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VOLUME V

LEGAL, INSTITUTIONAL AND ENVIRONMENTAL

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UNITED STATES GULF COAST GEOPRESSURED GEOTHERMAL
RESOURCES MANAGEMENT AND SCOPE-OF-WORK STUDY
FOR GENERATION OF ELECTRIC POWER

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PART 2

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DISCLAIMER

THE DEVELOPMENT OF GEOTHERMAL ENERGY IN THE GULF COAST: SOCIO-ECONOMIC, DEMOGRAPHIC, AND POLITICAL CONSIDERATIONS

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PHASE 0

SCOPE-OF-WORK AND MANAGEMENT STUDY

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CHAPTER I.

THE NATURE OF THE REGION: BASELINE SOCIAL AND DEMOGRAPHIC DATA

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INTRODUCTION

An important aspect of planning for major technological changes or innovations, such as the development of geothermal energy, is consideration of impacts on, and consequences for, individuals in the areas and communities where changes occur. Local and regional factors determine, in large measure, the success of technological developments, and absorb, too, many of the direct and indirect costs of the developments. Early attention to the interrelationships among the technological requirements for, and possible uses of, an innovation or expansion with such variables as local skill levels, wages, tax base, and social infrastructure (e.g., transportation, schools, housing, hospitals) can help in alleviating some of the burdens of development on local communities, and help insure optimal utilization of a resource within a given region. The Phase 0 Scope-of-Work study on geothermal development in the Gulf Coast attempts to identify possible effects of geothermal research, development, and utilization on the area and its inhabitants.

Chapters I and II address key socioeconomic and demographic variables. The present chapter provides an overview of the area where the resource is located. Major data are presented which can be used to establish a baseline description of the region for comparison over time and to delineate crucial areas for future study with regard to geothermal development. Several other more detailed descriptions of the Gulf Coast are available (e.g., Pan American University, 1973; Governor's Office of Information Services, 1974). The present chapter merely highlights some of the variables which reflect the cultural nature of the Gulf Coast, its social characteristics, labor force, and services in an attempt to delineate possible

problems with and barriers to the development of geothermal energy in the region.

The following chapter focuses on the local impacts of geothermal wells and power-generating facilities using data on such variables as size and nature of construction and operating crews. Note is taken of changes which have occurred in areas of California and New Mexico where geothermal-geopressured resources have already undergone development. Tentative projections of local impacts applicable to the Coastal Zone are set forth, and a methodology is developed for future work.

At the conclusion of Part II data from the areas studied--baseline descriptions and regional problems, local impacts of drilling and production--are brought together and summarized in terms of identified problems with geothermal resource development in the region. Included in that list of research also are recommendations from Chapter III on political and institutional considerations. A flow chart is utilized to describe research which is needed in order to exploit the resource as quickly and effectively as possible. Areas of interface among various parts of the research are identified and described. These will include joint research tasks and exchange of data between the social-cultural group and the institutional, legal, environmental, and resource utilization groups.

Definition of the Study Region.

The geothermal zone along the Gulf Coast is embodied in a geographic area with rather erratic boundaries. The study region has been delineated in county units and includes most of the area within the zone. Figure I.1 shows the 36 county area described in this report overlaid on a map of the geothermal configuration of the region. As can be seen from the map, the geothermal resource stretches the entire length of the coastline. At the present stage of study, no definite decision has been made as to test-well sites, although several potential site areas are designated in Figure I.1. The present volume, therefore, attempts to describe the entire Texas Gulf Coast, noting special problems or characteristics in different areas.

The geothermal zones continue across the Louisiana coast, as can be seen from the Phase 0 Resource Assessment report. The present volume focuses on the Texas Gulf Coast, however, for two major reasons. First,

