring of 1989, when millions of consumers stopped buying apples and apple products after CBS, prompted by the Natural Resources Defense Council, ran a news story on "60 Minutes" stating that the chemical Alar (used then as a growth regulator on apples) could cause cancer in children. The assertion that Alar was carcinogenic was based upon animal studies that were considered suspect because the doses used had been so large as to have been acutely toxic. Moreover, there was no evidence from epidemiological studies showing Alar to be a human carcinogen. Nevertheless, because of the strong public reaction to the CBS program, apple farmers saw the wholesale price of apples decline by about one-third (between 1989 and 1990) and nationwide revenues decline by over $100 million (roughly 10% of 1989 revenues) with many growers losing their farms (Rosen, 1990). The losses to apple growers would undoubtedly have been even greater had they not stopped using Alar soon after the CBS program was aired.

Within a year of the Alar scare, a minute amount of Benzene (a known human carcinogen) was found in water bottled by Perrier. The contamination did not originate in the mineral water itself, but from dirty filters used in the process of adding carbon dioxide to the water to give it its fizz. Although the health risk was judged by the Food and Drug Administration ("FDA") to be nil, every bottle of Perrier worldwide was withdrawn from the market in response to consumer pressure. Perrier estimated its short-term losses at $79 million

(Reuters, 1990). During the year following the incident, Perrier lost half of its share of the U.S. imported mineral water market as a result of the stigmatization of its product (Brown, 1991).

These strong reactions to Alar and Benzene are understandable in light of risk-perception studies that have found a high percentage of the public (70% or more) believing that any contact with a "carcinogen" (no matter how small or how brief) is likely to lead to cancer (Kraus, Malmfors, & Slovic, 1992). As a result of this belief, people want absolutely no contact with substances that are believed to be carcinogenic. Weinstein (1988), for example, found that 85% of the respondents in his survey of New Jersey residents agreed that "If even a tiny amount of a cancer-producing substance were found in my water, I wouldn't drink it."

From responses to these and other questions, researchers have concluded that public perceptions of risk from exposure to carcinogens tend to be insensitive to the amount of exposure (Kraus et al., 1992). That is, people tend to believe that if something is carcinogenic, it will likely cause cancer in people regardless of whether the amount of exposure or "dose" is large or small. This "mental model of carcinogenesis" stands in stark contrast to the way that scientists think about the risks from chemicals. The fundamental principle of toxicology is the fact that "the dose makes the poison."[3] Scientists believe that even very toxic substances, including carcinogens, may pose little risk if the dose is small enough.

Psychological and anthropological research provides insight into why people are so concerned about even minute exposures to carcinogenic substances. Frazer (1959) and Mauss (1972) described a belief, widespread in many cultures, that things that have been in contact with

---

3 This maxim of toxicology dates back to the observation by Paracelsus in the 16th Century that "All things are poison and nothing is without poison. It is the dose only that makes a thing not a poison" (as quoted in Ottoboni, 1984).

each other may influence each other through transfer of some of their properties via an "essence." Thus, "once in contact, always in contact," even if that contact (exposure) is brief. Rozin, Millman, and Nemeroff (1986) show that this belief system, which they refer to as a "law of contagion," is common in our present culture. The implication of this research is that even a minute amount of a toxic substance in one's food will be seen as imparting toxicity to the food; any amount of a carcinogenic substance will impart carcinogenicity, and so on. The "essence of harm" that is contagious is typically referred to as contamination. Being contaminated has an all-or-none quality to it — like being alive, or being pregnant. When a young child drops a sucker on the floor, the brief contact with "dirt" may be seen as contaminating the candy, causing the parent to throw it away rather than washing it off and returning it to the child's mouth. This all-or-none quality irrespective of the degree of exposure is evident in the observation by Erikson (1990) that "To be exposed to radiation or other toxins... is to be contaminated in some deep and lasting way, to feel dirtied, tainted, corrupted" (p. 122). The effect of contagion or contamination in the public's view is obviously very different from the scientist's model of how contact with a chemical induces carcinogenesis or other kinds of harm. In the scientific model, exposure (and the resulting risk) is viewed as a continuum, rather than as an "all or none" phenomenon.

The stigmatization and avoidance of such products as red apples treated with Alar and Perrier water containing Benzene, and the decline in property values in neighborhoods exposed to contamination by carcinogenic pollutants, thus appears both understandable and to some extent predictable in light of research on perceived risk and social amplification of risk.

3.6 Operationalizing Stigma

When a place or a product is stigmatized, its economic value may decrease to levels below what one would expect based upon any standard definition of risk. This concept of stigma

can be operationalized or measured by introducing a riskless product which sells at a price B on the market. If there is some well-specified probability (p) that users of the product will suffer an injury or illness that requires a cost of L on their part, then they will want to spend S = B-pL for the product to reflect its risk.[4] Now suppose that people become so concerned about the risk of the product, that the market price declines to V < S. We define S-V as an economic measure of stigma.

Similarly, the impact that stigma will have on property values can be operationalized as follows: Assume an individual, family or business would have considered purchasing a riskless piece of property at a price B. If there are well-specified marketing risks associated with the property the purchase price would be reduced to B-pL. Should this piece of property sell for V < S, then this difference can be attributed to stigma. A more formal model which suggests how one can measure S-V as a function of uncertainties in probabilities and a broader definition of consequence than just the cost of L is incorporated in the Appendix

A related quantitative measure of stigma in the case of property is offered by Chalmers (1996) who analyzes the impact of contamination on the types of loans provided by banks to purchase such property. On the basis of empirical data he concludes that the required risk adjusted equity yields are as much as 15% higher when the property is contaminated than when it is pristine. At a more general level Chalmers suggests that if the risk characteristics of the property increase the cost of capital, this difference from a normal interest rate can be used to measure stigma from an economic perspective.

