

THE IMPORTANCE OF COUNTING COWS: SOCIAL AND ECONOMIC EFFECTS
OF A HIGH-LEVEL NUCLEAR WASTE REPOSITORY IN TEXAS

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ABSTRACT

Impact assessments that rely on existing records and extrapolation from broad geographic areas provide inadequate information about social and economic conditions important in siting a high-level nuclear waste repository. Texas has used an alternative approach, involving systematic surveys of representative samples of local residents, farm operators and businesses in the proposed site counties and comparison areas. Results show that this technique is useful in describing current economic conditions, including characteristics of key sectors of the economy, changes related to the siting process, and expectations that may influence investment. In addition, the surveys are useful in assessing the degree of consensus in local communities and in identifying possible differential effects of a repository on particular groups. They also provide a baseline for long-term monitoring of repository effects and contribute to our understanding of the underlying processes that shape public response to the nuclear waste program.

INTRODUCTION

Other speakers today have talked about the psychological process of risk assessment, about deep public fear of nuclear power and nuclear wastes. I want to zoom the camera in much closer, to talk specifically about the responses of a particular group of people--the residents of the Texas Panhandle--to the possibility of burying high-level nuclear wastes under a few thousand acres of farmland in their own area. I want to talk about what we have heard over the past three years from farmers, business owners and more than a thousand Panhandle residents who participated in Texas' systematic surveys about the repository. And I want to talk about how the survey research methods we have used in Texas to produce fine-grained, site-specific analysis are a key to assessing social and economic effects of the repository - or of any hazard at any site.

So I brought with me seven slides with my adjusted relative frequencies and multiple regression coefficients to show what a nuclear waste repository would mean for agricultural communities in the Texas Panhandle. But being a good Texan and a social scientist, I also brought a random sample of hats.

Mr. Wayne Richardson, the fellow who handed me this first hat, farms a large chunk of the proposed Deaf Smith repository site. He grows foundation seed. When Texas A & M University developed a new strain of hard-red winter wheat a few years ago, they entrusted their original genetic material to Mr. Richardson to grow the first increase for distribution to other seedsmen throughout the Southwest. He maintains the genetic stock for wheat varieties grown in six states. Richardson and other Deaf Smith seed growers also

produce dozens of other types of seed for their neighbors and for farmers throughout the nation and the world.

I also have hats for Arrowhead Mills, a major health-food producer in Hereford; for Frito Lay, Texas Corn Growers, Flagg Farmers' Gin, Big T Pump Company, D & L Fertilizer, Hays Implement Company, Funk's Hybrid, Tidwell Spraying Service, and for Tommy Turner Cattle.

Deaf Smith County is the number two county in the nation in cattle production (1), with a million cattle raised within 50 miles of the proposed repository. When the U.S. Department of Energy (DOE) named Deaf Smith County a finalist for the repository, the Environmental Assessment said the site was "remote from highly populated areas." (2) They certainly weren't counting Tommy Turner's cows.

In fact, the Environmental Assessment really doesn't give a clear picture of Deaf Smith County as a uniquely rich and complex agricultural community--Texas' number one agricultural county, a county that produces everything from seed to wheat, corn, sorghum, sugarbeets... and on to packaged vegetables, sugar, flour, granola, tortilla chips, and steak.

Part of the problem with the Environmental Assessment is that it relies on existing published data and on extrapolating data from broad geographic areas. In order to begin to fill this gap, the State of Texas went directly to the people who hand out these hats and the people who wear these hats to ask them what a nuclear waste repository would mean for their families and for their financial plans.

Beginning in 1984, we surveyed representative samples of local residents, farm operators and business owners and managers (3,4,5). Surveys were conducted in Deaf Smith and Oldham counties, near the finalist site; Swisher County, a possible site now ranked less desirable by DOE; Amarillo, an urban area within commuting distance of the Deaf Smith site; and two rural counties that are located farther away, but are similar to the site area in cultural and economic character.