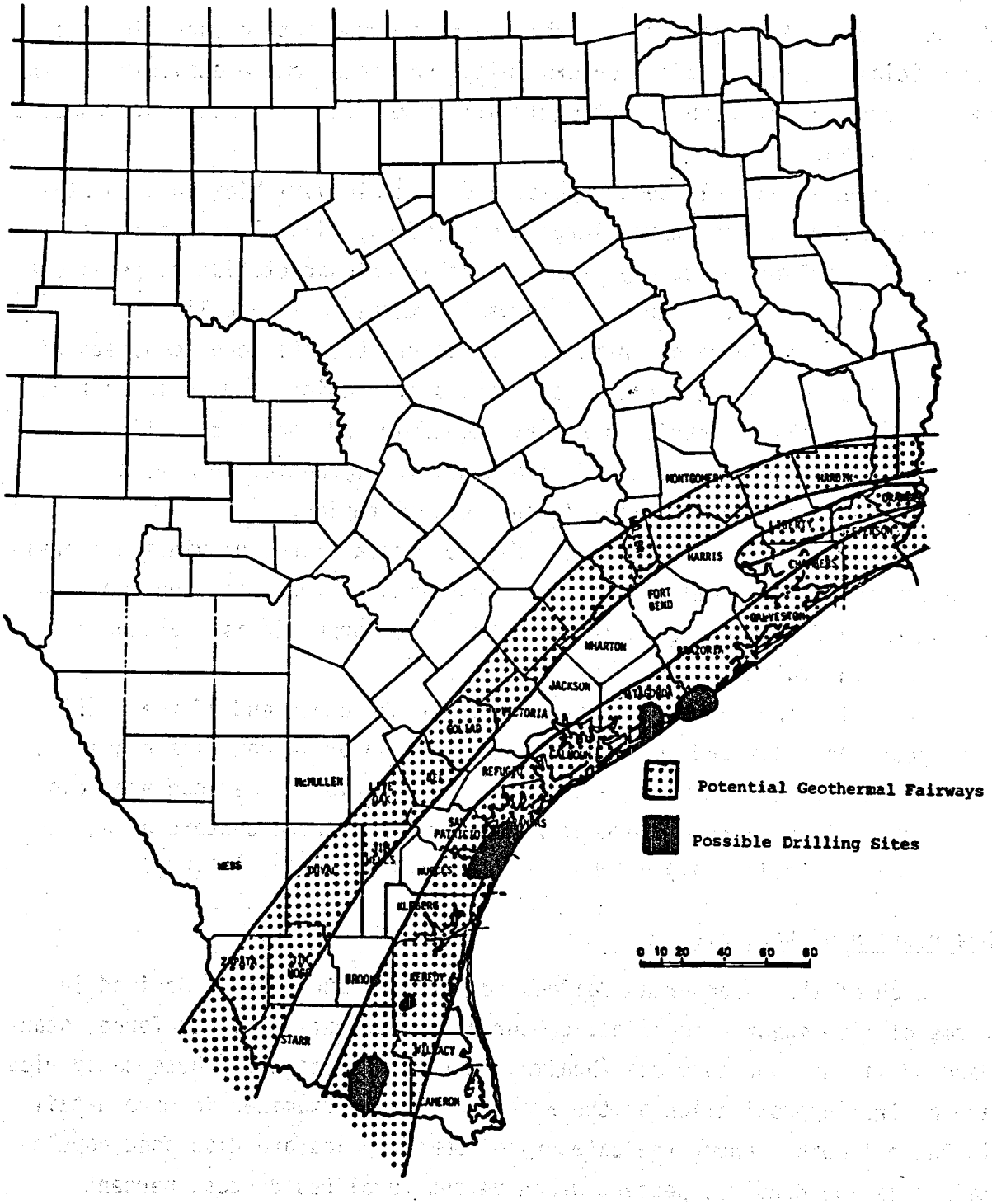


Figure I.1 The Study Area.

a decision was made to cover in detail at least a part of the Gulf Coast in the scope-of-work project rather than to review the entire coast in a more superficial manner. Second, by examining one state comprehensively a methodology could be developed that would allow immediate movement into Phase 1 for both states.

A number of social, demographic, and economic variables on a county-by-county basis suggest three large groups of counties along the Texas coast which differ noticeably from each other in characteristics pertinent to the present study. Figure I.2 shows the three areas and lists the counties included in each. Area I, the Eastern Coastal Zone, consists of the eleven eastern-most counties of the coastal region, and includes three census-designated metropolitan areas. Economic and social conditions, as defined by the variables studied, are consistently better in Area I counties than in other counties in the coastal region.

The eleven county Area II, the Middle Coastal Zone, provides a transition between the economically active urban area to the east, and the rural, economically depressed southern counties. The Corpus Christi Standard Metropolitan Statistical Area is in Area II.

Area III, the Southern Coastal Zone, at the other end of the scale both geographically and economically, is made up of 14 counties closest to the Mexican border. A high percentage of population is Mexican American. The area is largely rural, except for a few urban trade centers along the border and coastline (see Appendix C for detail on area clusters).

Description of Variables.

Each of the three areas delineated for this study are described in terms of five major categories: demographics, education, labor force, standard of living, and services (health and transportation). These categories are a first approximation of the area and must be examined in more detail in Phase 1 work. Under the category of demographics are discussed population size and density, percent urban versus rural residences, percent Black and Mexican American in the population. "Black" in this report is the same as the Census term "Negro" and refers to those who reported their race as Negro or Black in the 1970 Census Survey. The terms "Spanish Heritage" and "Mexican American" are used interchangeably in this report and

