

## FEEDBACK FROM THE FIELD

### THE LACK OF WARNINGS BEFORE THE SARAGOSA TORNADO\*

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On the evening of Friday, May 22, 1987, a tornado destroyed half of Saragosa, Texas. The town hall, post office, two churches, a school, and half the homes in the town were destroyed. There were 29 deaths and 121 injured. This research note analyzes the failure of the warning system in Saragosa. It concludes that the effectiveness of warnings depend on the existence of a common shared culture or the adaptation of the warning system to multicultural social contexts. When, as in the case of Saragosa, these assumptions prove false, warnings will fail.

#### THE SETTING

Saragosa is a small, unincorporated town in the southern part of Reeves County, Southwest Texas. The county's economy is based on agriculture (beef, dairy cattle, cotton, grains, alfalfa, pecans), mineral production (oil, gas, sand, gravel), service, and tourism. Pecos (population 13,429 as of April 1986), 32 miles northeast of Saragosa, is the county seat.

Reeves County is a "western" tourist area in the Trans-Pecos region of Texas. The local climate is semi-arid (average annual total precipitation is 11.99 inches), with low humidity. The dominant physical features of the local terrain are rolling to hilly plains. The Davis Mountains are to the south of the county. Reeves County is bordered on the northeast

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by Loving and Ward Counties, on the southeast by Pecos County, on the southwest by Jeff Davis County, on the west by Culberson County; and on the north by New Mexico.

The precise population of Saragosa is unknown. Newspaper accounts of the disaster and people in the county have different estimates of the pre-impact size of the population of Saragosa. The best available estimate, based on the number and average size of households of the town, is that at the time of the disaster Saragosa had a population of 428 people. All but two families in Saragosa are of Mexican descent. The majority of the adult population work on neighboring ranches and farms, or in service establishments in Pecos and surrounding towns.

### METHODS

Most of the interviews done during the three-day field work begun on June 1, were conducted in Spanish. A survey of newspaper articles on the disaster was made to develop questions and to doublecheck information collected during the field work. Questions about the warning experiences of the survivors were prepared for use during the field interviews (available upon request), but did not prove very useful since most of the respondents had not received warnings.

People were very cooperative. Interviews were conducted with the family heads of ten of the fifty-one households left untouched by the tornado. In spite of efforts to locate those whose homes had been destroyed by the disaster, only three family heads whose homes were destroyed could be located and interviewed. The others had moved out of town. Interviews were also conducted with three adult survivors who were at the community center at the time the tornado struck, and with the county surveyor, a deputy sheriff who was involved in the immediate rescue operations, the general manager of the local radio station, the Spanish-language radio operator at work during the evening of the disaster, the general managers of the water, electricity, and telephone companies serving Saragosa, and the clerk of the county court.

### FINDINGS

The focus in this section is on the spatial distribution of the deaths and the failure of the warning system in the Saragosa disaster.

### The Deaths

There were 29 known deaths in Saragosa. Twenty-two of the deaths occurred in the community center building and seven deaths occurred elsewhere in the town. One person died in a car (specific location unknown). The other six people died in their homes. Figure 1 presents the path of the tornado, the pattern of destruction, and the location (circled dots) of the victims' homes and the community center.

The tornado moved in a northeasterly direction from the southwest corner of town. According to eyewitness accounts, three funnel-like clouds formed in rapid succession but never touched the ground. This happened about three-fourths of a mile from the outskirts of Saragosa, sometime between 8:20 and 8:24 p.m. The fourth cloud or funnel touched ground and formed the tornado which impacted Saragosa in a couple of minutes. The funnel's destructive effect was about one-half mile wide. It was on the ground for approximately two miles. The path of the tornado is reflected in the distribution of the deaths. Indeed, the spatial distribution of the deaths can be summarized by a near-straight line on the map in Figure 1. It can be conjectured that the number of deaths might have been reduced if neighbors had not been congregated in the community center at the time of tornado impact.

A graduation ceremony for Headstart children residing in Saragosa and in neighboring Balmorhea started at 7 p.m. on the evening of the disaster. Survivors estimate that there were 100 people, or one-fourth of the total population of Saragosa, attending the ceremony. Twenty children were singing and participating on the stage. Another 30 or 40 children were spectators. The rest of the audience were parents and other adults.

