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Economic, Political, and Social Effects of
Man-Induced Environmental Disasters

by

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Environmental mishaps are not uncommon. But the negative consequences of them can be great; consider such recent disasters as Chernobyl, the Exxon Valdez, and Hurricane Andrew. In such cases, the story is all over the news. However, the media tend to cover stories while they are fresh, and often fail to look back later to analyze the long-term consequences. Long-term studies are crucial, especially when the environmental "disaster" was not a natural disaster, but rather a man-induced one. If people know the magnitude of the problems their actions may cause--problems that may not fade away with time--there is a much greater probability that they will find ways to proceed differently in the future.

There is no doubt that detrimental effects on the health and environment remain long after an environmental disaster has occurred, and that many such effects may never even be known. I propose that man-induced environmental disasters also leave long-lasting negative economic, political, and social impacts.

To research this, I have chosen three such cases and studied the impacts they have had that are still felt in 1993. The first case is Three Mile Island, which involved the release of radiation, and subsequent action by the NRC. The second case is Times Beach, which involved the uncertain biological effects of dioxin, and policies of the EPA. The third is Love Canal, which involved the dumping of chemical wastes in unregulated dumpsites, and action by authorities at all three levels of government. The cases are similar in that they are

not natural disasters; they were all environmental problems in or near populated towns, and they all occurred around the same time period (10-14 years ago).

TIMES BEACH

Times Beach, Missouri, was located on the floodplain of the Meramec River near St. Louis. Through the 1970s, Russell Bliss sprayed waste oil laced with dioxin on the roads, stables, parking lots, and farms to control the dust problem in Times Beach, as well as in other towns in Missouri. The waste oil was originally produced in the early 1970s by Northeastern Pharmaceutical and Chemical Co. (NEPACCO), owned by Syntex Agribusiness Inc. Independent Petrochemical Corporation (IPC) was hired to dispose of the wastes, and they in turn hired Russell Bliss to use it as dust suppressant. In late 1982, when the Environmental Protection Agency learned of the spraying done in Times Beach, they began conducting studies of the soil, which revealed levels of dioxin hundreds of times above allowable limits. At the same time, the Meramec River flooded, and there was fear that the flood water had spread the dioxin contamination throughout the town. At the time, the EPA regarded dioxin as "the most toxic man-made chemical"(Thomson, 11A). Out of fear of dioxin-induced health effects, the federal government recommended evacuation of Times Beach and purchased the town

for \$33.7 million (Adler-Stacy, 100), making Times Beach the "first town...bought out by the government because of chemical poisoning"("Making sense of a tangled tale", 3). Over 2,000 residents evacuated (Allen, 3A).

Since the evacuation, the government has spent more than \$400 million studying the health threat caused by dioxin (Uhlenbrock, 1D). The results have led many scientists, including Dr. Vernon Houk of the federal Centers for Disease Control, who recommended the evacuation in the first place, to reverse their former opinions on the toxicity of dioxin. Opponents argue that these studies examine only cancer, which is not the only dangerous effect of dioxin. Reproductive, developmental, and immune system problems can also result from dioxin, "no matter how low the exposure"(Magner, 1A). The debate is the center of a large controversy, with the possible victims of chemical exposure being among the many concerned with the result. Since dioxin is a byproduct of paper bleaching, chemical manufacturing, and waste incinerating, "large segments of the American private sector are affected"(Uhlenbrock, 1D), and often join in the debate.

Until 1992, Times Beach had been held in trust by former Mayor Leistner. To get more control over clean-up, the trust was acquired by the state as part of an agreement with the EPA. All the buildings were demolished, as plans went underway for a temporary incinerator to be built, with a levee for flooding. The incinerator will burn dioxin-laced soil from Times Beach

and other areas of Missouri, and the waste from the incinerator will be buried in a landfill in Times Beach (Kemezis-Paul, 5). Within ten years, the incinerator will be disassembled, and a park will be constructed on the land.