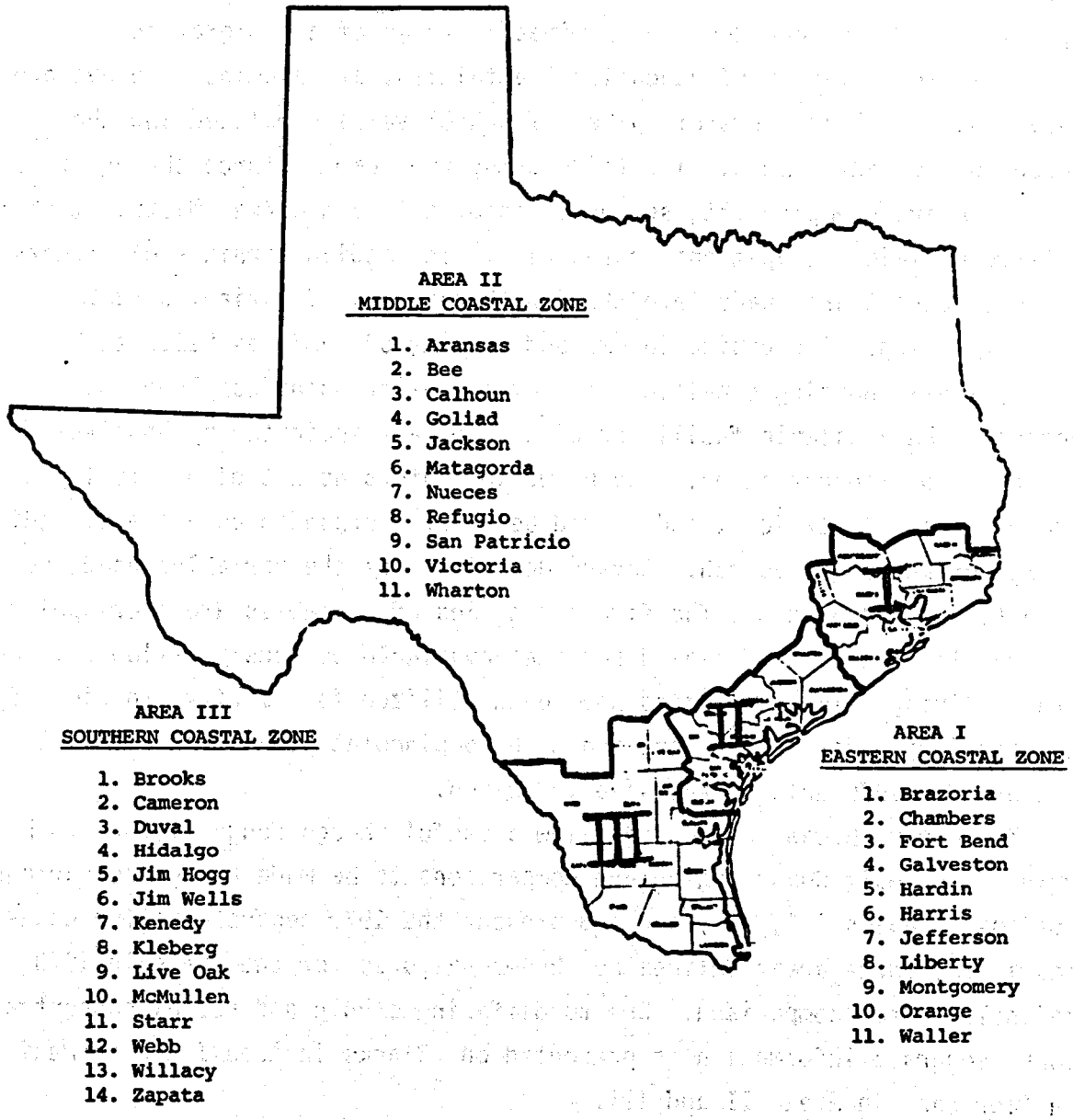


Figure I.2 Texas Counties.

consist of census counts of persons of Spanish language and/or Spanish surname. Those counts no doubt under-report the numbers of Mexican Americans for several reasons; for example, women who marry Anglo men and no longer have a Spanish surname, and Mexican Americans who prefer to "pass" as Anglos. Population changes are examined in terms of net migration.

Under the category of educational attainment are examined the average educational level in terms of number of school years completed and the present school enrollment. The third category--labor force characteristics--covers unemployment, seasonal employment, and worker distribution in terms of major occupational categories. The median earnings of workers in those occupations leads into the fourth category of variables--standards of living. Per capita income and percent of families below the poverty level, housing conditions and extent of crowding complete that section. The available facilities of an area are indicated by hospital services and transportation. These two indicators do not give a full picture of regional services, and should be greatly expanded as a set of indicators for Phase 1 research. Census definition of the variables used are presented in Appendix A. The five categories of variables are overlapping; for example, the type of health services available obviously reflects standard of living. The categories have been utilized for clarity, to simplify the description for the reader, and to help pinpoint problem areas. All data are for 1970 unless otherwise indicated.

These five broad categories allow a useful though rough picture to be drawn of the Gulf Coast region and comparisons to be made among the various sections. Tables I.1, I.2, and I.3 present the 1970 census data for counties in the three areas delineated above. Figures for the state in 1970 are included for comparison. Due to differing ethnic and racial concentrations, separate information is presented on Blacks in Area I and on Mexican Americans in Areas II and III.

AREA I. THE EASTERN COASTAL ZONE

Demographics.

Three Standard Metropolitan Statistical Areas (SMSA) are located in Area I, as can be seen from Figure I.3. The Houston SMSA covers Harris, Liberty, Montgomery, Waller, Ft. Bend, and Brazoria Counties. Galveston County contains the Galveston-Texas City SMSA. Hardin, Jefferson, and Orange Counties constitute the Beaumont-Port Arthur-Orange SMSA. Of the eleven counties in Area I, then, only Chambers County has not yet been included officially in one of the major metropolitan areas. Chambers is, however, 46.4% urban (Waller, by contrast, is only 28.1% urban despite its inclusion in the Houston SMSA). The entire Eastern Coastal Zone is a highly developed urban-industrial center, and constitutes one of the 25 urban regions projected to hold 85% of the total American population by the year 2000 (Pickard, 1972: 143). The region is heavily populated and much of it is densely settled, from a high in Harris County of 1,011 population per square mile to a low in Chambers with 20 people per square mile. Seven of the eleven counties report population densities higher than the state average.

The Eastern Coastal Zone attracts migrants because of the employment opportunities generally associated with urban areas (Fig. I.4). Only Jefferson and Liberty Counties reported more people moving out than moving in during the 1960 to 1970 period. Montgomery County, by contrast, showed a positive net migration of nearly 76% over the decade. Adjoining Harris County, Montgomery has experienced "spill-over" from the Houston suburban growth, evidenced by number of new residential developments (Barnstone, et al., 1974: 39).

The Mexican American population is relatively small in Area I, ranging from 1.3% of the population in Liberty County to 26.6% in Ft. Bend. Area I, on the one hand, contains proportionately fewer Mexican Americans than does the state as a whole. Blacks, on the other hand, represent a sizeable portion of the population in Area I, making up nearly 20% of the total compared to 12.5% for the state population. Because it is the largest minority in Area I (see Figure I.5), we have included separate figures on the Black population in Table I.1.