---

[4] Note that we are assuming that purchasers are risk neutral. A risk-averse person would want to spend less on the product.

4. Strategies for Dealing with Stigma

From the analysis in Section 3, we can see why stigma is so powerful a phenomenon and so hard to manage. It arises from fundamental psychological processes of imagery, affect, and learned associations between the two, amplified by the media and by the use of risk-assessment studies whose results are often uncertain or distrusted. Nevertheless there are a number of potential strategies for reducing vulnerability to stigma. As outlined in Table 2, these include efforts to:

- prevent the occurrence of stigmatizing events
- reduce perceived risk
- reduce the number of stigmatizing messages and their social amplification
- reduce the impacts of stigma, and
- increase understanding of stigma.

Each of these approaches will be discussed below.

Table 2. Strategies for Coping with Stigma

1. **Prevent Stigmatizing Events**
   - Model stigma impacts as explicit costs in decision analysis
2. **Reduce Perceived Risk**
   - Create and maintain trust
   - Inform, educate, and desensitize the public
   - Educate scientists about how risk studies and quantitative risk assessments breed fear
3. **Reduce Social Amplification**
   - Educate the media about stigma
   - Educate the government about stigma
4. **Reduce Stigma Impacts**
   - Provide insurance
   - Guarantee property values
   - Provide compensation
5. **Understand Stigma**
   - More research is needed

4.1 Prevent Stigmatizing Events

One implication of signals, ripples, and stigma is that effort and expense beyond that indicated by the expected losses from direct impacts (the inner circle in Figure 1) might be warranted to reduce the frequency of occurrence of high-signal, stigmatizing events. For example, in the event of another "contained" core-damaging accident in a nuclear reactor such as the one that took place at Three Mile Island, the major costs of such an accident would not be those from immediate loss of life, latent cancers, and direct economic expenses (e.g., property damage, repairs, cleanup), important as these may be. Instead, the dominant costs might arise from secondary impacts such as public reaction, perhaps leading to shutdown of the industry, and the resulting higher-order consequences of shutdown (e.g. dependence on more costly and less reliable energy sources), which could total tens or hundreds of billions of dollars.

These sociopolitical and economic costs must be considered when determining the acceptable probability of a core-damaging accident. In other words, the design of nuclear safety criteria might be phrased in terms of the question: "What probability of an accident costing several hundred billion dollars is tolerable?" Because of social amplification and stigma, such high costs may result from an accident with no deaths and little property damage as well as from an accident that produces many deaths and much damage.

This notion calls for a more comprehensive modeling of the overall social costs (including stigma impacts) of nuclear accidents. If even small and contained (but frightening) accidents are likely to have immense costs, this would imply the need for strict criteria, even at great expense, to minimize the probability of such accidents. Similar logic might argue in favor of remote siting of hazardous facilities, dedicated trains for transporting hazardous materials,

tamper-resistant packaging on products, expensive safety precautions in blood banks, and other measures to prevent stigma producing events from taking place.

Of course, we need to better understand how to model and predict stigma impacts but we already know a lot about qualities of hazards and their victims that trigger media coverage, ominous signals, stigmatizing images, and strong avoidance behavior, and this information should be incorporated into impact projections (for a related discussion of modeling and predicting potential future sources of toxic tort litigation see Foran, Goldstein, Moore, & Slovic, 1996).

4.2 Reduce Perceived Risk

4.2.1 Create and Maintain Trust

Reducing perceived risk should decrease stigma, but doing so is not easy. One key link is through trust. If trust in experts, managers, and policy makers declines, perceived risk will increase and so will stigma. Unfortunately, trust in risk management is difficult to achieve and maintain (Slovic, 1993). Trust is fragile. It is typically created rather slowly, but it can be destroyed in an instant — by a single mishap or mistake. Thus, once trust is lost, it may take a long time to rebuild it to its former state. In some instances, lost trust may never be regained.

The fact that trust is easier to destroy than to create reflects certain fundamental mechanisms of human psychology that Slovic (1993) called "the asymmetry principle." When it comes to winning trust, the playing field is not level. It is tilted toward distrust, for each of the following reasons:

1. Negative (trust-destroying) events are more visible or noticeable than positive (trust-building) events. Negative events often take the form of specific, well-defined incidents such as accidents, lies, discoveries of errors, or other mismanagement. Positive events, while sometimes

visible, more often are fuzzy or indistinct. For example, how many positive events are represented by the safe operation of a nuclear power plant for one day? Is this one event? Dozens of events? Hundreds? There is no precise answer. When events are invisible or poorly defined, they carry little or no weight in shaping our attitudes and opinions.

When events do come to our attention, negative (trust-destroying) events have much greater weight on our opinions than do positive events. Adding to the asymmetry is yet another idiosyncrasy of human psychology — sources of bad (trust-destroying) news tend to be seen as more credible than sources of good news. Another important psychological tendency is that distrust, once initiated, tends to reinforce and perpetuate distrust. These various trust-destroying tendencies are, of course, amplified by the news media. Just as individuals give greater weight and attention to negative or trust-destroying events, so do the media (Lichtenberg & MacLean, 1992). The implication of all this for managing stigma is that, again, great efforts and costs may be warranted to prevent the occurrence of events that could fuel distrust. In other words, loss of trust is one of the ripple effects referred to earlier that needs to be modeled and valued when making decisions about risk management.

Another way to generate trust is to have the concerned public intimately involved in the process of making key decisions. For example, in siting new facilities it is important to hear the concerns of the affected public and determine how to deal with them. If there is a concern with monitoring and control procedures for making certain the facility is safe, then a committee could be established to inspect the facility at regular intervals and report its findings back to the local community. The facility would have to be shut down temporarily to correct any defects. Such a process might help to establish trust and confidence between the developer and the affected parties and thus reduce perceived risk and stigmatization.