Economic Impacts

Economically, the incident affected many, although the greatest impact seems to have been outside the local community. Times Beach was a small, economically depressed town of 2,242 before the dioxin contamination happened, so the surrounding areas were not dependent on business from its residents. Also, because of the occasional flooding, evacuations had been dealt with before. However, the stigma and fear factor surrounding Times Beach, along with the incinerator, have affected the surrounding areas economically to some extent, primarily by lowering property values. Before the Times Beach homes were demolished, they were "a blot on the surrounding communities" (Scales, 3D), and the "planned incinerator has already depressed property values in the area"(Bertelson, 1991). Even so, the long-term economic impact has been greatest on those who must now clean up their dumpsites.

The clean-up of Times Beach is a big job, and the buy-out, court costs, settlements, and dioxin research only add to the overall price of the incident. It is estimated that when the cleanup is completed in 2000, about \$200 million dollars of

state, federal, and private money will have been spent (Koenig, 1A). The incinerator alone will cost about \$80 million, and in order to put it into operation the town had to be razed and a landfill for the incinerator waste had to be constructed, making it about a \$200 million, 10-year project (Kemezis-Paul, 5). With help from the EPA, Syntex Corp. is paying for the cleanup, including the incinerator and landfill, and since it was ruled in 1991 that cleanup costs are "damages", insurance companies can be forced to help with the payment (Poor, 7A).

The cost of the government buyout has risen since the 1983 estimate of \$33 million ("Hindsight on Dioxin", 1991). The other costs borne by the government rest mainly with the EPA, including dioxin research costs and court costs. The decisions by the EPA regarding acceptable levels of dioxin will be the factor determining the overall cost to industries with dioxin as a byproduct.

Political Impacts

Especially due to the questionable toxicity of dioxin, Times Beach was and still is a very "political" incident. Liability had to be determined, court cases abounded, and the EPA was put in a position where it must play politics.

Even before the dioxin dispute, it was suspected that people's fears "were fanned" by the media, leading to an evacuation "based on politics, not science" (Wolfe, 1991).

Although many felt at the time that the extreme way the problem was handled was overkill, "politicians had no readily justifiable way to do anything less"("Reassessing Danger", 1991). When it comes to public health, especially after a highly publicized incident such as Times Beach, it is better to be safe than sorry.

However, now that government studies are showing dioxin to be less of a cancer risk than was thought at the time of the evacuation, there are accusations of "yet another apparent government about-face"(Thomson, 11A), and the EPA is caught right in the middle. In 1983, the Environmental Defense Fund filed suit against the EPA "for failing to act swiftly in the cleanup of dioxin sites"(Uhlenbrock, 1D), yet now the EPA could face legal suits for making evacuation decisions that were 'arbitrary and capricious' if they change their stance on dioxin. Because of this, and the fact that much tax money has already been spent, it is not likely that the EPA will ever change its stance. However, the pressure from government and especially from industry is overwhelming. Industry, especially the paper industry, is pushing hard for the EPA to report that dioxin has been found to be less harmful and to set less stringent restrictions. This way they can "avoid costly pollution regulations and liability for past discharges"(Magner, 1A). The government is receptive because of its liability concerning the herbicide Agent Orange, which was used in Vietnam and also contains dioxin.

The uncertainty surrounding the effects of dioxin also interrupted the ability of the district court to decide dioxin cases. Although the courts were able to determine liability for cleanup with Syntex Corp. and insurance companies, the system was not designed to determine the true dangers of a particular chemical. After the evacuation, "381 former residents of Times Beach and other areas charged that the companies had been negligent in handling dioxin"(Allen, 3A), and that the contamination led to health and personal problems. Companies usually agreed to settlements in order to avoid the more expensive court costs. However, in 1988, "after other plaintiffs got \$19 million in an out-of-court settlement, a...jury denied damages to 10 former Times Beach residents"(Wolfe, 1991) due to the jury's belief that the residents simply were not harmed by the dioxin.

Other political friction has been caused by the incinerator plan at Times Beach. Area residents are distrustful of whether the incinerator will truly be only temporary (Kemezis-Paul, 5). Also, many feel that digging up the soil and burning it will be more dangerous than leaving it, because of exposure to exhaust air. In 1990, St. Louis County opposed the incinerator plan in a non-binding referendum (Cohen, 1991), but the area residents' input has been all but ignored. The EPA is again involved in the dispute, being questioned on the logic of its decision to locate the incinerator at Times Beach. Times Beach is located on a floodplain near a populated area,

which would not normally be an acceptable site for an incinerator and landfill. The EPA insists on the site because "it is the only site [the EPA] owns that is large enough for the staging areas"(Bogosian, 1991).