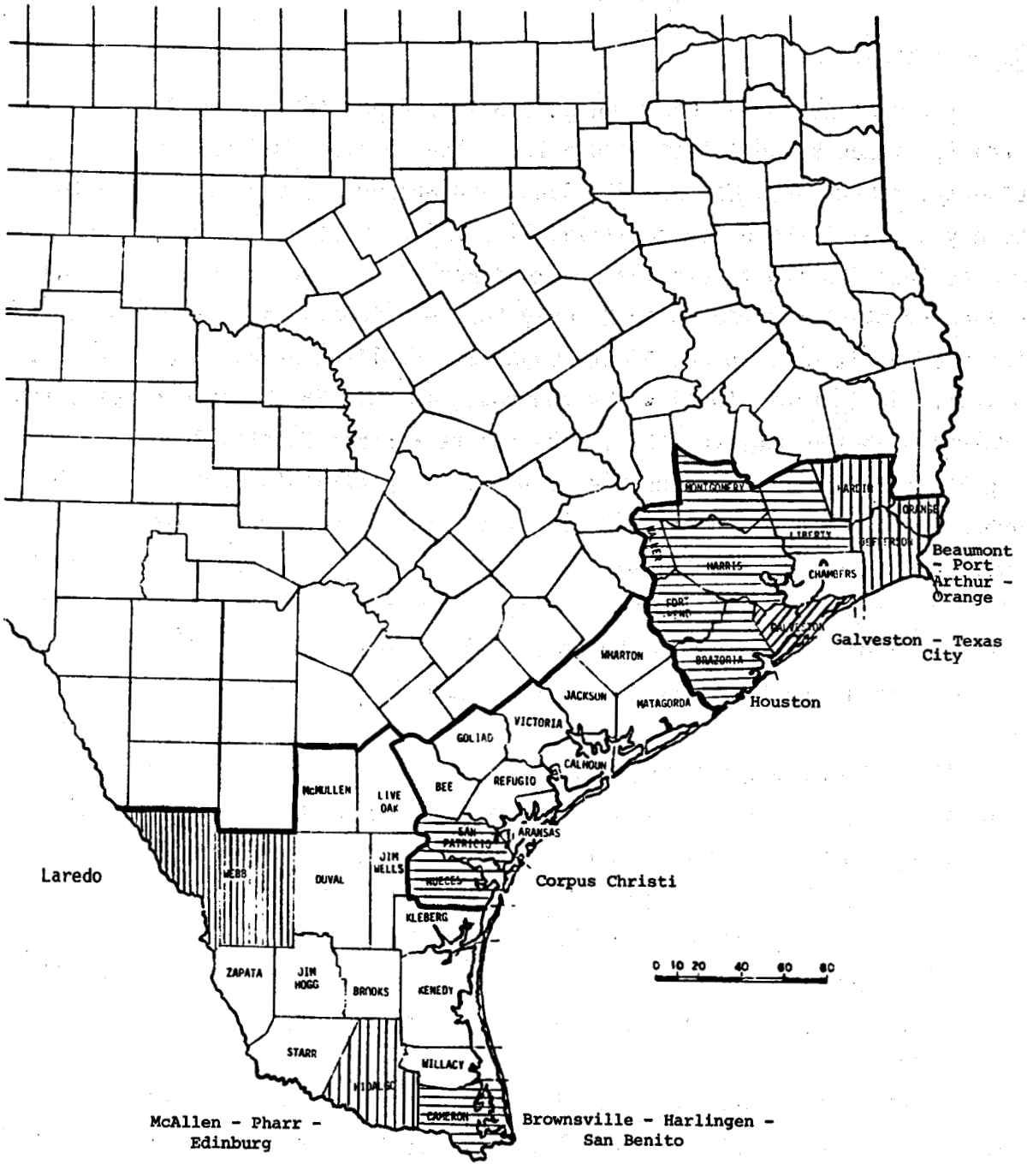


Figure I.3 Standard Metropolitan Statistical Areas.