A set of guidelines for a fairer, wiser, and more workable siting process — the Facility Siting Credo — was developed during a National Facility Siting Workshop in 1990. A questionnaire based on the Credo was completed by stakeholders in 29 waste facility siting cases, both successful and unsuccessful, across the United States and Canada. Using an independent determination of outcome success, a preliminary rank of the importance of various credo principles was obtained. The data revealed that establishing trust between the developer and host community was an important factor in facilitating the siting process. The siting process was most likely to be successful when the community perceived the facility design to be appropriate and to satisfy its needs. Public participation also was seen to be an important process variable, particularly when it led to the view that the facility does a good job of meeting community needs (Kunreuther, Fitzgerald, & Aarts, 1993).

4.2.2 Inform, educate, and desensitize the public

It is natural to turn to informing and educating people about risk in order to reduce stigma impacts by calming what technical experts may view as "exaggerated fears." The dawn of "risk communication" was greeted with high hopes in the mid 1980's. However, we now know that education and communication, though important, have limited ability to influence perceived risks and reduce stigma. For one, due to the reason noted earlier, trust is often lacking, and without trust in the communicators and in the risk-management system, no form of message will "take."

Second, the affective nature of stigma limits the influence of quantitative risk information. Consider phobias, for example, which are strong affective and aversive reactions to stimuli such as spiders, snakes, airplane travel, the outdoors, and so on. It is well known that risk communication (i.e., statistics showing that the risks are small or nonexistent) is virtually useless in treating phobias. We can expect the same to be true with stigma. What works with phobias is

systematic desensitization or counterconditioning to reduce the negative affect. For example, a subject who developed an inability to take pills following the Tylenol poisonings in 1981 was "cured" by starting with relaxation training and then being exposed very gradually to stimuli increasing in similarity to medicine pills (first, simply imagining pill taking, then drinking wine, then taking a vitamin pill, etc., see Pbert & Goetsch, 1988). Similar counterconditioning may be necessary to deal with the conditioned negative affect that drives stigmatization and avoidance behavior.

For example, in the difficult area of dealing with minute exposures to carcinogens, it may help people to learn of Bruce Ames' (1983) studies showing that many common fruits and vegetables contain natural carcinogens in far greater amounts than the small exposures they are concerned about (hopefully this will not stigmatize fruits and vegetables). It may also help if people understand that the body has defenses against the cell damage that might lead to cancer and if they understand the essence of current theories of carcinogenesis, so they can appreciate that minute exposures may pose little or no risk.

Educating about the benefits of such exposures (e.g., the great benefits of water chlorination, a procedure that may also expose people to very small amounts of carcinogens) may also reduce negative affect as there is evidence to believe that the positive affect associated with benefits can partially offset the negative affect associated with risks (Alhakami & Slovic, 1994).

4.2.3 Educate scientists: Risk studies breed stigma

Risk assessment, as currently practiced and communicated, is part of the problem. The practice of quantitative risk assessment has steadily increased in prominence during the past several decades as government and industry officials have sought to develop more effective ways

to meet public demands for a safer and healthier environment. Ironically, as society has expended great effort to make life safer and healthier, many in the public have become more, rather than less concerned about risk. This is particularly true for involuntary exposure to chemicals, which the public associates to a remarkable extent with danger, cancer, and death. The image of chemical technologies is so stigmatized that when you ask college students or members of the general public to tell you what first comes to mind when they hear the word "chemicals," by far the most frequent response is "dangerous" or some similar response (e.g., toxic, hazardous, poison, deadly, cancer); beneficial uses of chemicals are rarely mentioned. National surveys have found that about 75% of the public agree with the statement, "I try hard to avoid contact with chemicals and chemical products in my everyday life" (reference).

There are several major problems with risk-assessment studies, particularly studies of carcinogens. First, it is now widely believed that animal studies overpredict cancer because the high doses used in such studies kill cells and overpower natural defense mechanisms in ways that would not happen in humans exposed to far lower doses of the chemical in question. Yet the public believes that chemicals that cause cancer in animals (at any dose) cause cancer in humans, even if scientists do not believe this (Kraus et al., 1992; Slovic, in press). Similar problems occur with epidemiological studies of risk which often seem better able to frighten the public than to reduce scientific uncertainty (reference: e.g., studies of EMF health effects).

Second, in order to be "conservative" and provide maximum protection for the public, cancer risk assessments are based on assumptions designed to minimize the chance that the risk will be underestimated. Data for animals exposed to chemicals at high doses is extrapolated to low doses using a linear, no-threshold model. No exposure is said to be without risk. A very small exposure to a carcinogen may be estimated as producing, say, 1 case of cancer per 100,000

people, but if one million people were exposed, this leads to an estimated 10 cases of cancer. This was the type of estimation that was communicated by CBS in their program on Alar. In fact, such low risks could well be zero.

The linear, no-threshold model of cancer risk assessment has long been the subject of debate and criticism (see, e.g., Nichols & Zeckhauser, 1980). Recently, Purchase and Auton (1995) described an alternative model in which the lowest dose at which the critical effect has been observed is identified and used to define the No Observed Adverse Effect level (NOAEL) for that effect. Purchase and Auton show that one cannot distinguish empirically between the linear, no-threshold model and a model in which the NOAEL is divided by a safety factor. Thus, for example, the linear model used by the EPA regulates any lifetime risk in excess of 1 chance in 10^6, which can be shown to be equivalent to the NOAEL divided by a safety factor of about 250,000.