Repeated examples have been found of "government apathy and corporate deception"("Making sense of a tangled tale", 3), causing disillusionment with public leaders. However, even if it is true that "most everyone who lived in Times Beach left with a mistrust of government and a sense of betrayal"(Brandon, 1991), there is a positive political aspect of the Times Beach legacy. It has sparked the need for tighter hazardous waste regulations, and has kept the controversy in the public eye.

Social Impacts

Even more painful and long-term than financial impacts which the Times Beach contamination caused the residents and surrounding communities, are the social impacts. The mistakes at Times beach have cost "countless hours in court, the end of Times Beach as a community and an understandable concern by nearby residents...that any cleanup that includes burning could only compound the danger" ("Finally, Cleanup In Times Beach", 1991). The confusion surrounding the true health threat of dioxin mixes emotions and adds stress to an already difficult situation.

After being evacuated, the former Times Beach residents had to start over in new communities, many with financial difficulties caused by the move. Because of the forced move, some former residents faced months of temporary housing before settling in nearby towns (Bertelson, 1991), going into debt to purchase a new home, and facing the difficulty of leaving all possibly contaminated belongings behind and starting from scratch ("Cleanup comes, but 'It'll never be over'", 1991). Acceptance in the new communities did not come easy. Former Times Beach residents felt that they were ostracized, because "everybody else considered them contaminated" ("Times Beach Haunts Former Residents," 1991). They would be called "Martians", dry cleaners would sometimes refuse to clean their clothes, and the children would be "the butt of jokes at school" (Leistner, 1991).

Studies of the effects on residents conducted by Elizabeth Smith, an associate professor of psychiatry at Washington University's School of Medicine, reveal that almost 90 percent of the former Times Beach residents feel that their families have suffered greatly, and only one fourth feel they have been able to recover. The harms they feel were inflicted on them include "depression, anxiety, sleeping problems and increased alcohol abuse" (Brandon, 1991).

The ongoing dioxin dispute makes it all the more difficult for the former residents to put Times Beach behind them. They will forever wonder if dioxin was the cause of their health

problems, and fear that it will cause health problems in the future. The state's preliminary findings that dioxin may be safer than originally thought and the fact that the Times Beach evacuation may not have been necessary are not comforting to former residents, leaving them with mixed emotions. Many people "saw too many mysterious tragedies" ("Cleanup comes, but "It'll never be over'", 1991) to believe that the studies are accurate, and feel that the studies did not include enough people. The findings anger residents who would have loved to remain in Times Beach. They feel they were done wrong and could still live there.

The incinerator also has impacted the community socially. The surrounding communities do not want an incinerator near them for fear of dangerous health effects that may be caused by potential chemical exposure. Some former residents object to it because they do not feel the town should be destroyed. They argue that the town should be left the way it is, "in all its shame" ("People journey to Times Beach for last goodbyes", 1991), because of the mistake it stands for. Others feel that the sooner it is cleaned up and put to some good use, the sooner they can put the whole thing behind them.

LOVE CANAL

In 1953, Hooker Chemical and Plastics Corp. sold a property in Niagara Falls, New York, which included the Love Canal, to

the Niagara Falls Board of Education. The corporation had purchased the Love Canal, which originally was dug for transportation and hydroelectric power generation, to use as a dumpsite for the nearly 22,000 tons of chemical and toxic wastes produced by its Niagara Falls plants (Silverman, 836). As housing development grew around the Love Canal, the school board wanted that land to build a grammar school. So, Hooker Chemical sold them the land for one dollar. Once the property was acquired by the school board, a grammar school was built on the site, and many homes began to go up in the area.