Purpose of the Surveys

This research serves several purposes under the site-selection process outlined in the Nuclear Waste Policy Act (6). First, it provides an additional avenue for public participation in the siting process. DOE has filled the Hereford Bull Barn to the gills more than once for public meetings, and formal hearings are an important part of the repository site-selection process. But survey results indicate that only a third of local residents have ever attended an information meeting or hearing about the repository, and only 6 percent have testified. The surveys provide systematic access to a representative cross-section of local residents, including those who have difficulty attending meetings and those who hesitate to speak frankly in a public forum.

A second purpose of the surveys is to provide detailed information about current social and economic conditions and expectations for the future. This information is important both for anticipating effects of the repository and for documenting baseline conditions.

A third purpose is to begin to understand the underlying processes that influence communities facing construction of a large-scale hazardous facility. By examining patterns of responses to the nuclear waste repository, we can begin to understand how local residents weigh expected benefits and risks. We can identify effects of the program on particular subgroups of local populations; and we can explore the role of economic stakes, knowledge and personal values. These issues have important practical implications for planning public information and participation programs, for anticipating effects of site-selection and repository construction, for planning mitigation and ultimately, for deciding whether farm communities are a suitable place to store wastes.

The Current Economy

Backtracking for a minute to the second purpose I mentioned-- documenting current social and economic conditions-- It would take more than my 30 hats to give you a comprehensive picture of the role of agriculture in the Deaf Smith economy. But I want to illustrate some of the things that we learned through systematic surveys that we couldn't learn either from existing records or from public hearings.

For example, existing records provide only very general information about what proportion of the local economy depends on agriculture. Our 1985 survey of a 50 percent sample of businesses in the Texas site counties asked owners and managers directly about their revenues, sales and purchases. Results document that 92 percent of business revenues and 57 percent of business employees in these counties are in firms that buy or sell agricultural commodities (Fig. 1). Results also indicate patterns of local business ties. Eighty-eight percent of site-county businesses,

representing half of business revenues and 71 percent of business employees, are locally owned. Agricultural businesses that dominate the economy also make large local purchases. About two-thirds of them make 75 percent or more of their purchases in their own county or neighboring counties, a pattern that could be disrupted by construction of the repository. In addition, these businesses have substantial sales outside the local area, so they bring new money into the local economy. But businesses say their sales would be hurt by consumer fears about produce grown near nuclear wastes (4).

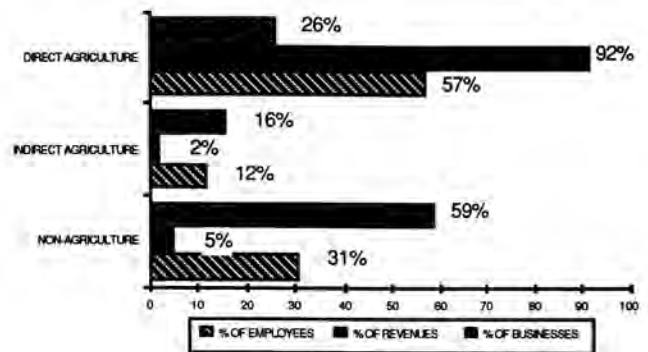


Fig. 1. Site Area Businesses.

Survey results also provide information about effects of the site-selection process itself. In our most recent surveys, conducted last fall, 11 percent of Deaf Smith and Oldham county residents said they have already changed financial plans because of the repository. They described specific decisions to delay local investments, to focus on short-term rather than long-term investments, or to invest elsewhere. Another family delayed moving from town to the land they farm near the site (5). Effects like these were anticipated by the National Academy of Sciences in their 1984 report cautioning that site-selection itself may be harmful to local communities (7).

Public Opposition and Expectations About the Repository

In addition to providing specific information about some aspects of the local economy, the Texas surveys give a broad picture of public responses to the proposed nuclear waste repository. You don't need a scientific survey to tell you that local opposition to a repository in the Texas Panhandle is loud and clear. You could listen to the comments at a public hearing or count the "Don't Waste Texas" bumper-stickers or read the thousands of signatures on the Nuclear Waste Task Force petitions. But information from a representative cross-section of local residents is useful in assessing the degree of consensus on the issue. In addition, structured interviews provide information on a consistent set of issues related to the repository, so results indicate how different aspects of public responses are inter-related.