Use of a non-threshold linear model to express risk in probabilistic terms leads to higher perceived risk than does the safety-factor format based upon the same data (Purchase & Slovic, 1997). Thus risk assessors and risk communicators are faced with a choice, given the same set of data, between asserting (a) that the probability you will develop cancer from exposure to Chemical Y is about 1 chance in 1,000,000 and asserting (b) that "Chemical Y has been observed to cause cancer in animals but only at doses more than 250,000 times greater than what you will ingest. At doses less than 250,000 times greater than what you will ingest, no cancer in animals has been found."

Statement (b) is not demonstrably less accurate than statement (a) and may be less likely to contribute to the stigma-causing view that exposure to this carcinogen is likely to cause some cancers.

More generally, the point we are trying to argue here is that the rise of quantitative risk assessment, with its proliferation of high-dose animal studies and reliance on conservative extrapolation methods, may be a strong contributor to destructive stigmatization involving chemical products. This poses a dilemma for risk managers who cannot and should not abandon animal studies and risk assessment. However, they must recognize that stigma is a side-effect of such efforts and consider ways to offset its damaging impacts without jeopardizing public health and safety.

4.3 Reduce Social Amplification

Another strategy would focus on possibly altering the number and type of stigma producing messages reaching the public by educating the media and the regulatory community about the effects their messages may have.

4.3.1 Educate the Media

The media will not easily be persuaded to change their way of "reporting on risk." They believe they are providing an important duty to society in warning of potential threats, and this is true. Moreover they are well protected by the First Amendment of the Constitution. Although apple growers in Washington State sued CBS for making numerous false statements about the risks of apples treated with Alar, the suit was dismissed by a federal judge who argued that "Even if CBS' statements were false, they were about an issue that mattered, cannot be proven as false and therefore must be protected" (reference). The judge further affirmed the right of a news-reporting service to rely upon a scientific government report (which CBS did) and communicate the report's results.

However, we suspect that CBS, in their reporting on Alar, did not intend to harm the apple growers. They wanted to motivate EPA to take action against Alar and did not anticipate

the massive stigma response they created. Thus one strategy would be to educate the media about the nature and potency of stigma and their responsibility to anticipate and weigh potential stigma losses against more direct risks when deciding what information to present about risk and how to present it.

In response to the Alar incident, Florida, Washington, and other states have proposed (and in some cases passed) legislation allowing producers of agricultural commodities to recover damages for the disparagement of any agricultural commodity (where disparagement is defined as "dissemination to the public... of any false information regarding the application of any agricultural chemical or process to agricultural commodities that is not based on reliable scientific data, that the disseminator knows or should have known to be false, and that causes the consuming public to doubt the safety of any agricultural commodity."

Although "anti-disparagement legislation" may discourage and punish some wanton attacks on products, it seems unlikely to penetrate the First Amendment defense of the news media.

4.3.2 Educate the government

In an earlier section, we argued that government-endorsed methods of risk assessment may contribute to exaggerated fears of chemical carcinogens and the destructive stigmatization of certain chemicals (and perhaps the entire chemical industry).

In its attempts to carefully regulate public exposures to harmful substances, government does other things besides promulgating risk assessments that place products in jeopardy. Like the media, the government communicates risk information to the public in ways that may be destructive as well as helpful. A case in point is the government's Annual Report on Carcinogens, a list of known or suspected cancer-causing substances. At the lowest (least

dangerous) level on the list is a category labeled "reasonably anticipated to be a carcinogen." The degree of evidence necessary to "earn" this listing is far less than what is needed to be listed as a "probable" or "known" human carcinogen. All that is needed is evidence of cancer in two animal studies, regardless of whether or not the dose or route or exposure matches the manner in which humans are exposed. This "reasonably anticipated" listing is meant as the very first step in the hazard-identification process, a red flag so to speak. It carries no legal penalty but, as should be obvious from the preceding discussions, it has the potential to inflict massive losses to manufacturers because of the stigma of being labeled as a carcinogen of any sort.

This issue came to attention of the glass-wool (fiberglass) industry around 1990 when the government proposed placing glass-wool insulation in the reasonably anticipated category. The industry objected strenuously, claiming that the animal data had little relevance to human health because they were obtained from studies that surgically implanted massive quantities of fibers into the body cavities of test animals, bypassing normal bodily defense mechanisms. Moreover, the relevant human exposure pathway is inhalation. Fearing that the industry would be "needlessly stigmatized" and irreparably harmed by the listing, the glass-wool manufacturers challenged the very nature of the research methods used by the National Toxicology Program as well as the criteria used to evaluate data and label degrees of cancer risk. [Expand — give outcome of case.]

This case shows that it is not only the media who need to be sensitive to the nature and impacts of stigma but researchers and government regulators as well as they seek to compile, evaluate, and communicate research findings. The glass-wool episode forces us to consider how much evidence is necessary to warrant the issuing of a very early (and thus possibly wrong) warning, given that the consequences of the warning itself could be very damaging (not unlike

the question of deciding when to yell fire in a crowded theater). We have no easy solution or answer to this question except to note that the reality of stigma should face a reexamination of research methods and criteria for identifying and labeling carcinogens.

4.4 Reduce Stigma Impacts

If stigmatizing events cannot be prevented (or have already occurred) and frightening messages have been disseminated, then perhaps the effects of stigma can somehow be mitigated through insurance and compensation mechanisms.

4.4.1 Insure Clean-up Costs of Brownfields

One of the reasons that the brownfields problem exists is because there is great concern by buyers of property that they may be forced to incur large cleanup expenses if the land that they purchase is found to be contaminated. In addition, the financial institution that issues a mortgage is concerned that it may have to cover the costs of cleanup if the buyer goes bankrupt. As noted earlier, many areas in the inner cities are stigmatized because there is great uncertainty regarding the risk (probability and consequences) that the land is contaminated with toxic wastes.