The community center building was approximately 2,500 square feet (50' by 50'). During the program the space inside the community center was divided into three areas: the stage area, the area adjacent to the stage where the audience was seated, and a third area behind the audience. In this third area there were tables placed against the walls with refreshments and pastries which were to be consumed after the formalities ended. According to the respondents who were at the community center during the impact period or who rendered assistance and engaged in rescue work, most of the deaths in the community center

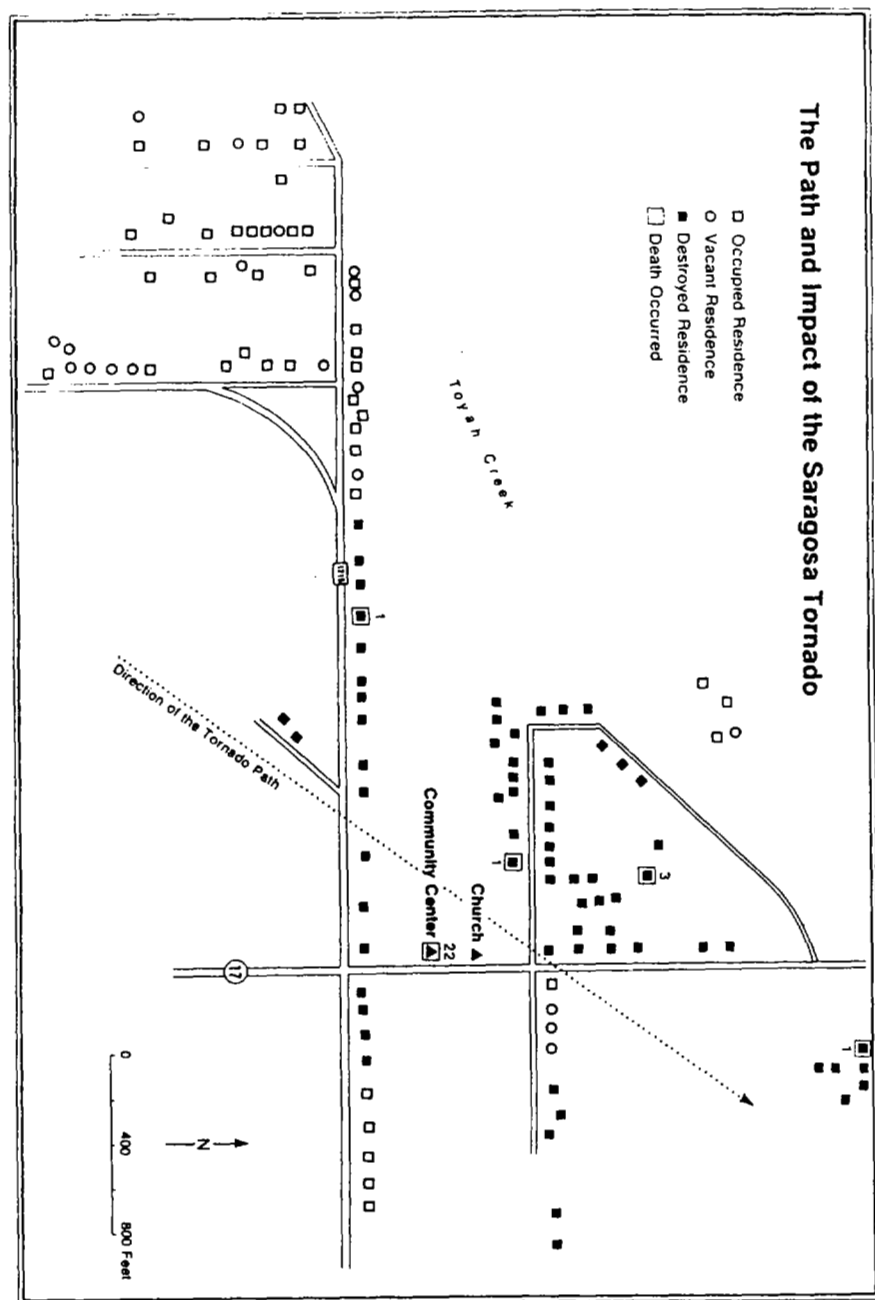


Figure 1.

occurred to people who found refuge against the walls of the building. People in the middle of the room who found shelter under the tables fared much better.

### The Failure of Warning

The characteristics and timing of the official emergency weather announcements during the afternoon and evening of May 22, 1987, were as follows:

Kansas City weather station. 3:45-10:00 p.m. Severe thunderstorm watch. Reeves County was included in this watch.

Midland station. 3:24-4:30 p.m. Severe thunderstorm warning for southwest Reeves County.

Midland station. 7:37-9:45 p.m. Severe thunderstorm and flash flood warning for southern Reeves County.

Midland station. 7:45-9:00 p.m. Tornado warning for southern Reeves County (the tornado cloud and a funnel was seen at 7:50 p.m. by a highway patrolman on mile 210 of I-10, southwest of Balmorhea).