The neighborhood's environmental problems began to be severe in the summer of 1976, when the buried chemicals began to surface. According to the New York State Department of Health, for a number of years "[there] were persistent reports...of chemicals breaking through the top soil, spontaneous fires, and injuries to children and pets"(Silverman, 838). After years of such complaints, chemical tests, and area studies, the State Health Commissioner declared a state of emergency on August 2, 1978. On August 7, President Carter declared a federal state of emergency, the "first ever in the case of a man-made environmental disaster"(Silverman, 838). On August 9, the state agreed to buy the 239 homes closest to the dump (those homes within "Rings 1 and 2"). In February of 1979, all pregnant women and children under the age of two were told to relocate (Gibbs, 30). Those residents in the area who had not been relocated complained and protested until finally, in

May of 1980, President Carter declared a second state of emergency, relocating 728 more residents (from Ring "3").

Since then, the homes from Rings 1 and 2 have been demolished and buried, and the dumpsite has been contained. A habitability study done in 1988 by the Technical Review Committee (which includes members from the EPA, DHHS, DEC, and DOH) has determined most of the area to now be habitable, with the uninhabitable areas safe for commercial or industrial use ("Love Canal EDA Habitability," 1988). The Love Canal Area Revitalization Agency (LCARA), whose purpose is to restore the community by repairing and selling habitable homes in the Love Canal area, has begun to fix up the habitable parts of the area, and is reselling many of the homes the state had bought during the relocations.

Economic Impacts

Of the many financial aspects which emerge from this case, two stand out as the most monumental and long-term. The first is the value of the homes bought by the state, and the second is the liability regarding payment for the clean-up of the landfill.

At the time of the relocation, the homes in the area were worth around \$50,000 (Brown, 28). The Love Canal was a depressed area to begin with, so even though the residents were given a fair price for their homes, it was not enough money "to buy

comparable houses elsewhere"(Brown, 28). Because of this, most of the residents "spent the money buying or building new houses in the area"(Brown, 28). Property values affected people's decisions to leave. Many left "because of concerns they'd never be able to sell their houses and not because of any health concerns"(Burch, 8A).

The Love Canal Area Revitalization Agency(LCARA) had trouble at first finding a source of mortgages. According to Leonard Rinallo, a realtor from the LCARA, the problem was that "the banks can't redline...but they can sit on an application forever"(Klinkenborg-Verlyn, 73). By August, 1990, though, LCARA had nine Love Canal homes repaired and up for sale. The section being sold is called Black Creek Village, and "the actual dump is located 150 yds. from the nearest house"(Burch, 1A).

The homes are sold at 15-20% less than local market prices (Klinkenborg-Verlyn, 74), ranging from \$48,000 to \$81,000 (Burch, 1A). For example, 1071 98th St. (Ring 3), which is a small 1,026 square foot ranch, sold for \$48,000, including the LCARA renovations--paint, outside doors, insulation, and a driveway. 1076 98th St. is a 1,144 square foot ranch on a corner lot, with a breezeway, two bedrooms, one bath, a fireplace, a patio, and a barbecue pit. It sold for \$60,000 (Klinkenborg-Verlyn, 72). Although old residents think the prices are too high (Burch, 8A), finding buyers has not been a problem, mainly due to the attractive price range of the homes. In fact, the homes are

in high demand. "Some 260 prospective home buyers are bidding for the right to move into the neighborhood"(Burch, 1A).

Technically, liability for the clean-up seems complicated. The contract between Hooker and the Board of Education (1953) included a clause informing the Board of the dumpsite and releasing Hooker from any liability in the future. In 1960, the Board of Education deeded the northern third of the property to the city of Niagara Falls, with another annulment of liability (Klinkenborg-Verlyn, 74). In 1962, the Board of Education sold the southern third of the property to the state for development, which eventually included the LaSalle Expressway. By the time the chemical problems began to occur, Hooker Chemical Corp. had ceased to exist, and any legal battles would be with Occidental Corp., its successor (having purchased Hooker Chemical in 198).

Two important legal decisions were made regarding liability. The first was in 1988, when the district court ruled that Occidental Corp. was liable for the chemical leaking in the Love Canal, regardless of the clause in its deed releasing itself from liability. Although Occidental informed the school district that the dump was there, it did not provide adequate warning about the dangers. School officials would have no way of realizing the dangers of a waste dump, especially at the time. It is not surprising that they would ignore the warning, "like we ignore so many warnings"(Silverman, 837).