Some form of property transfer insurance may help reduce the stigma that are currently associated with these properties. However, in order for insurance to be marketable, there needs to be a more precise estimate of the risk associated with any particular piece of property than is normally found through title searches. Audits and inspections, such as a pre-acquisition site assessment by an engineering consulting firm to determine whether the property is contaminated, are needed to clarify the nature of the risks. If, in addition, federal and state environmental protection agencies are willing to issue well specified standards for cleanup, then property owners and potential insurers will even have a better idea on what the costs are likely to be

should an audit reveal contamination. Currently several insurers are marketing property transfer coverage using the following procedure:

- Require that the prospective buyer undertake an audit or inspection of the property. Phase 1 audits usually cost approximately $8,000 and provide a good indication of whether there is contamination on the land. If there is some concern with contamination then a Phase 2 audit will be necessary (a much more thorough audit) to determine the extent of the contamination. This costs of this audit normally ranges from $25,000 to $30,000.[5]
- Even after undertaking a Phase 1 audit and declaring "no contamination" there is a 10% chance that the audit is incorrect. It is here that insurance is very useful. If the insurer can determine the range of cleanup costs associated with contamination when a Phase 1 audit fails, then a premium reflecting risk can be charged. An examination of the costs of federal and state mandated cleanups at more than 3000 sites revealed that the average costs of remedial action ranged from $102,000 for underground storage tanks to just over $33 million for federal national priority list sites (in 1991 dollars) (Freeman & Kunreuther, in press). These data and related information enable insurers to set a premium based on risk where the amount charged will vary with the type of land, the nature of the audit and the terms of the contract (e.g. deductibles, upper limits of coverage).
- Banks will often require insurance as a condition for a mortgage to protect their investments should the buyer go bankrupt, much as they do with homeowners coverage today. Potential buyers may find the property attractive if they know they are protected against losses.

---

5 In theory, a buyer who undertakes audits is not held liable using the "innocent landowner purchase" defense as part of recent amendments to Superfund (CERCLA) legislation. However, to our knowledge this defense has not been tested in the courts. (M. Gerrard, personal communication, February 1997.)

Suppose that an audit has been undertaken on the property and reveals that there is no contamination on the land. Recognizing that there is still some chance that the audit has incorrectly diagnosed the situation, the buyer decides to purchase insurance or is forced to do so by the bank issuing a loan and is now protected from losses due to contamination.

The purchase price will now reflect the cost of insurance and the audit. Should the buyer want to sell the now-insured property in the future, there would be no decrease in value due to stigma because the existing coverage would protect the new owner from any cleanup costs.

At a broader level, the above example illustrates two ways to deal with stigma:

- Undertake inspections or audits to determine whether property has certain characteristics that may require remediation.
- Provide insurance so that buyers know that they are protected against any loss (unless there is an upper limit on coverage and the buyer believes the loss could be above this amount).

4.4.2 Insure New Facilities

If one is siting a hazardous facility in an area, then the type of insurance that the developer or company purchases may reduce the discrepancy between the experts' and public's views of the risk. The idea is a simple one: if an insurer is willing to offer coverage against an accident then it must be confident that the risk associated with the facility can be quantified. The lower the premium charged by the insurer, the safer the facility is likely to be. In this sense insurance can serve as a signal of relative safety, to the extent that the information on premiums is publicly available. Furthermore the public can view the insurance premium as a surrogate for the risk and hence better appreciate how risky it is.

Insurance can be viewed as a signal for safety in much the same way that past accidents or near-misses can be viewed as a signal for danger (Slovic, 1987; March, Sproull, & Tamuz,

1991). One reason that a low premium should be viewed as a legitimate signal is that the insurance industry is a competitive one. Hence no company can charge an unusually high rate and not be undercut by someone else who can make a profit. Otherwise insurers would have no incentive to treat the risk as smaller than what the public perceives it to be. Of course, if the new facility is hazardous, higher premiums or inability to obtain insurance would signal that too.

However, insurance may sometimes send mixed or confusing signals about safety. For example, consider the Price Anderson Act, which was passed in 1957 to encourage the utilities and industry to develop nuclear power as a source of energy. This piece of legislation provided insurance that would provide protection to the utilities with a $560 million limit on liability. This relatively low figure could be interpreted to mean that the insurance industry was so concerned about the risk that they did not want to provide more than this amount of protection. Alternatively one could interpret this low dollar value as saying that the catastrophic potential was not high. When the limit was raised a few years ago to $6.2 billion, the signal may also have been mixed for the same reasons.

4.4.3 Guarantee property values

One way to address the concern that residents in a community have with respect to the economic impact that siting a noxious facility will have is for the developer to provide property value guarantees. For example, in 1990 Champion International Corp. established a program to protect the property values of residents within two miles of an industrial landfill they sited. The company monitors changes in the sales prices of property in the county over a 10-year period and pays residents who sell their homes for any decrease in property value that is attributed to the presence of the landfill (Ewing, 1990).

As with insuring a new facility, this type of guarantee serves as a signal for safety since the developer is willing to cover costs associated with the facility. If it felt there would be large expenses then it would not offer this type of compensation. It is clearly designed to allay any concerns that citizens in the area may have with respect to the risk.

The challenge in developing property value guarantees is to develop an index that will effectively measure normal changes in comparable structures in areas which are not subject to the risks associated with the new facility. Champion's approach seems to make sense, but it would be interesting to know what their experience has been over the past seven years.

4.4.4 Provide compensation

Empirical evidence indicates that compensation can prove effective in gaining public acceptance for siting facilities on the benign end of the spectrum (e.g., landfills, prisons), but it is subject to serious limitations when it comes to facilities that the public regards as particularly risky or of questionable legitimacy such nuclear wastes. These require creative mitigation measures such as independent inspections of the facility and local authority to monitor and shut-down the facility. Even then they may be viewed as too risky to be acceptable with or without compensation (Kunreuther & Easterling, 1996).