Results of Texas' October 1986 surveys of 1388 Panhandle residents show strong and consistent opposition to the repository in Deaf Smith and Oldham counties, Amarillo and selected rural counties farther

from the site. About four out of five Panhandle residents said they would not allow construction of the repository in Texas if it were up to them (5). These results are shown in Fig. 2.

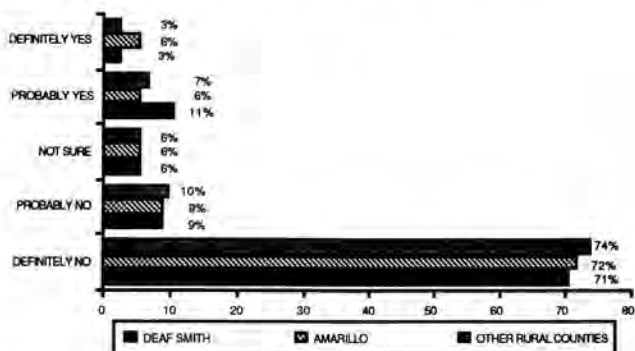


Fig. 2. Would you Allow Construction of a High-Level Nuclear Waste Repository In Deaf Smith County?

By the way, the survey question we used was taken from an Oak Ridge Laboratories study that showed local support for construction of a nuclear power plant. Researchers later found public support for the project declined during construction of the plant (8,9).

In Texas, concern about the repository centers on environmental risks and agriculture. More than three-fourths of Panhandle residents believe it is "very likely" or "somewhat likely" that nuclear wastes will escape into the water supply. They also expressed strong and consistent concern about other environmental hazards, including transportation accidents, worker health problems and food contamination.

Local residents believe agriculture could be hurt not only by actual contamination of crops or agricultural resources, including soil and water; but also by consumers' reluctance to buy food grown near nuclear wastes. Consensus about negative effects of the repository on agriculture is quite strong. About four-fifths of Deaf Smith residents believe farmland values and agricultural production will decline in their county, and roughly half of the residents of more distant counties believe farmers in their own communities will be hurt.

Expectations about possible economic benefits from the repository are less consistent. Residents of rural counties farther from the site expect to share environmental and economic risks from the repository, but not its benefits. Fewer than 15 percent expect any economic benefits for their county if the repository is built. In Deaf Smith, 58 percent expect increased employment and half expect more stores and businesses in their county if the repository is built. In Amarillo, 54 percent expect increased employment and a third expect more stores and businesses.

Expectations about site characterization are closely related to expectations about the repository itself, so opposition to characterization studies is nearly as strong as opposition to the repository. The correlation between attitudes about characterization and attitudes about the repository is .71 ($p \leq .01$). A substantial majority of Panhandle residents who had heard about site characterization before we contacted them for the surveys said they would not allow the studies to go forward in

Deaf Smith County if it were up to them. Local residents are concerned that characterization would lead to water contamination; and they believe it would hurt property values, intensify conflict in local communities and put families and businesses in limbo for years.

It's interesting to note, though, that many Panhandle residents are not aware of DOE site characterization plans. About a fourth of Deaf Smith-Oldham residents and 38 percent of Amarillo and Swisher County residents hadn't heard about the studies. Only 12 percent of Deaf Smith-Oldham residents are aware that site characterization will disturb land outside the nine-square-mile proposed repository site. These results indicate that there could be substantial shifts in public responses to site characterization as local residents learn that characterization will involve large shafts through the two aquifers and developing rights of way and research sites outside the nine-square-miles.

Factors in Public Opposition to the Repository

We'll know more in a few months about the underlying processes that shape public opposition to the nuclear waste program. Our 1986 surveys re-interviewed local residents that we surveyed in 1984, so we will be able to trace responses across the past two years and to statistically compare responses of different geographic areas and different subgroups within local populations.