In spite of this lengthy record of official warnings, and with the exception of two of the respondents who saw the warnings in English language television programs, the warnings were not received by the respondents. Most of the people of Saragosa did not perceive the weather to be threatening or dangerous. There were a number of reasons for this fact.

1. The weather conditions in Saragosa during the afternoon and early evening of May 22, and shortly before the tornado, were normal. It was not raining and the wind was not blowing. Some respondents said they could see rain in the direction of Pecos (northeast), but that it was clear in Saragosa and in the opposite direction (southwest, towards Balmorhea). In the absence of bad weather the people of Saragosa went about their business in the usual way. None of the respondents had

previous experiences with tornados, nor had tornados impacted Saragosa in the past.

2. The emergency weather announcements made references to geographical locations in Reeves County which were not relevant to the Mexican people of Saragosa. Two of the respondents said that they saw the official emergency announcements but that they did not know if it applied to them. The vast size and sparse population of Reeves County probably contributed to the inefficiency of the emergency weather announcements in eliciting protective responses. The broad geographical locations used in the emergency weather announcements were difficult to interpret by the people of Saragosa. The emergency weather announcements could have been more effective if they had included the names of towns in the sublocalities at risk. While the inclusion of these names is unmanageable at certain levels of geography, it should be attempted when the emergency announcements, as in the case of the Saragosa disaster, are relevant only for a section of a county.

3. There were no on-site emergency public warning system or sirens. Moreover, there were no communications of the danger to the neighbors of Saragosa by public officials or community leaders. On this fact there was complete uniformity of opinion and experience by everyone contacted during the interviews. Every respondent said that they had not been warned by police and sheriff officers, firemen, highway patrolmen, or by representatives of other official agencies. I do not know the reasons for this lack of contact between the officials and the neighbors of Saragosa. By the very nature of the tornado there was very little time available, although my guess is that the lack of warning in this case reflects, in part, the absence of a tradition of public service to the people of Saragosa. From this hypothesized perspective the absence of warnings by officials in effect mirrored the structure of social stratification in the county. (One respondent complained that Saragosa had been systematically ignored by public agencies, and it will be interesting to see if this issue becomes an important source of controversy during the reconstruction of the town.)

The warnings which were received came from people who saw the tornado approaching and ran to their neighbors and kin to alert them of the impending disaster. These warnings were taken seriously and were very effective in eliciting protective actions. But they occurred very close

to the time of impact (in most instances in less than two minutes), so that, in the absence of preparations, the range of options available to the people was quite limited. They either stayed in their own homes, moved to a neighbor's home which they perceived as safer than their own, or got in their cars and tried to escape the tornado.

For example, the people in the community center were warned of the approaching tornado by a father who rushed into the building, grabbed his son, and fled in his car. It appears that the emergent norm which developed in the group was for people to remain in the community center building for shelter since it was argued that it was one of the best-built and strongest buildings in Saragosa (it was not an approved civil defense center).

4. The English language TV stations broadcasted the tornado warnings. However, the neighbors of Saragosa had recently (within the last five months) acquired television cable services. This cable service included in its programming the major Spanish-language TV channel in the United States (Univision). Univision is very popular with Hispanics throughout the United States. In Saragosa, where almost everyone is of Mexican descent and prefers to use Spanish with intimates, the cable was a welcome source of entertainment. Univision carries romance stories (novelas) during the evening, and according to the respondents these romance stories were very popular in Saragosa. Apparently, during the night of the tornado (Friday, May 22, 1987) many of the televisions in Saragosa which were turned on were tuned to the Spanish language channel.

The importance of this presumption is that Univision did not (and does not) carry the emergency weather station announcements which were being broadcasted in English language TV stations serving Reeves County. Many lives may have been saved if the emergency weather announcements had been transmitted in the Univision channel to the people of Saragosa. An effort to see what can be done to provide this service to the Hispanic people of the United States is needed.

Univision is an untapped resource in the disaster preparedness and response system serving Hispanics in the United States. It needs to be brought into this national system. Parenthetically, in this regard it is important to keep in mind the distinction between, on the one hand, the language encoding of the message going over such channel. Vast

numbers of Hispanics who enjoy the cultural contents of the programs of Univision are fluent English language speakers. In moments of impending crisis, as in Saragosa, they might not be listening to English language television stations, but rather, might be enjoying Spanish language television programming in stations such as Univision which do not carry warnings. Thus, at present an act of cultural preference becomes an impediment to effective warnings. This is the problem that needs to be resolved in the case of Univision and other foreign language cable TV channels.