With respect to relatively benign facilities, as shown in Table 3, a local landfill was acceptable to 30% of the Bacot, Bowen, and Fitzgerald (1994) sample and to 25% of the Jenkins-Smith, Kunreuther, Barke, and Easterling (1993) sample when compensation was not made part of the package. In both cases the rate of acceptance approximately doubled with the introduction of compensation.

The survey by Jenkins-Smith et al. (1993) also investigated the impact of compensation on acceptance in the case where the facility being sited was a hazardous-waste incinerator and a

medium-security prison. Although these two facilities differed markedly in the absolute level of acceptability (15% versus 29% in the no-compensation case), the introduction of benefits produced similar levels of increased acceptance (17 percentage points for the incinerator, 22 percentage points for the prison).

Table 3. Effect of Compensation Measures in Increasing Acceptance of Facilities

	Landfill for Municipal Waste			
	Study 1[a]	Study 2[b]	Haz. Waste Incin.[b]	Prison[b]
Acceptance without incentives	30%	25%	15%	29%
Acceptance with economic benefits		50%	32%	51%
Rebates on property tax	63%			
State money for schools	62%			
State money for roads	56%			

a) Bacot, Bowen, and Fitzgerald (1994). Sample of 844 Tennessee residents. The 30% figure for acceptance without incentives was derived from the reported result that 70% opposed the landfill; 30% is an upper bound on the actual figure. The authors do report the proportion in favor under the incentives conditions.

b) Jenkins-Smith et al. (1993). Total sample of 1200 U.S. residents. Each condition has $n = 150$.

In situations where residents view the facility as hazardous so that it is likely to stigmatize the community, compensation will be unable to overcome opposition. Support is provided by six separate studies on the effective compensation on siting nuclear waste repositories (see Table 4). One reason for the more positive acceptance of a repository by Hanford residents (Study 5) than by citizens in other areas in the U.S. (Studies 1–4) is that the city has had a long history with nuclear technology and hence may be more accepting of the waste than other communities which may have been fearful of being stigmatized.

Table 4. Limited Effectiveness of Compensation the Case of Nuclear Waste Repositories

	Study 1[a]	Study 2[b]	Study 3[c]	Study 4[d]	Study 5[e]	Study 6[f]
Acceptance without incentives	22%	10%	27%	24%	60%	51%
Acceptance with economic benefits 25%:						
"substantial payments"	26%					
"economic benefits"		14%				
$1,000/yr for 20 years			26%	23%		
$3,000/yr for 20 years			30%			
$5,000/yr for 20 years			30%			
$100+$900/yr for 20 years					51%	

a. Carnes et al. (1983). 1980 survey of 420 Wisconsin residents.

b. Jenkins-Smith et al. (1993). Total sample of 1200 U.S. residents. Each condition has $n = 150$.

c. Kunreuther, Easterling, Desvousges, and Slovic (1990). 1987 survey of 1001 Nevada residents ($n = 498$ answered compensation questions).

d. Herzik (1993). 1993 survey of 1212 Nevada residents.

e. Dunlap and Baxter (1988). 1987 survey of 658 persons living near Hanford, Washington.

f. Frey, Oberholzer-Gee, and Eichenbach (1996) 1993 survey of 305 person living in Wolfenschiessen, Switzerland.

Studies 5 and 6 found that offering payments led respondents to be less accepting of a radioactive waste repository. In the Dunlap and Baxter (1988) survey, 60% of the sample voted in favor of a HLNW repository at Hanford without benefits, while only 51% voted in favor when tax rebates were offered. In the Frey et al. (1996) survey of attitudes toward a low- and mid-level waste repository, acceptance was cut in half—from 51% to 25%. Moreover, the size of the compensation did not significantly influence the acceptance rate. Overwhelmingly, those who refused compensation reported that they could not be bribed.

A graphic illustration of actual rejection of compensation comes from North Dakota. In 1990 three country commissioners in sparsely populated Grants County applied for a non-binding grant to study the possibility of hosting a monitored retrievable storage (MRS) facility for temporarily storing high level radioactive waste. The three commissioners who initiated the

process were all voted out of office in a recall election because they accepted the grant even though they knew it was not binding in any way (Kunreuther, Linnerooth, & Fitzgerald, 1996).

Even if residents in the host community are willing to accept compensation, it may provoke very strong negative reactions and stigmatization because some view it as morally wrong. Elster (1992) suggests that people may view health and safety as inherent rights that should never be traded off for material goods. An illustration of this point is provided by the German city of Bergkamen where concerned citizens were persuaded by the prospective operator to accept a power plant in exchange for money. The German press objected, claiming that this exchange creates incentives for groups to protest a facility under the expectation that they will eventually be bought off by the developer (Kunreuther & Linnerooth, 1982). Since that time direct monetary compensation has not been utilized in Germany in connection with the siting of facilities.

Taiwan offers another example of a negative response to monetary compensation. In this case, villagers forced 23 petro-chemical firms in an industrial park to close in 1988 after an overflow of waste water from the treatment plant polluted nearby streams and adversely affected fishing in the area. The Minister of Economic Affairs responded by offering substantial amounts of monetary compensation to residents of the area who accepted the funds in return for reopening the facilities. This action produced an outcry throughout the country and led the legislature to pass the Pollution Conflicts Resolution Act which explicitly prohibits this kind of individual compensation in the future (D. Shaw, personal communication, May 1995).

4.5 Understanding Stigma

Although stigma has been studied by social psychologists, sociologists, and other social scientists as it applies to people, there is very little empirical research or stigmatization of places,

products, industries, and technologies. It seems obvious that the better we understand the dynamics of these forms of stigmatization, the better we can forecast and manage in any given situation. Given the vulnerability that stigma imposes on our society, a research program on this topic would seem to be warranted.