A decision in this case would have been much more difficult if it were not for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as "Superfund," which was passed in 1980. This helped to establish liability on the part of Occidental Corp., and forced them to pay for proper cleanup of their old waste dump. Occidental had argued that since CERCLA did not exist at the time the "crime" was committed, they were not being given due process. However, the district court ruled that the whole purpose of CERCLA was to be retroactive in order to correct past disposal mistakes; therefore, an argument of due process would not be applicable to the case.

The other key liability decision was when the district court found Occidental Corp. liable for creating a public nuisance (Silverman, 848). The court said Occidental did know that the toxic waste site was dangerous, and as the area became more developed, it became nervous and wanted to get rid of it. Occidental purposely "persuaded the Board of Education to take three times as much of the site as it needed for a new school on 99th Street"(Silverman, 837) in order to release itself from liability. If Occidental Corp. had not sold the property, the Love Canal may not have happened, since private corporations have a "powerful economic incentive to act responsibly"(Stroup, 33) that public officials, such as the school board and the state, lack. Therefore, the court found that Occidental's

defense that it released itself from liability by selling the property with a disclaimer was without merit (Silverman, 848).

Political Impacts

The level of involvement by the people in the community, especially residents like Lois Gibbs, makes it difficult to distinguish many political aspects from social ones. The social mobilization and grass-roots activism were the reasons for most of the political changes which came about from the Love Canal incident. However, for the purpose of distinguishing between the political and social aspects, I will not expand on the grass-roots activism in this section. The focus here is on the timing of the incident with regard to the environmental movement as a whole, and the resulting legislation which changed the outlook of, and the future for, the entire country concerning hazardous waste storage and clean-up.

Until Love Canal, the environmental movement had focused on air and water pollution. Also, there was a need for a 'rekindling of the fire' to get the movement going again, since before Love Canal most of the battles fought were legal battles that most people were uninterested in (Silverman, 836). The Love Canal brought the hazardous waste disposal problem to the attention of the country, and also provided the spark that was needed by the environmental movement. Everyone was involved, because they realized that they could have dangerous materials

in their own back yard that they are unaware of, just as the residents of Love Canal did. It was a national problem, and it could happen to anyone.

The severity, and most likely the publicity, of the problem led to the creation, on the federal level, of CERCLA, "a landmark piece of environmental legislation"(Silverman, 835). The fund was created for the purpose of cleaning up "abandoned chemical dumps and toxic chemical spills"(Zuesse, 33) all over the country, and establishing liability to help finance the clean-ups.

Until Love Canal, air and water had been the focus of environmental disputes, and land was left alone. According to Thomas C. Jorling, commissioner of the New York State Department of Environmental Conservation, this disparity was because air and water are considered public property, while land is considered private property. Therefore, "it wasn't until there was some pretty demonstrable evidence that abuses on the land were also causing some problems off-site that there was any rationale for government to intervene on it, and Love Canal provided that in spades"(Silverman, 835).

The state of New York also created its own plan to conquer the waste disposal problem. Since the Love Canal incident, New York has passed a series of laws to help the state get sites cleaned up and to establish liability. The state Department of Environmental Conservation has come up with a plan to find sites that need to be cleaned up, oversee the cleanup, and

monitor the sites after the cleanup is completed. State laws have been passed that provide greater funding and staff for site cleanups. Also, the state allocated \$1.2 billion through the Environmental Quality Bond Act, to assist in clean-up costs (Kadlecek, 3). Before the problems at Love Canal, "neither New York nor any other state had staff or funding for site cleanup"(Kadlecek, 3).

The handling of the situation by administrators at all three levels of government caused confusion and mistrust of the government by the residents of Love Canal. Not only did the residents question the motives of the public officials, but also their wisdom, since they did not seem to have any answers. Officials either "denied problems existed or pointed with alarm and then offered no help or advice"(Levine, 22). They lacked any real plans; when people would loudly voice complaints, the response was typically impulsive and disorganized. This led to distrust and criticism of the government by the residents (Levine, 23).

