

MASTER

THE EFFECTS ON RESIDENTIAL PROPERTY VALUES OF PROXIMITY TO A SITE
CONTAMINATED WITH RADIOACTIVE WASTE

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ABSTRACT

An issue often raised by the public regarding projects that involve hazardous chemical or radioactive waste sites is whether distance from these sites affects residential property values. Previous research has studied changes in the housing market in communities near Three Mile Island after the 1979 accident and legal precedents of compensation for loss of property value because of proximity to "hazardous areas". However, this research has not addressed effects on residential property values of proximity specifically to hazardous chemical or radioactive waste sites. The effects of the proximity of residences to such a site in West Chicago, Illinois--used for many years for disposal of thorium waste from processing ores--were investigated in this study. Single-family residence sales located within about 0.4 km of the West Chicago site were compared with residence sales located between 0.4 km and 1.6 km from the site. Trends in average annual selling prices were analyzed both before and after publicity appeared about the existence of the radioactive material at the site. Results indicate that older residences (built before 1950) located within about 0.4 km of the disposal site experienced a prolonged depression in selling prices after the publicity, in comparison with older residences located farther from the site and with all transactions on newer residences. These results confirm to some extent public perceptions and potentially raise legal issues associated with property values. Suggestions are provided for mitigative measures to alleviate these issues.

INTRODUCTION AND BACKGROUND

Controversy among the general public, the scientific community, and all levels of government has existed for many years regarding the safety of radioactive and other hazardous waste management practices. As a result, careful attention is now given to the selection of high-level radioactive waste repositories. Much of the attention has focused on the health effects of short-term and long-term exposure to different levels and kinds of radiation, including increases in cancer mortality rates and in the incidence of genetic and birth defects. Effects are known to be serious under certain exposure conditions, particularly short-term exposure to high levels of radioactivity. However, despite growing consensus in the scientific community that risks from long-term exposure to low levels of radiation are small relative to other health risks in the human environment, considerable uncertainty remains about these health risks. Government standards for exposure have changed and can be confusing. This uncertainty is evident in the scientific community and has been communicated to the public.

The fears and lack of knowledge about radioactivity and radiation held by the public have been documented in the literature¹⁻⁹. In essence, the general public has little understanding about radioactivity and radiation, has not learned about it appreciably since the early years of nuclear power plants, and remains fearful of the risks associated

with it. The public tends to perceive all activities related to radioactive materials as carrying similar risks, from nuclear weapons and power plants to waste disposal sites. Researchers suggest that individuals tend to generalize from such incidents as the accident at Three Mile Island and other highly publicized incidents. Individuals focus on the potentially disastrous consequences of a hazard, rather than on the probability of the event occurring.¹ The consequences of the maximum credible disaster as perceived by the public have been found to differ from those determined by experts. Public fears are reinforced by the realization that many facts concerning risks are disputed by the experts.^{2,9}

Although fears of health risks dominate the controversy, other factors are affected by the existence of these fears. One issue that arises repeatedly in these situations is that the value of property near hazardous or radioactive waste sites will decrease. The claim is that people who live or work near sites with radioactive materials will want to move away in order to protect the health of their families and businesses. In order to move, the argument continues, property owners will have to take lower prices for their land and buildings both to leave quickly and because buyers will be unwilling to pay much to live or establish businesses in that area.

The object of this study is to test the hypotheses that (1) residences located within close proximity to a particular radioactive waste site have experienced a

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significant decline in property values by comparison to residences located within the same city but at a greater distance from the site, and (2) this decline occurred after publicity on the contamination appeared in the media.

Residential property values reflect the availability of housing on the market and various amenities and disamenities associated with the location and structure of a particular house, e.g., the number of rooms; lot size; proximity to parks, transportation routes, power plants, polluted beaches, and sources of loud noise.¹⁰⁻¹⁴ We assume that the perception of increased health risks from living near a radioactive waste facility is a disamenity that motivates people to want to leave the geographical area of risk. However, it is unclear what level of fear, perceived risk, or health problem must exist before people will ignore or compromise other factors (e.g., economic investment and emotional ties to homes and neighborhoods) and attempt to relocate.