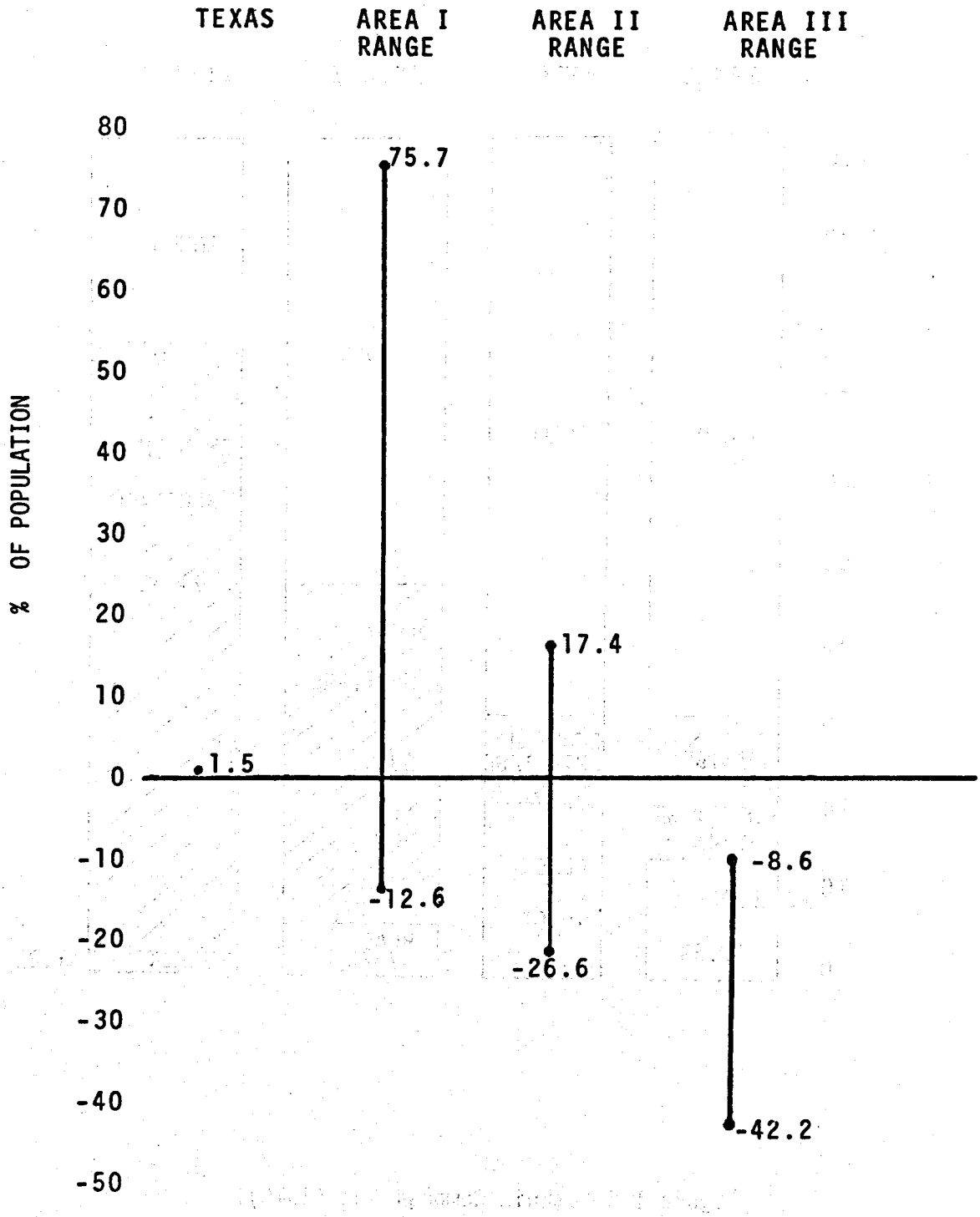


Figure I.4 Net Migration 1960-1970.

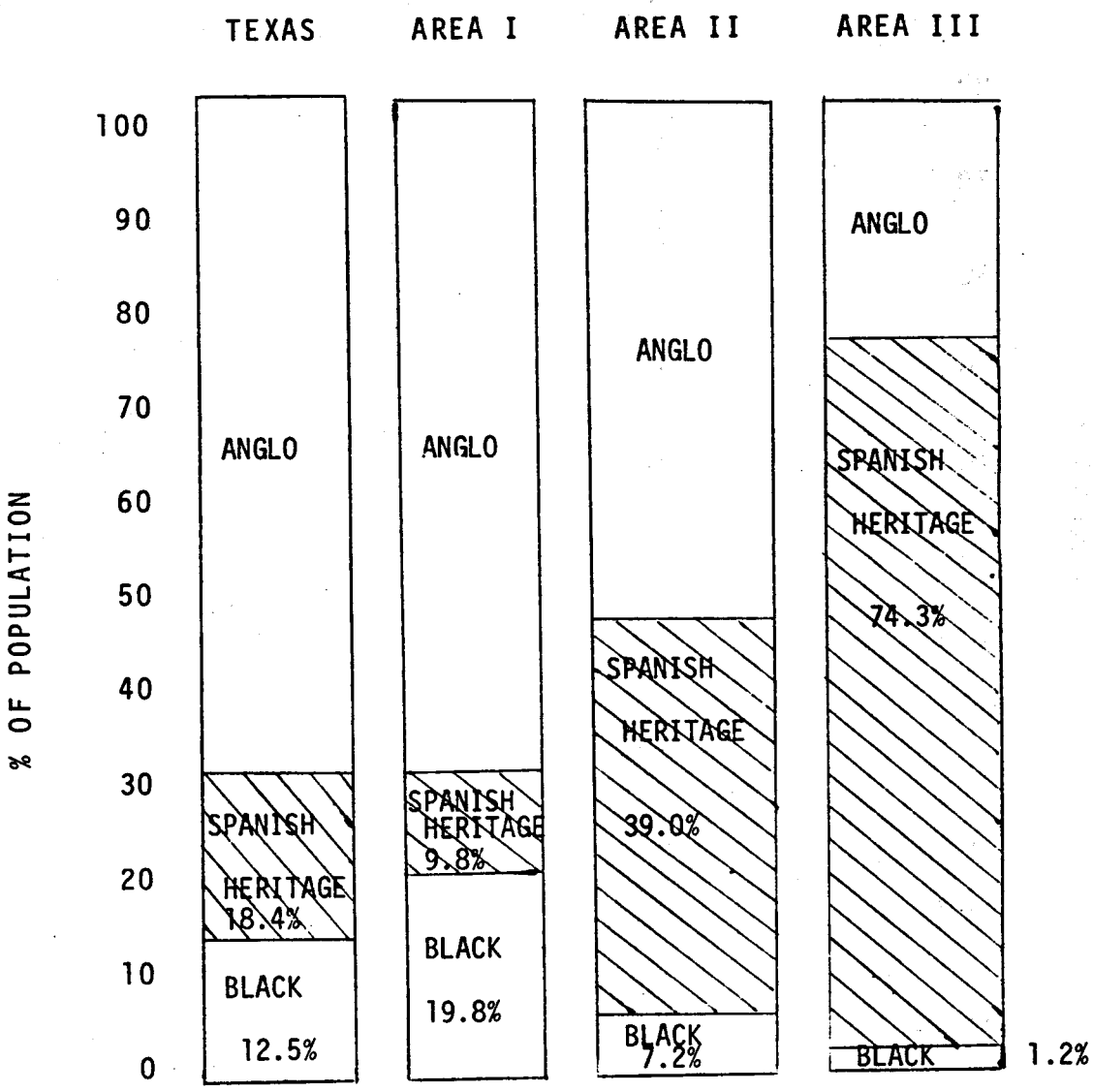


Figure I.5 Ethnic Composition (1970).

Education.

In terms of the median number of school years completed, Area I falls slightly behind state averages for both Blacks and the total population (Fig. I.6). Most counties in Area I, however, rank slightly higher than the state average of 52.1% for total population age 3 - 34 enrolled in school, ranging from 49% to 66.7%. The same is true for the Black population, with a range of 47.5% to 76.6% enrolled, compared to the state average of 53% (Fig. I.7).

Labor Force.