In the meantime, cross-sectional analyses of our 1984 results provide some indications of important factors in public opposition to the repository (3). Figure 3 shows results of a path analysis of 1984 results. The numbers are standardized regression coefficients, so they indicate the size and direction of the effects of particular research variables on variables shown later in the model.

In this illustration, you can see that results are consistent with the idea proposed by earlier researchers that attitudes towards hazardous facilities are formed by a process of weighing expected socioeconomic benefits of the project against expected environmental risks. Results also indicate that concerns about health and the environment weigh somewhat more heavily than expectations about socioeconomic benefits--a finding that should discourage theorists who hope to "buy-off" public opposition (10).

Results also show smaller effects of several background characteristics. For example, the path diagram indicates that local residents who are more knowledgeable about the nuclear waste program rated accidents more likely, a finding consistent with earlier results reviewed by the National Academy of Sciences (7). Results also show some differences among demographic groups. Farmers expect fewer socioeconomic benefits and greater environmental risks than others, a finding that may reflect their special economic stake in the natural environment or their personal commitment to land stewardship.

However, it's important to remember in interpreting demographic differences that a majority of every subgroup opposes construction of the repository. It's also interesting to note that business ownership is not in the picture because it is not significantly related to overall attitudes towards the repository. This finding from the survey of local residents is supported by results of surveys addressed specifically to business owners and managers (4). A