REFERENCES

Ames, B. (1983). Dietary carcinogens and anticarcinogens. *Science, 221,* 1256-1264.

Bacot, H., Bowen, & Fitzgerald, M. (1994). Managing the solid waste crisis: Exploring the link between citizen attitudes, policy incentives, and siting landfills. *Policy Studies Journal, 22*(2), 229-244.

Brown, W. (1991, January 4). Perrier's market share fizzles in the aftermath of its recall. *Washington Post,* p. F3.

Burns, W. J., Slovic, P., Kasperson, R. E., Kasperson, J. X., Renn, O., & Emani, S. (1993). Incorporating structural models into research on the social amplification of risk: Implications for theory construction and decision making. *Risk Analysis, 13,* 611-623.

Camerer, C., & Kunreuther, H. (1989). Decision processes for low probability events: Policy implications. *Journal of Policy Analysis and Management, 8,* 562-592.

Carnes, S. A., Copenhaver, E. D., Sorensen, J. H., Soderstrom, E. J., Reed, J. H., Bjornstad, D. J., & Peelle, E. (1983). Incentives and nuclear waste siting: Prospects and constraints. *Energy Systems and Policy, 7*(4), 324-351.

Chalmers, J. (1996, January). Risk factors in the appraisal of contaminated property. *The Appraisal Journal,* pp. 44-58.

Damasio, A. R. (1994). Descartes' error: Emotion, reason, and the human brain. New York: Avon.

Dunlap, R. E., & Baxter, R. K. (1988). *Public reaction to siting a high-level nuclear waste repository at Hanford: A survey of local area residents* [for Impact Assessment, Inc.]. Pullman: Washington State University, Social and Economic Sciences Research Center.

Elster, J. (1992). *Local justice: How institutions allocate scarce goods and necessary burdens.* New York: Russell Sage Foundation.

Erikson, K. (1990, January-February). Toxic reckoning: Business faces a new kind of fear. *Harvard Business Review,* pp. 118-126.

Ewing, T. F. (1990, July 8). Guarantees near a landfill. *New York Times.*

Foran, J. A., Goldstein, B. D., Moore, J. A., & Slovic, P. (1996, Winter). Predicting future sources of mass toxic tort litigation. *Risk: Health, Safety & Environment, 7,* 15-22.

Frazer, J. G. (1959). *The new golden bough: A study in magic and religion.* New York: MacMillan (Original work published in 1890).

Freeman, P., & Kunreuther, H. (in press). *Managing environmental risk through insurance.* Washington, DC and Norwood, MA: American Enterprise Institute and Kluwer.

Frey, B. S., Oberholzer-Gee, F., & Eichenbach, R. (1996). The old lady visits your backyard: A tale of morals and markets. *Journal of Political Economy, 104,* 1297-1313.

Graham, J., Green, L., & Roberts, M. (1988). *In search of safety.* Cambridge, MA: Harvard University.

Herzik, E. (1993, July 23). *Nevada statewide telephone poll survey data.* Report presented to Nevada State and Local Government Planning Group, University of Nevada, Reno.

Jenkins-Smith, H., Kunreuther, H., Barke, R., & Easterling, D. (1993). *UNM mitigation/compensation survey.* Albuquerque: University of New Mexico, Institute for Public Policy.

Kasperson, R., Renn, O., Slovic, P., Brown, H., Emel, J., Goble, R., Kasperson, J., & Ratick, S. (1988). The social amplification of risk: A conceptual framework. *Risk Analysis, 8,* 177-187.

Kraus, N., Malmfors, T., & Slovic, P. (1992). Intuitive toxicology: Expert and lay judgments of chemical risks. *Risk Analysis, 12,* 215-232.

Kunreuther, H., & Easterling, D. (1996). The role of compensation in siting hazardous facilities. *Journal of Policy Analysis and Management, 15,* 601-622.

Kunreuther, H., Easterling, D., Desvousges, W., & Slovic, P. (1990). Public attitudes toward siting a high-level nuclear waste repository in Nevada. *Risk Analysis, 10,* 469-484.

Kunreuther, H., Fitzgerald, K., & Aarts, T. D. (1993). Siting noxious facilities: A test of the facility siting credo. *Risk Analysis, 13,* 301-318.

Kunreuther, H., & Linnerooth, J. (1982). *Risk analysis and decision processes: The siting of LEG facilities in four countries.* Berlin, Germany: Springer Verlag.

Kunreuther, H., Linnerooth, J., & Fitzgerald, K. (1996). Siting hazardous facilities: Lessons from Europe and America. In P. Kleindorfer, H. Kunreuther & D. Hong (Eds.), *Energy, environment and the economy: Asian perspectives.* Cheltenham, UK: Edward Elgar.

Lichtenberg, J., & MacLean, D. (1992). Is good news no news? *The Geneva papers on risk and insurance, 17,* 362-365.

March, J., Sproull, L., & Tamuz, M. (1991). Learning from samples of one or fewer. *Organization Science, 2,* 1-13.

Mauss, M. (1972). *A general theory of magic.* New York: Norton (Original work published in 1902).

Mazur, A. (1981). *The dynamics of technical controversy.* Washington, DC: Communications Press.

McClelland, G., Schulze, W., & Hurd, B. (1990). The effect of risk beliefs on property values: A case study of a hazardous waste site. *Risk Analysis, 10*(4), 485-497.

Mitchell, M. L. (1989, October). The impact of external parties on brand-name capital: The 1982 Tylenol poisonings and subsequent cases. *Economic Inquiry, 27,* 601-618.