Also, it was suspected that some government officials may not have been quite as solicitous in their actions had it not been an election year, with election day approaching. "Most observers agree it was no coincidence"(Silverman, 840) that Governor Carey announced the state buyout of homes in August of 1978, just before the gubernatorial election, and President Carter announced the second federal emergency and home buyout in May of 1980, while campaigning for the November Presidential

election (Silverman, 840). Such accusations stem from the uncertainty in the scientific community about the dangers of the dumpsite to the community. Scientific studies did not confirm that an evacuation from Ring 3 was necessary, so many feel that the second evacuation "was based on emotion and not scientific fact"(Burch, 8A). Even Lois Gibbs, who with her Love Canal Homeowner's Association (LCHA), fought for the second evacuation, "admits that 'it's not a scientific fight, it's a political fight'"(Silverman, 840).

Social Impacts

The local social impact Love Canal had was immeasurable. The 2,500 residents (Burch, 8A) who were evacuated from their homes had their lives suddenly disrupted, and had to deal with the financial difficulties of finding and starting over in a new home. Those who decided to remain in their homes despite the warnings, were suddenly left with few neighbors, and an unkempt, boarded-up neighborhood with a negative stigma. All residents faced the mental frustrations of not knowing if health problems were related to exposure to the chemicals and whether or not there would be related health problems in the future. Numerous health studies were done, and reports showed conflicting evidence, adding to the confusion. The "lack of coordination in the early years and poor communication among scientists and with the people affected...created fear, anxiety, and mistrust

among Love Canal residents that cannot be overstated"(Silverman, 842).

This fear led most residents to evacuate the area when it was labeled an emergency declaration area. However, about 150 residents remained, in 72 of the homes in the area. In fact, 40 families are still in areas declared uninhabitable by the 1988 habitability study (Silverman, 846). Some remained simply because the prices in other areas were too high for them to afford. However, others remain because they do not feel there is a health risk, especially since the dump has been cleaned up properly. After all that has happened, they know what is in their backyards, whereas if they moved elsewhere they could not be so sure. With all the health studies and monitoring, one resident claims that "in time, this is going to be one of the safest areas in the U.S. to live in"(846).

Through all the uncertainty, confusion, and frustration, the community ended up making history. The social mobilization spurred by the Love Canal has been "one of the most successful, single-purpose grass-roots efforts of our time"(Gibbs, xv), and has influenced national policy. Lois Gibbs headed the efforts, creating the Love Canal Homeowner's Association. If it were not for the LCHA's pressures on the government, Love Canal residents who wanted permanent relocation may not have gotten it. Even today, the LCHA is active and publishes a newsletter. In 1981 Lois Gibbs founded Clearinghouse, which helps assist other communities which are taking charge of their

hazardous waste dumpsite problems. Clearinghouse also helps by publishing pamphlets on the subject, as well as the journal Everyone's Backyard (Gibbs, 173).

THREE MILE ISLAND

Three Mile Island is located in the middle of the Susquehanna River in central Pennsylvania. Two nuclear power reactors owned by a subsidiary of General Public Utilities (GPU) are located on the island, and on March 28, 1979, Unit Two experienced "the worst reactor accident in the history of the U.S. commercial nuclear energy program"(Campbell, 652). The accident was a result of both technical reactor failure and operator error.

The extent of radiation exposure was and remains unknown. However, due to the possibility of serious danger, the Governor of Pennsylvania ordered the evacuation of pregnant women and children within 5 miles of the reactor in 1979, and 200,000 people then evacuated ("Lust for power," 471). Ten days later, he announced that the danger of a possible meltdown had passed, and those who had evacuated were safe to return (Houts, Cleary & Hu, x).

Cleanup of the TMI-2 reactor was difficult and slow. Since there was no established plan to follow, the procedures were experimental. The contaminated debris from the reactor was placed

in canisters and sent to Idaho to be researched and stored at a U.S. Department of Energy facility ("TMI-2 story," 7).

Now that more is known about the accident, it seems that the it could have been much more serious than any officials admitted at the time. Part of the core had been exposed, and it was lucky that the problem was contained before more of the core melted. Also, since two days went by before GPU officials told the public or the government what they knew ("Lust for power," 471), the most serious danger had already passed by the time the Governor ordered the evacuation (471).