Research specifically on the effects of a radioactive waste disposal site on residential property values is not available and research on effects in comparable situations is inconsistent. Yet despite the absence of empirically based evidence, court cases are being decided and decisions are being made regarding the compensation and siting factors relevant to hazardous and radioactive waste management. And the issue continues to be raised by the public. This study is an empirical test of the question: Does proximity to a hazardous/radioactive waste disposal site affect residential property values?

DESCRIPTION OF THE CASE AND METHODS

An industrial site contaminated by radioactive materials is located in West Chicago, Illinois, a suburb of Chicago. It is currently owned by the Kerr-McGee Chemical Corporation. Although the site is no longer active, it was previously used to produce thorium ore and thorium nitrate. The site has been contaminated for over 50 years, but major public awareness of the contamination did not occur until July 1976 when a local newspaper revealed its existence. The U.S. Nuclear Regulatory Commission has prepared an environmental impact statement¹⁵ to evaluate alternative actions to deal with the contamination, including (a) stabilizing the material onsite for a temporary but indefinite period, and (b) decontaminating the site and removing the material entirely. The site remains a point of controversy in the local community and occasionally in the wider press.

Many residence owners near the site have complained of decreased property values, and there are two lawsuits pending in West Chicago claiming loss of property value due to proximity to the Kerr-McGee site. In one case, a family owns a residential lot adjacent to the site. A chain-link fence and standard radioactivity signs mark the boundary between the site and the family's lot. Unable to sell their home under several realty contracts, the family has given up trying and is suing for loss of value. The other suit concerns a nonresidential contaminated building located approximately 0.8 km from the factory site. After allegedly decommissioning the building, Kerr-McGee sold the building to the current owners. The building was converted to office space, but recent investigations have revealed levels of radiation in the building that are high enough to require further decontamination. The owners claim that the building is both unsaleable and unrentable and that the cost of decontamination is prohibitive. They are seeking compensation for loss of value from the Kerr-McGee

Corporation through the Federal District Court. Thus, property values are clearly a prime issue, perceptually and legally, in the Kerr-McGee situation.

Although some local homeowners are seeking compensation for depressed property values "caused" by their proximity to the site, this study is not intended to address claims made by such property owners. Rather, we are testing whether or not residences within close proximity to the Kerr-McGee site have, in general, experienced a change in property values that is significantly different from residences located farther away. The study does not address the issue of whether or not, nor by how much, the sale of any individual residence may have been affected by its proximity to the Kerr-McGee site.

Residential property values are measured in terms of the characteristics of real estate transactions on single-family homes. Records were collected of real estate transactions occurring in the city of West Chicago from January 1, 1973, to December 31, 1982. (The Chicago Office of the National Association of Realtors states that realtor sales represent approximately 84% of all residential property transactions occurring in the city.) All real estate transactions on single-family residences at two different distances from the Kerr-McGee site were used for this study: those located within about a 0.4-km (two-block) radius of the perimeter of the site (Inner Ring), and those located from 0.4 km to 1.6 km of the perimeter of the site (Outer Ring).

The total number of transactions occurring within the Inner and Outer Rings of the site from 1973 to 1982 are 168 and 1,084 respectively. The range in number of annual transactions for the two rings is 4 to 30 and 28 to 196, respectively. Selling price and age of residence were collected on each transaction. The age of each residence in the transaction data was also incorporated in the analysis by identifying residences as older (built before 1950) or newer (built during or after 1950). The year 1950 was recommended by local realtors as the cutoff year defining old and new residences. Local realtors suggested that the age of a residence might influence the selling price if a given community were disproportionately represented by transactions on older or newer homes. For example, a newer home might be less susceptible to depreciation in property value as a result of its proximity to a waste facility because of its higher original market value.

Average annual selling prices for newer and older residences in the Inner and Outer Rings from 1973 to 1982 are shown in Fig. 1. The selling prices of newer

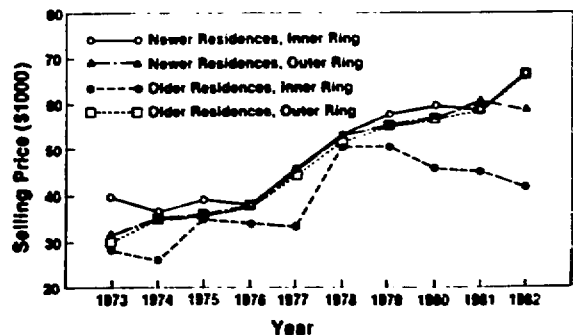


Fig. 1. Average annual selling prices of newer and older residences, by distance from site.

residences in the two rings increased in a relatively consistent pattern throughout the 10-year time period. However, selling prices of older residences within 0.4 km of the site (Inner Ring) began to decline after 1978, while values for older residences in the Outer Ring continued to increase as they had in the past.