Area I had, in 1970, unemployment rates for total population and Blacks that were slightly higher than state averages. (Fig. I.8: in July, 1975, however, seven of the eleven counties in Area I reported unemployment rates considerably lower than the state figure of 6.5 [Texas Employment Commission, 1975]). Employment in Area I appears to be somewhat steadier than in the state as a whole since the part-time labor force (those working 26 weeks or less in a year) is smaller. Blacks represent less than their proportionate share of the labor market with approximately 18% of the total employed compared to 20% of the total population.

The labor force structure in Area I closely approximates the over-all state distribution, with some slight upward shift toward the top three categories in Figure I.9. The urban industrial nature of Area I is clearly demonstrated in the low rates of agricultural employment. Despite the over-all trend, several counties in Area I are still heavily based on agriculture. Conspicuous here are Brazoria and Ft. Bend Counties which have extensive rice cultivation.

Standard of Living.

As might be expected from the occupational distribution, Area I has higher median earnings than the state average. This comparison does not hold for Blacks, but that is primarily due to the particularly low median earnings reported for Blacks in Waller County. Waller is 52.6% Black, and unlike the area as a whole, shows a high degree of part-time Black employment. Agriculture claims many of these workers, with 6.7% of the Black labor force in farm-related work compared to 1.1% for Area I. Over

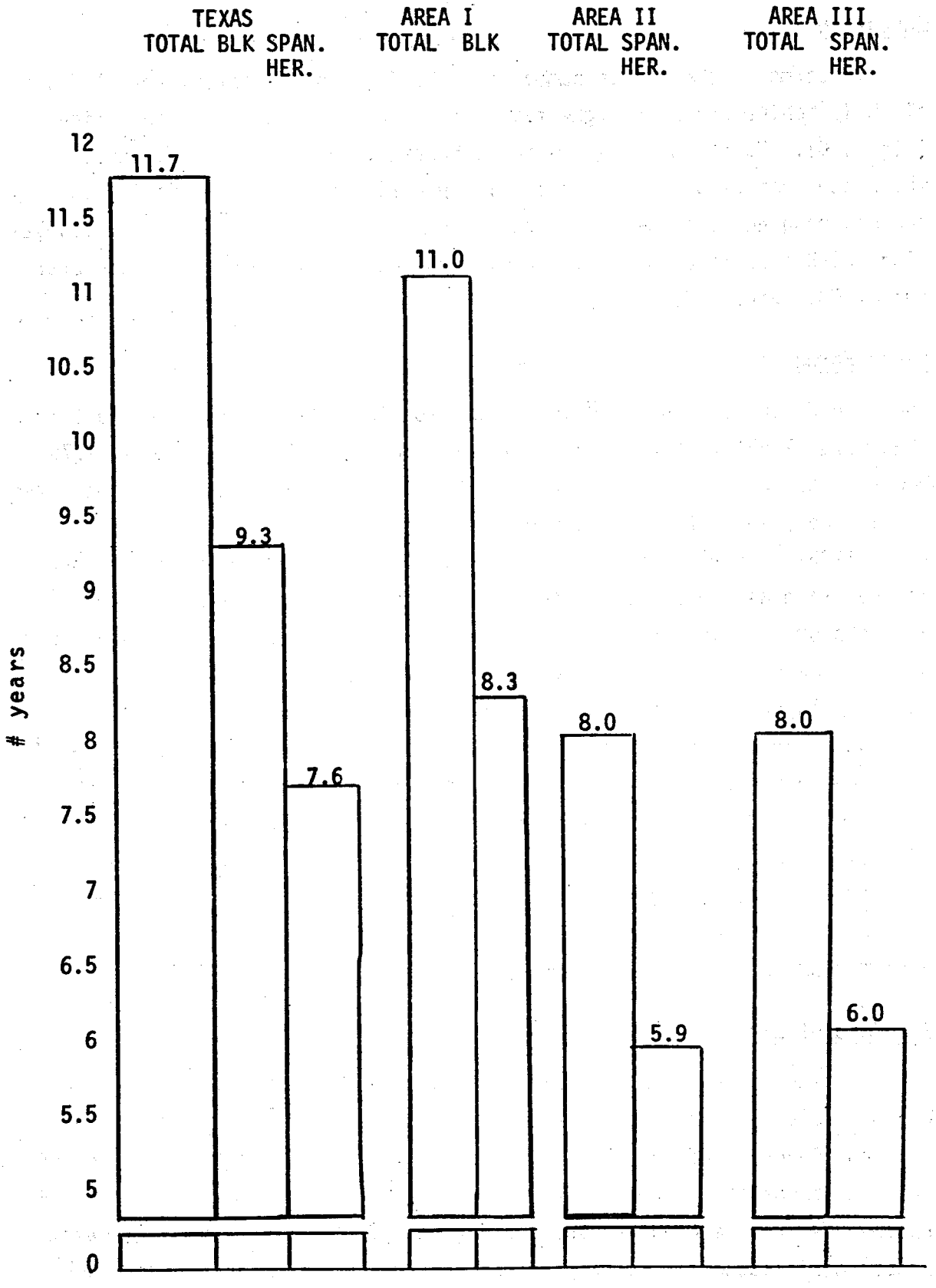


Figure I.6 Median school years completed (males 25 & older in 1970).