Economic Impacts

The accident at Three Mile Island had an enormous economic impact on the nuclear industry. Since the accident, "Wall Street lowered the bond ratings on nuclear utilities" (Campbell, 653), which is bad for plant construction. The increased regulatory requirements imposed on the nuclear industry by the Nuclear Regulatory Commission (NRC) have also led to greatly increased construction and operation costs. The effects of such strict regulations together with the "poor economics [and] bad publicity...in the wake of TMI"(Stephens, 230) led to the cancellation of 47 nuclear plants ordered since 1977, and the absence of any orders for new plants (Shulman-Seth, 190).

The cost of the cleanup of TMI-2 is nearing one billion dollars, which is ironic since it cost \$700 million to build

(Shulman-Seth, 190). The cleanup is being funded by many different sectors. About one third of the cost is coming from GPU and its customers, one third from the states of Pennsylvania and New Jersey, and one third from the U.S. nuclear industry, with contributions from the U.S. DOE and the Japanese electric/utility industry for related research and development ("TMI-2 Story", 4).

For people in the area, there have not been any significant long-term economic impacts, which is partly due to the fact that no physical damage to the area was caused by the accident (Houts, Cleary & Hu, 44). Although there were "school and business closings in the area"(Goldsteen, 389) at the time of the accident, there have been no long-term business or real estate problems. Electricity rates did go up, but they are not higher than those of other utilities in the state (Houts, Cleary & Hu, 45). There has been no change in real estate values (45). In fact, according to the Greater Harrisburg Board of Realtors TMI Impact Study Committee, the real estate market in 1979 within the 20-mile radius of Three Mile Island "held up better than did the national market as a whole"(Shearer, 12).

Three Mile Island also affected the way the nuclear industry operated as a whole. The accident "compromised the legitimacy of the nuclear sector and the U.S. Nuclear Regulatory Commission (NRC), and exposed serious weaknesses in the government's and the industry's capacities for maintaining the economic and

political stability that nuclear corporations felt was necessary for their sector's survival"(Campbell, 652). Because of this, nuclear corporations began to form associations and other collective organizations. For example, the Electric Power Research Institute established two organizations after the accident. The first, called the Nuclear Safety Analysis Center, was formed within weeks of the accident; the second, called the Institute on Nuclear Power Operations, was formed later that year (Shulman-Seth, 190). Then in 1982, GPU created the GPU Nuclear Corporation, which is the licensed operator of Three Mile Island. It provides oversight of nuclear power generation, and prepares information for the public ("TMI-2 Story," 10).

Political Impacts

The accident at Three Mile Island brought to the attention of the country the need for stricter regulation of the nuclear industry. By 1981, 43 lawsuits were pending against the NRC "trying to get either specific regulatory policies or the policy-making changed"(Campbell, 652). By 1989, more than 2,000 lawsuits were pending (Shulman-Seth, 190).

In response to the accident, the NRC issued "hundreds of new safety regulations"(Worsnop, 121). It increased the number of personnel and the amount of training required. It mandated "extensive back-fitting of equipment"(121), and devised emergency evacuation plans with state and local authorities (Wilson-Kinsey,

40). The changes in regulatory requirements was "so great after the accident...that specialists in nuclear economics now distinguish as a matter of course between pre-TMI and post-TMI generating costs"(121).

Three Mile Island is another case of government action resulting in mistrust and anger by the public. It has been only recently that the Department of Energy "conceded that the accident at TMI was far more serious than the government or GPU originally reported"("Lust for power," 471). Also, the public became aware of the lack of planning and regulation by the government regarding a very dangerous issue. The U.S. does not even have a repository for storing high-level commercial nuclear waste or a comprehensive emergency evacuation plan, yet many plants are in operation (Wilson-Kinsey, 40).