The transaction data were analyzed for all transactions together as well as separately for older and newer residences for each of the time periods: before (1973-1976) and after (1977-1982) the media publicity. The method of analysis is a two (older or newer) by two (Inner or Outer Ring) factorial analysis of variance (ANOVA) on average annual selling prices. It is hypothesized that prior to the media publicity in mid-1976, there were no differences in selling prices of residences in the Inner and Outer Rings; but after the publicity, the selling prices in the Inner Ring would be significantly lower over time relative to those in the Outer Ring.

RESULTS AND DISCUSSION

The results of ANOVA show that, in the time period prior to the publicity, there were significant differences by age of residence ($P < 0.05$) but none by distance from the site. In the post-publicity period, age, distance from site, and interaction effects were statistically significant ($P < 0.05$). Thus, the hypothesis was supported for older homes.

Several issues should be considered in the interpretation of these findings. First, the use of a 0-2 block limit to the Inner Ring was arbitrary; other limits should be tested and we are in the process of doing this. Second, the findings of a significant variation in average annual selling price by distance from the site does not draw the causal relationship that it was proximity of residences to the site that actually caused the lowered selling prices. This issue of causality is central to correlational studies; but, in many cases, ex post facto correlational studies are the best that can be done. Third, one of the more difficult problems in a study such as this is sample size. In some years, the number of cases in the Inner Ring was fairly small, which means that by using annual averages of selling prices, just one or two extreme cases in a given area and year could distort the results. Fourth, the results of this study cannot be generalized beyond this particular geographic location, nor are they appropriate to be used by any individual in the city of West Chicago to support claims of reduced property values on a particular lot. Finally, factors other than selling price can reduce the value of property to the seller, e.g., an extended number of days on the market, as was found in the case of the accident at Three Mile Island.¹⁶ Subsequent analyses of these data and of other cases should include investigations of these issues.

IMPLICATIONS AND MITIGATION

This study provides some support for the argument that proximity to a radioactive waste disposal site perceived by the public as hazardous reduces property values (see Reference 17 for more extended discussion of the literature and background theory). Whether or not health risks exist, the perception that they do is important.

This is suggested in several cases showing why people relocate away from areas of actual and perceived health risks. In the case of the Love Canal incident, government action provided financing for purchasing all homes within a certain area around the

actual hazard site and for paying moving costs. However, residents of homes slightly farther from the site perceived that health risks to themselves and their children existed because contamination did not stop at any particular street. These people were offered a less comprehensive relocation package, requiring that the selling price and costs of moving be negotiated with government agencies. Relocators from this group were younger, had dependent children, and viewed contamination as more widespread than those who remained.¹⁶ Unfortunately, no evidence was gathered with regard to financial concerns about relocating. The Love Canal case shows differences in relocation aid based on government definitions of the actual existence of certain levels of health risk and differences in characteristics of relocators who perceived the existence of health risk beyond the government definition.

Similar results on the decision to relocate were found in a study of the impacts of toxic waste disposal in a local landfill in Legler, New Jersey.¹⁹ Until residents were warned not to use their water due to contamination, the vast majority were unaware of the hazard. Once they were made aware of the actual hazard, younger people with small children were more interested in relocating than were older residents and younger couples without children¹⁹--a finding comparable to that in the Love Canal case. A lawsuit is now pending that was filed by a group of Legler residents asking for financial aid to move away from the area on the assumption that property values had declined as a result of the contamination. Again, an actual hazard was identified, but the perceived level of risk to certain segments of the population determined relocation decisions.