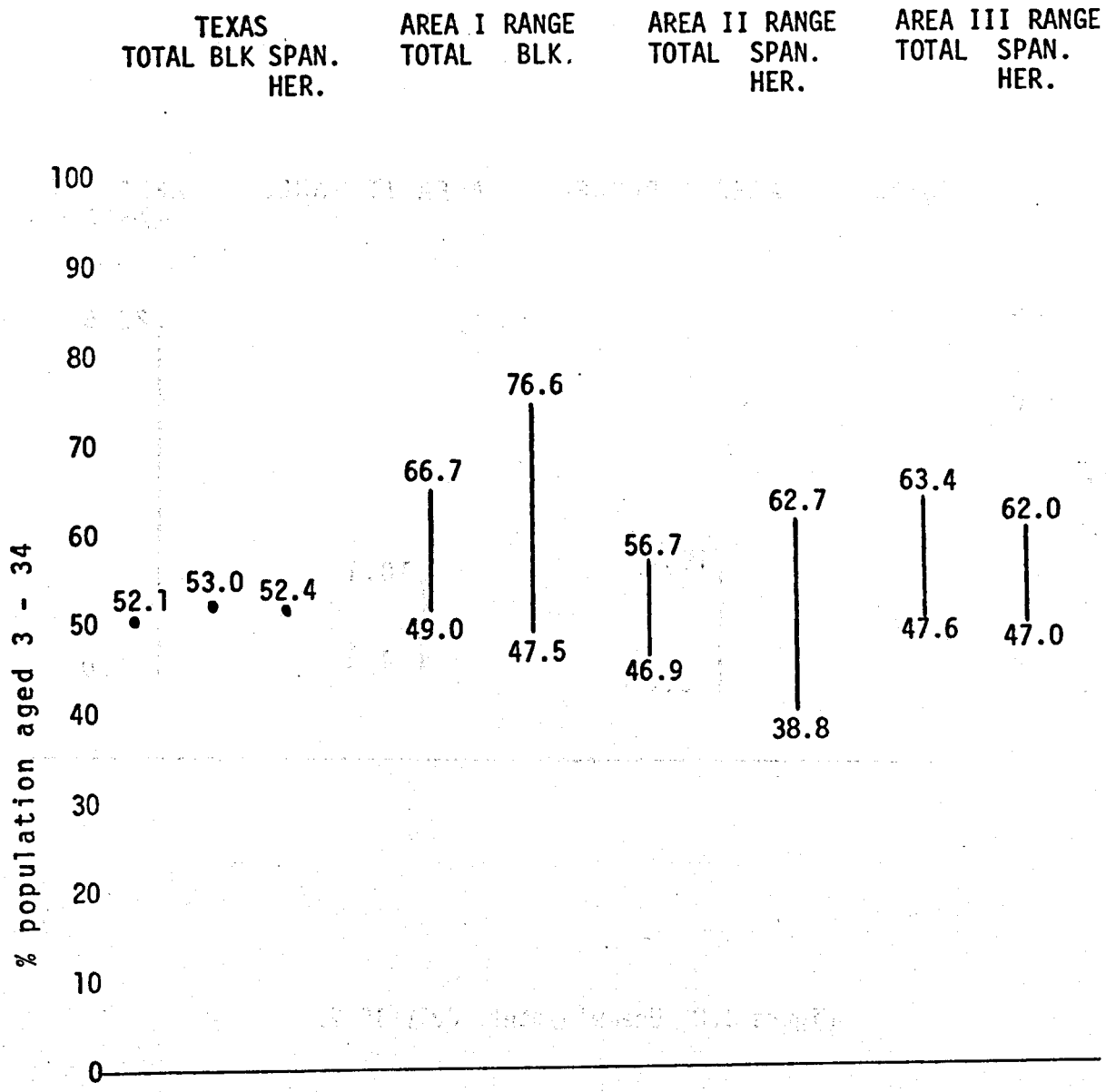


Figure I.7 Population age 3-34 enrolled in school.