5. The local radio station in Pecos serves the town of Saragosa. It participated in the disaster response. The evening of the disaster its radio operators broadcasted the weather warnings in Spanish and English. These operators were able to respond almost immediately to the impending threat of the tornado. The Spanish language operator who participated in the emergency broadcasting estimates that the first emergency warning of the tornado was broadcasted by 8 p.m. and that emergency warnings in both languages went out every six minutes thereafter. Since the tornado impacted Saragosa sometime between 8:20 p.m. and 8:24 p.m., it is probable that the Spanish language radio emergency warnings about the tornado were broadcasted three to four times before the electricity was cut off and radio reception was blocked in Saragosa.

The radio operator cannot remember with certainty how he translated the English version of the emergency tornado warning he received from the Midland weather station. He said that he probably used "Aviso de tornado," followed by the rest of his translation of the message. The emergency messages he received were teletyped in English, so that he had to translate the message to Spanish before broadcasting it. Accurate translation of the message was rendered difficult by his feeling of great urgency and by the technical content of the message (for instance, the difference between watch and warning had to be preserved in translation); great care was needed in selecting the right Spanish words. In retrospect, the operator's use of "aviso" probably was not correct, for the word means to give news, advice, or information. The technical meaning of the word "warning," representing a materialized, impending disaster, has no direct translation into Spanish and its meaning is not conveyed by "aviso."

It would be a significant improvement if these emergency weather announcements could be translated and made available to Spanish language radio operators throughout the country. The operators would still need to add some of the specifics of the situation at hand. However, these standardized officially-approved Spanish-language translations would make it easier for Spanish language radio operators to maintain uniformity, exactness, and accuracy with the meaning of the original messages in English. In this regard Perry et al. (1983) found that their Mexican American respondents preferred radio over newspapers and television as a source of disaster preparedness, and this finding adds credence to the need to improve the effectiveness of radio messages for Hispanics in the United States.

## CONCLUSION

The Saragosa disaster is a good example of the things that can go wrong with a warning system. There is an important lesson to be learned from this misfortune. The effectiveness of warnings in the United States presupposes either a common shared language and culture or the adaptation of the warning system to a multilingual and multicultural social structure. When, as in the case of Saragosa, these presuppositions prove false, warnings will fail. Public policies and programs to lessen the destructive effects of natural disasters need to examine the cultural heterogeneity of the population they serve and to adjust their services accordingly. Indeed, as Perry (1987, p. 142) indicates, officials in charge of disaster preparedness planning need to develop ethnic profiles of the communities they serve to maximize the effectiveness of their services.

In spite of considerable social scientific work on warning (see Drabek 1986, pp. 70-99 for a thorough review of the literature), much remains to be done. Very little is known of ways in which the dimensions of warning systems (e.g., initial responses, message quality, confirmation and coalescing behavior, organizational and community responses (Drabek 1986) are affected by the ethnic and racial characteristics of target populations. The dearth of social science work on the interrelationships between dimensions of ethnicity and disaster-related experiences is documented in Perry's (1987) exhaustive review of the social science literature on this topic.

We now have the first major study of the experiences of American minority citizens in disasters (Perry et al. 1983), although clearly much remains to be done in this area. There is a special need for holistic analyses of the social organization and culture of ethnic communities and the meaning of disasters and disaster preparedness in these ethnic worlds. The present study shows the importance of some elements of ethnic culture and society and argues for the systematic assessment of these matters in future studies of warning effectiveness and response.

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#### IMPLEMENTATION RESEARCH EARTHQUAKE RISK REDUCTION

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The United States Earthquake Hazard Reduction Act has set an ambitious agenda for the development of earthquake hazard reduction measures, including the development of earthquake prediction systems, and the development of research relating to earthquakes (Public Law 99-170). The enactment of the legislation, policies, and procedures learned about implementing risk reduction measures have not been produced that describe the efforts to take further steps in implementing the program (Federal Emergency Management Agency 1984; 1987). In addition, the panels have turned their attention to implementing the program. A perception that increased earthquake risks has not stimulated research to reduce the risks posed by earthquake hazards.

Largely because of research funds available under the Hazardous Reduction Act, there has been a significant amount of science research in the United States to date. However, to stimulate appropriate governmental action to reduce earthquake risks. In researching the barriers to research, bureaucratic, technical, organizational, and financial barriers impinge on implementation of earthquake hazard reduction research to date evidences a healthy skepticism of theoretical approaches. At the same time, the panels have failed to provide implementation research and somewhat obvious advice.

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