The effects of perceived health risk on residential property sales have been studied relative to proximity to four nuclear power plants²⁰ and to Three Mile Island.²¹ The researchers found no effects as a function of distance from or visibility of the operating nuclear power plant in either study. In the case of the Three Mile Island accident in particular, they did find two short-term (4-8 week) effects: the number of sales of residences within 16 km of the plant dropped sharply^{21,22}; and the average number of days on the market increased.¹⁷

Two legal cases have been based on perceived loss in value relative to perceptions of health risks rather than on actual documented loss. A Texas landowner whose property was crossed by a rail line that carried waste from a nuclear power plant won compensation on the argument that the value of his land decreased due to a decline in agricultural output capacity and the fear of sabotage or accidents on his land.¹² In this case, there were no observed damages; the market value of the land was determined to decrease due to the perception or fear of health risks from radioactivity. In another case, a firm planning to develop 240 ha of land near the Rocky Flats plant in Colorado for commercial use has filed suit claiming losses because the city has denied rezoning permits due to possible health risks from the plant. Again, there has been no research to establish whether loss of property value has actually occurred.¹²

From these cases, we can conclude that both actual and perceived health risks have served as the basis for financial aid and legal decisions. However, with the exception of research at Three Mile Island, actual property value losses have not been clearly documented until now.

The results of this study are not necessarily generalizable to new waste management sites for several reasons. First, the Kerr-McGee waste site existed for many years before it drew attention from the media in 1976. During those years, it is not clear what health risks existed to nearby residents or to people working or playing on the site. This situation would not occur for a new waste management site that was constructed with state-of-the-art methods specifically for controlled management of radioactive wastes. Second, although the Kerr-McGee site is monitored and access is controlled, public confidence in the integrity of a site in this situation may not be as strong as for a new site. Third, there are few, if any, compensating positive aspects to the Kerr-McGee site, such as a source of employment for nearby residents. Finally, the effects observed may not be permanent, as they could be with a new waste-management facility, because property value changes related to the Kerr-McGee site may disappear when a decision on how to manage the wastes in the long term is implemented.

Despite the qualifications, actual negative effects on property values were observed even if health risks were only perceived and not actual. Legal cases and other problems for decision-makers will occur at this site and in other similar situations. The obvious mitigation is financial compensation for value lost. Formulas for deciding who will be compensated, for how much, and by whom are difficult to devise, both in cases of existing hazardous waste sites and in siting new waste management facilities. In the cases of Love Canal and Times Beach, clear evidence of contamination was found within a certain radius of the site. The decisions in these cases were for the government to pay all relocation costs of residence owners within this radius and to negotiate compensation for relocation of those living farther away. Drawing from these experiences, one could devise negotiation rules. However, this tactic might encourage needless and costly relocation and also would compensate only those who wished to relocate, rather than all who might have experienced a property value loss.

Another suggestion would be to pay a lump sum to each residence owner within a certain radius, possibly determined by a study like ours, based on the pre-publicity assessed value of their residences. This would provide for more equitable distribution of compensation. In separate studies of the effect on housing values of proximity to an electric utility power plant,⁴ a solid waste disposal site,³ and a polluted bay,⁷ economists have calculated precise reductions in dollar values from each disamenity. Similar calculations, based on studies of several waste management sites, could be made.

Another suggestion would be to provide low-cost loans for those who wish to relocate. In this case, the compensator would bear less cost in the long run, even on relocations due to actual health risks. Choosing who would receive such loans and for how much remains a dilemma.

The mitigative suggestions made above are intended to stimulate thought. Other researchers have explored more carefully the specifics of compensation for such losses (e.g., see the work of H. Kunreuther and his associates). The most striking point is that further research is required regarding both the effects on property values of proximity to a perceived or actually hazardous site and regarding appropriate compensation. We have begun the effort to investigate an issue commonly raised by citizens who are faced

with the the existence of a hazardous waste repository in their neighborhood. We hope this will stimulate future empirical research by social scientists on the concrete problems that policymakers and environmental assessors face daily.