Social Impacts

The effect that Three Mile Island has had on the public can not be overestimated. In fact, "most agree that the incident's greatest legacy is a sustained level of lingering public fear and opposition to nuclear power in the United States"(Shulman-Seth, 190), which has negatively affected the industry's attempt to survive. According to Rankin, Nealey, and Melber public opinion polls, within months after the Three Mile Island accident public opposition to nuclear power exceeded support for the first time ever (Campbell, 652). Opposition

was so strong that anti-nuclear groups formed around the country and staged "major demonstrations and rallies...protesting nuclear power"(652). Advocates of nuclear power feel that since it is so much safer now with the strict regulations, all that is left to do to get the industry going again is to convince the skeptical public. However, "that is likely to require a world-class job of persuasion"(Worsnop, 116).

The health effects caused by the accident are uncertain. Most health studies that were done reveal no related physical health problems. Other studies, however, show conflicting results, although a reason for higher statistics regarding health problems may be that the residents are much more likely to report them (Houts, 384). Studies do show adverse mental effects, though. Especially in the first year, problems have been stress and depression, and many residents have problems with hypochondria (Denton, 8).

CONCLUSIONS

Before my study, I had proposed that man-induced environmental disasters would have long-term detrimental effects that are not only environmental, but also economic, political, and social. All three cases demonstrated this, in varying degrees due to the different circumstances surrounding each case.

Economically, I found the long-term impact from all three

cases to be the greatest on industry. The Three Mile Island accident led to so many costly restrictions and regulations on the nuclear industry, that the future of nuclear power is now questionable. The Love Canal resulted in the implementation of CERCLA, forcing added costs on industries to have facilities for proper disposal of their hazardous wastes, as well as to clean up their past waste dumps. Times Beach also forced industries to be liable for the disposal of their hazardous wastes.

I found that locally, none of the three cases resulted in long-term economic problems to the extent that I had expected. Local businesses, property values, and individual residents seem to have been affected, if at all, at the time of the incident more than in the long-run. Also, since man-induced disasters do not physically damage areas like natural disasters do, the economic hardships are not as devastating (at least so far).

Local businesses were affected most in Times Beach, due to the entire town shutting down. However, the town had a population of under 3,000 people to begin with, so any long-term impact on businesses is minimal. Perhaps in a larger town, such a shut-down would be much more detrimental to businesses in the area. Also, due to the economic hardships associated with forced relocation, many residents of both Times Beach and Love Canal relocated within the same general area, keeping the effect on businesses in the area to a minimum. Again, the impact

may have been greater if circumstances were different, and residents could afford to go elsewhere. With no permanent relocation involved, as was the case at Three Mile Island, it seems any effect on local businesses is only short-term.

I found adverse effects on property values to be very dependent on particular circumstances. The most influential factor seems to be whether or not the government forced relocation and bought out the property. This leads to bad publicity, fear of personal contamination, and property deterioration, all of which negatively affect property values. However, in Love Canal the low prices are attracting people back to the area, regardless of the past. At Three Mile Island, where there was no government buy-out, long-term property values were not affected.

The two government buy-out cases I studied were in depressed areas to begin with. This may be a reason why there was not more of an economic impact on businesses and property values; however, it may also be a reason why there was so great of an economic impact on individual residents. With a government buy-out, residents may feel they have received less than what their home is really worth; they may not move, regardless of the health risks, simply because the government money is not enough to begin a new life elsewhere; they may make sacrifices in order to survive financially elsewhere, with the possibility that their home may be resold in the future, and ironically they may not be able to afford to buy it back.

The political impact from these cases is enormous. The most obvious long-term impacts are the resulting government restrictions, such as CERCLA legislation and new NRC requirements. The government is also involved in years of litigation, cleanup programs, and financial involvement.

A political impact that is not so obvious, which I observed in studying the three cases, is the mistrust of government by the people, especially regarding the environment. Although the government in these cases may have done the best it could under the circumstances, residents were understandably frustrated and confused by their treatment.

The confusion and uncertainty resulting from ad hoc government policy and the scientific community seem to be the root of the long-term social impacts of man-induced environmental disasters. No amount of time can fade the impact on individuals regarding health problems that may or may not have occurred regardless of the disasters, or health problems that may or may not exist inside their bodies and will only be discovered some time in the future.

Another important social impact to note is the social mobilization and increased public involvement that has come about due to disasters such as the ones studied here. In all three cases, environmental issues were brought to the attention of the public, and it was the uprising of the public that got things changed.

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