Mowrer, O. H. (1960a). *Learning theory and behavior.* New York: John Wiley & Sons, Inc.

Mowrer, O. H. (1960b). *Learning theory and the symbolic processes.* New York: John Wiley & Sons, Inc.

Nichols & Zeckhauser, 1980.

Ottoboni, R. (1984). *The dose makes the poison: A plan language guide to toxicology.* Berkeley, CA: Vincente Books.

Pbert, L. A., & Goetsch, V. L. (1988). A multifaceted behavioral intervention for pill-taking avoidance associated with Tylenol poisoning. *J. Behav. Ther. & Exp. Psychiat., 19*(4), 311-315.

Purchase, I. F., H., & Auton, T. (1995). Thresholds in chemical carcinogenesis. *Regulatory Toxicology and Pharmacology, 22,* 199-205.

Purchase, I. F., H., & Slovic, P. (1996, November). *Risk assessment breeds fear* [Report No. 96-11]. Eugene, OR: Decision Research.

Reuters Library Report. (1990, May 10). Perrier puts cost of Benzene scare at 79 million dollars.

Rosen, J. D. (1990). Much ado about Alar. *Issues in Science and Technology, 7*(1), 85-90.

Rozin, P., Millman, L., & Nemeroff, C. (1986). Operation of the laws of sympathetic magic in disgust and other domains. *Journal of Personality and Social Psychology, 50,* 703-712.

Slovic, P. (1987). Perception of risk. *Science, 236,* 280-285.

Slovic, P. (1993). Perceived risk, trust, and democracy: A systems perspective. *Risk Analysis, 13,* 675-682.

Slovic, P. (in press). Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. In M. Bazerman, D. Messick, A. Tenbrunsel & K. Wade-Benzoni (Eds.), *Psychological perspectives to environment and ethics in management.* San Francisco: Jossey-Bass.

Slovic, P., Layman, M., Kraus, N., Flynn, J., Chalmers, J., & Gesell, G. (1991). Perceived risk, stigma, and potential economic impacts of a high-level nuclear waste repository in Nevada. *Risk Analysis, 11,* 683-696.

Viscusi, W. K. (1991). *Reforming products liability.* Cambridge, MA: Harvard University Press.

Weinstein, N. D. (1988). *Attitudes of the public and the department of environmental protection toward environmental hazards* [Final report]. New Jersey Department of Environmental Protection.

APPENDIX

This Appendix presents a more formal model which measures how stigma affects the value of property. The model consists of two periods: Period 1 is the present and Period 2 is the future. This enables us to consider the impact that a decision to buy property today will have on concerns that the citizen will have in period 2 should he wish to sell his property

Nature of Risk. The risk can be viewed from the perspective of the experts and the general public.

Experts: There is considerable uncertainty associated with the risk. For simplicity we assume that the consequences from a given event are well specified as L but that experts disagree on the chance of its occurrence.[6] The best estimate of the probability based on all the scientists estimates is p but there are some experts who believe the probability to be $p^* > p$.

Public: Laypersons affected by the risk believe the probability of a given event to be p^* but also perceive the losses from an accident (L^*) to be greater than the experts (i.e. $L^* > L$). A property owner considers the potential decrease in property value due to the perceived risk associated with negative events that could occur the area in which the property is located. Define C to be this decrease in property value from the perceived risk where $C = f(p^*, L^*)$.

Notation:

B_1= buying price of the property in period 1 based on the experts view of the risk associated with living in the community

S_2 =selling price in period 2 based on the public's perception of the risk associated with the facility.

Assume that if the public perceived the chances of an accident to be p then $S_2 = B_1$. Since perceived risk is based on p^* then $C = B_1 - S_2 > 0$ which represents the cost attributable to stigma, that is the decrease in property value between buying and selling the property.

Determining the Value of C

In analytic terms we can determine C as follows:

Step 1. Compute the utility of purchasing a piece of property in a particular community in period 1 as $U_1 (V, F_1)$ where V= the value of the property to the owner and F_1 = the consequences associated with the property from the experts perspective due to external forces. Then $B_1 = U_1 (V, F_1)$. More specifically $F_1 = 0$ if there is no accident to the facility an event with probability (1-p) and $F_1 = L$ with probability p.

---

6 L is measured in terms of loss of lives, injuries, diseases with associated costs .

Step 2. Compute the utility of selling a piece of property in a particular community in period 2 as $U_2(V, F_2)$ where V= the value of the property to the owner and F_2= the consequences associated with the property from the public's perspective due to external forces . Then $S_2 \doteq U_2(V, F_2)$. Note that F_2= 0 if there is no accident to the facility an event with probability (1-p*) and $F_2 = L^*$ with probability p*.

Step 3 Compute the value of C. If we assume that the value of the property remains the same in periods 1 and 2 should there not be a negative event. so that $U_1(V,0) = U_2(V,0) = U(V,0)$, then

$$C = B_1 - S_2 = U_1(V, F_1) - U_2(V, F_2) = (p^* - p)U(V,0) + pU_1(V,L) - p^*U_2(V, L^*) > 0 \quad (1)$$

Equation (1) can also be written as

$$C = p^* [U(V,0) - U_2(V, L^*)] - p [U(V,0) - U_1(V,L)] \quad (2)$$

Equation (2) suggests that there are two complementary ways of reducing the stigma associated with purchasing a facility:

- Reduce the perceived probability of an accident (p*)
- Reduce the perceived consequences of the event on the piece of property (L*)

An Illustrative Example

Let $U(V,0) = 100$
$U_1(V,L)] = 30$
$U_2(V, L^*)] = 10$
$p = .1 \quad p^* = .25$

From these data $B_1 = .9\ (100) - .1\ (10) = 89$
$S_1 = .75\ (100) - .25\ (30) = 67.5$
$C = 22.5$