REFERENCES

1. B. FISCHHOFF, P. SLOVIC, and S. LICHTENSTEIN, "How Safe is Safe Enough? A Psychometric Study of Attitudes Towards Technological Risks and Benefits," Policy Sci., 127-152 (1978).
2. M.K. LINDELL, T.C. EARLE, J.A. HEBERT, and R.W. PERRY, "Radioactive Wastes: Public Attitudes Toward Disposal Facilities," Topical Report B-HARC-411-004, Battelle Memorial Institute, Human Affairs Research Centers, Seattle, Washington (1978).
3. W.L. RANKIN and B.D. MELBER, "Public Perceptions of Nuclear Waste Management Issues," BHARC/411-80-004, Battelle Memorial Institute Human Affairs Research Centers, Seattle, Washington (1980).
4. P. SLOVIC, B. FISCHHOFF, and S. LICHTENSTEIN, "Facts and Fears: Understanding Perceived Risk," pp. 181-214 In R.C. Schwing and W.A. Albers (eds.), "Societal Risk Assessment: How Safe is Safe Enough?" Plenum Press, New York (1980).
5. T.C. EARLE, "Public Perceptions of Industrial Risks: The Context of Public Attitudes Toward Radioactive Waste," PNL-3799, Battelle Memorial Institute, Human Affairs Research Centers, Seattle, Washington (1981).
6. S. NEALEY, "Nuclear Power Attitude Trends," Presented at American Nuclear Society 1981 Winter Meeting, San Francisco, California (1981).
7. NATIONAL RESEARCH COUNCIL, "Social and Economic Aspects of Radioactive Waste Management," National Academy Press, Washington, DC (1984).
8. A.S. BURNES, "Risk: Accounting for an Uncertain Future," Nat. Resour. J., 2, 723-734 (1981).
9. P. SLOVIC, "Images of Disaster: Perception and Acceptance of Risks from Nuclear Power," pp. 34-55 In G. Goodman and W. Rowe (eds.), "Energy Risk Management," Academic Press, London (1979).
10. J. HAVLICEK, JR., R. RICHARDSON, and L. DAVIES, "Measuring the Impacts of Solid Waste Disposal Site Location on Property Values," Am. J. Agric. Econ., 35(5), 869 (1971).
11. G. BLOMQUIST, "The Effect of Electric Utility Power Plant Location on Area Property Value," Land Econ., 50(1), 97-100 (1974).
12. R.K. HAGEMAN, "Nuclear Waste Disposal: Potential Property Value Impacts," Nat. Resour. J., 21, 789-810 (1981).
13. S.M. MASER, W.H. RIKER, and R.N. ROSETT, "The Effects of Zoning and Externalities on the Price of Land: An Empirical Analysis of Monroe County, New York," J. Law Econ., XX(1), 111-132 (1977).
14. C.E. YOUNG and F.A. TETI, "The Influence of Water Quality on the Value of Recreational Properties Adjacent to St. Albans Bay, Vermont," U.S. Department of Agriculture (1984).

15. U.S. NUCLEAR REGULATORY COMMISSION, "Final Environmental Impact Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois, Docket No. 40-2061," NUREG-0904 (1983).
16. H.B. GAMBLE and R.H. DOWNING, "Effects of the Accident at Three Mile Island on Residential Property Values and Sales," NRC FIN B7078, U.S. Nuclear Regulatory Commission, Washington, DC (1981).
17. B.A. PAYNE, S.J. OLSHANSKY, and T. SEGEL, "The Effects of Proximity of a Low-Level Radioactive Nuclear Waste Site on Residential Property Values," Paper presented at 79th Annual Meeting of the American Sociological Association (1984).
18. M.R. FOWLKES and P.Y. MILLER, "Love Canal: The Social Construction of Disaster, Final Report," Federal Emergency Management Agency (1982).
19. M. EDELSTEIN, "The Social Impacts of Residential Exposure to Toxic Wastes," Social Impact Assess. 79/80, 11-20 (1983).
20. H.B. GAMBLE, R.H. DOWNING, and O.H. SAUERLENDER, "Effects of Nuclear Power Plants on Community Growth and Residential Property Values," Final Report," NUREG/CR-0454, U.S. Nuclear Regulatory Commission, Washington, DC (1979).
21. H.B. GAMBLE and R.H. DOWNING, "Effects of Nuclear Power Plants on Residential Property Values," J. Reg. Sci., 22(4), 457-478 (1982).
22. COMMONWEALTH OF PENNSYLVANIA, "Three Mile Island Socio-Economic Impact Study," Governor's Office of Policy and Planning, Harrisburg, Pennsylvania (1979).