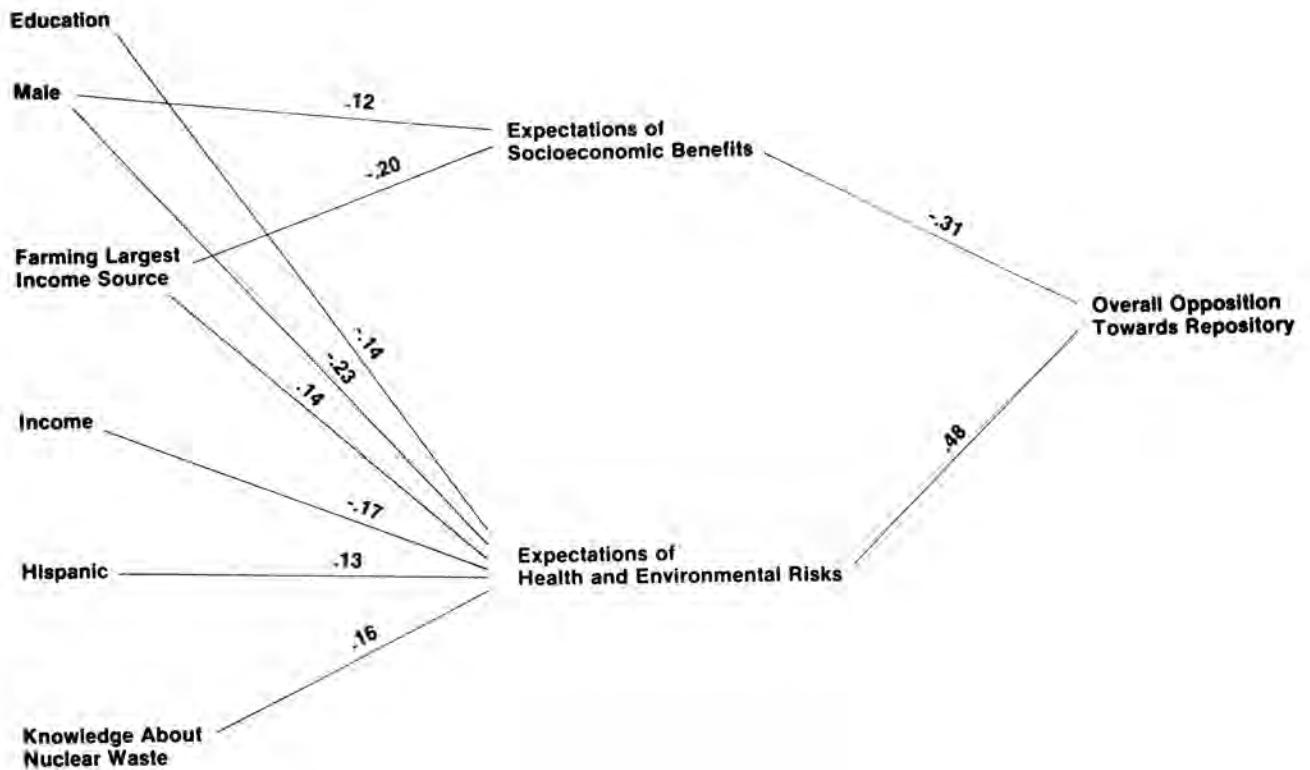


Fig. 3. Factors in Public Opposition to the Nuclear Waste Repository.

majority of site-area businesses, representing 84 percent of business revenues, said their business would not benefit from the repository.

Future Analysis

Now I'm coming up to the point in the story where I have to "to be continued." Our next step will be to see whether statistical patterns we found in 1984 are repeated in 1986, indicating consistent underlying processes. We will also collect new data over the coming years as part of Texas' ongoing responsibility under the Nuclear Waste Policy Act to facilitate public participation, assess potential effects of the repository and monitor the siting process. While I focused today on results concerning public awareness and expectations about the repository, our telephone interviews also included standard measures of quality of life, psychological stress and psychosomatic health. By comparing results for the Deaf Smith area with results for similar communities farther from the site, we will be able to identify any effects of the nuclear waste program on these indicators, too. Similar measures have previously been used at Three Mile Island, where research shows increased stress among residents near the TMI plant

compared to those in comparison areas (11).

Implications for the Siting Process

From the Texas results reported so far, we have already learned some things that we believe could be useful in a broader context in evaluating current and potential effects of siting hazardous facilities. First, we learned that telephone surveys can be very effective in reaching a representative cross-section of local residents. Roughly 90 percent of the site-county residents we contacted about our research completed an interview.

In Texas, results show broad consensus in opposing the repository; but in other settings, surveys could be useful in identifying differences in the views of subgroups within local communities. They may also help in anticipating differential impacts of the repository on particular groups. For example, the Texas results indicate unique effects of the repository on farmers because of their dual concerns about risk to environmental resources of soil and water and to consumer confidence that their produce is safe.

The Texas studies also show another pattern that has important implications for all proposed sites. Results indicate that residents living farther away from Deaf Smith expect to share in the health and environmental risks of the repository, but not in the possible economic benefits. This pattern is seen more clearly in Washington, where statewide opposition to the repository far exceeds opposition near the Hanford site. The Texas studies show that regional concerns about bearing risks without benefits is not just a function of Hanford's special history in the nuclear industry, but may be a factor at all sites. This possibility needs more careful study; but it is important because current mitigation plans focus very narrowly on local impacts, with no attention to broader regional effects.

Another lesson for mitigation planners is that local residents are most concerned about health and environmental risks that can't be easily translated into money. As a result, many of them see no logic in the mitigation process. They want DOE to leave town, not negotiate.

Finally, surveys provide detailed local economic information, so they can describe particularly vulnerable sectors of the economy. In Texas, that means agriculture, but other states could use similar techniques for other economic sectors. And surveys can focus even more narrowly on specialized operations, like seed production and health foods, that are most likely to be hurt by the repository. In addition, the Texas interviews asked about any current changes in investments and about expectations for the future. Expectations are particularly important in an agricultural economy because of the role of land values, the need to maintain investments in local food processing capacity and the critical importance of consumer perceptions that food products are safe. But economic effects of expectations and public perceptions are not unique to agriculture. For example, they could also be a key factor in several first- and second-round states where tourism is important.

We learned a lot by talking directly to the people who live and work in Deaf Smith County. And we're going back. As long as DOE is considering Texas as a possible repository site, we'll be watching; and we'll be watching up close.

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