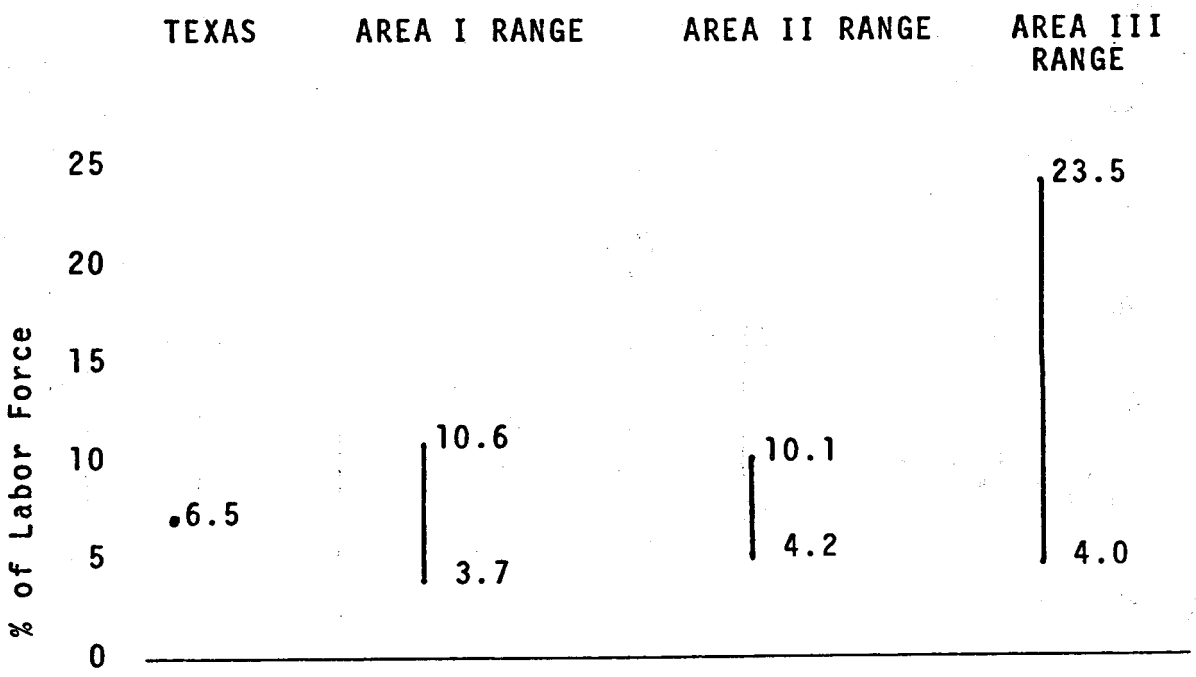
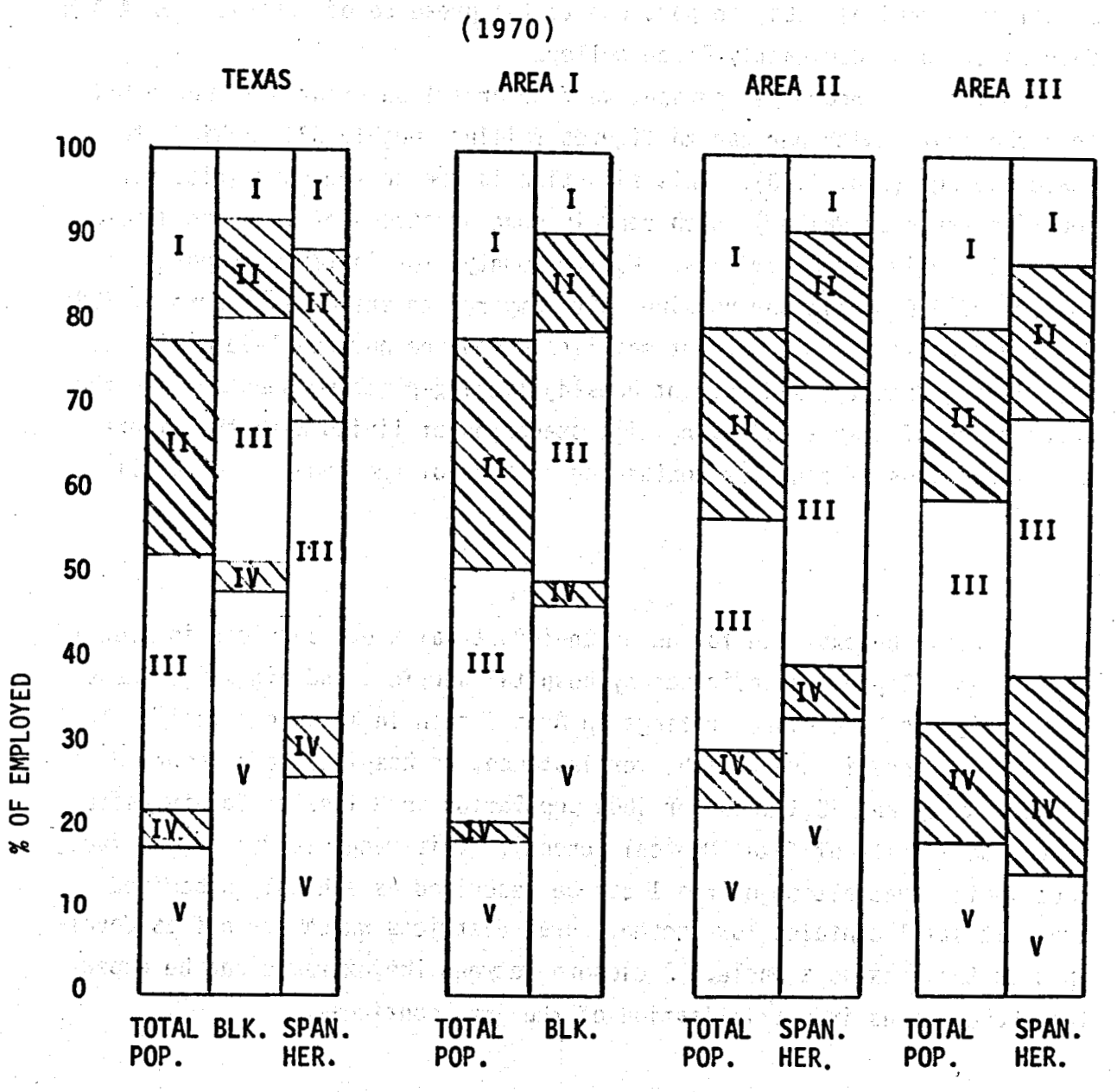


Figure I.8 Unemployment, July 1975.



I. Professional, Technical, Managerial, Administrative
II. Clerical, Sales
III. Craftsmen, Foremen, Operatives, Transport
IV. Farmers, Farm Managers, Farm Labor and Foremen
V. Laborers, Service Workers, Private Household Workers

Figure I.9 Occupational Distribution (1970).

twenty-three percent of Blacks employed in Waller County are in professional or technical jobs, in part due to the presence of Prairie View A & M University, a predominantly Black college.

Looking at income per person, we find Area I substantially worse off than the state, with per capita figures falling roughly $200 behind the state average (Fig. I.10). This situation is due to the statistics for counties (such as Waller) which contain concentrations of low-paid Blacks with relatively large families. Waller County, for instance, reports an average of 3.9 people per housing unit compared to the Texas figure of 3.2. Other variables such as percent families below the poverty level (Fig. I. 11), living density, and percent housing lacking plumbing substantiate the description of Area I as having high standards of living with the important exceptions of counties containing pockets of the low-income racial minority.

Services.

As would be expected for an urban-industrial area, services in Area I are well-developed, as indicated by hospital services and highway mileage. Both variables have higher ratings in Area I than in Texas generally. The intra-area range is great with, for instance, no hospital beds reported in Waller County and 10.1 beds per 1000 population in Galveston County (site of the University of Texas Medical School). This range is due to the fact, once again, that although Area I can be described as a highly urbanized area, it still contains low-income, rural districts which are not as developed as the area as a whole. A closure between the extremes can be expected, however, as industrialization of the area continues.

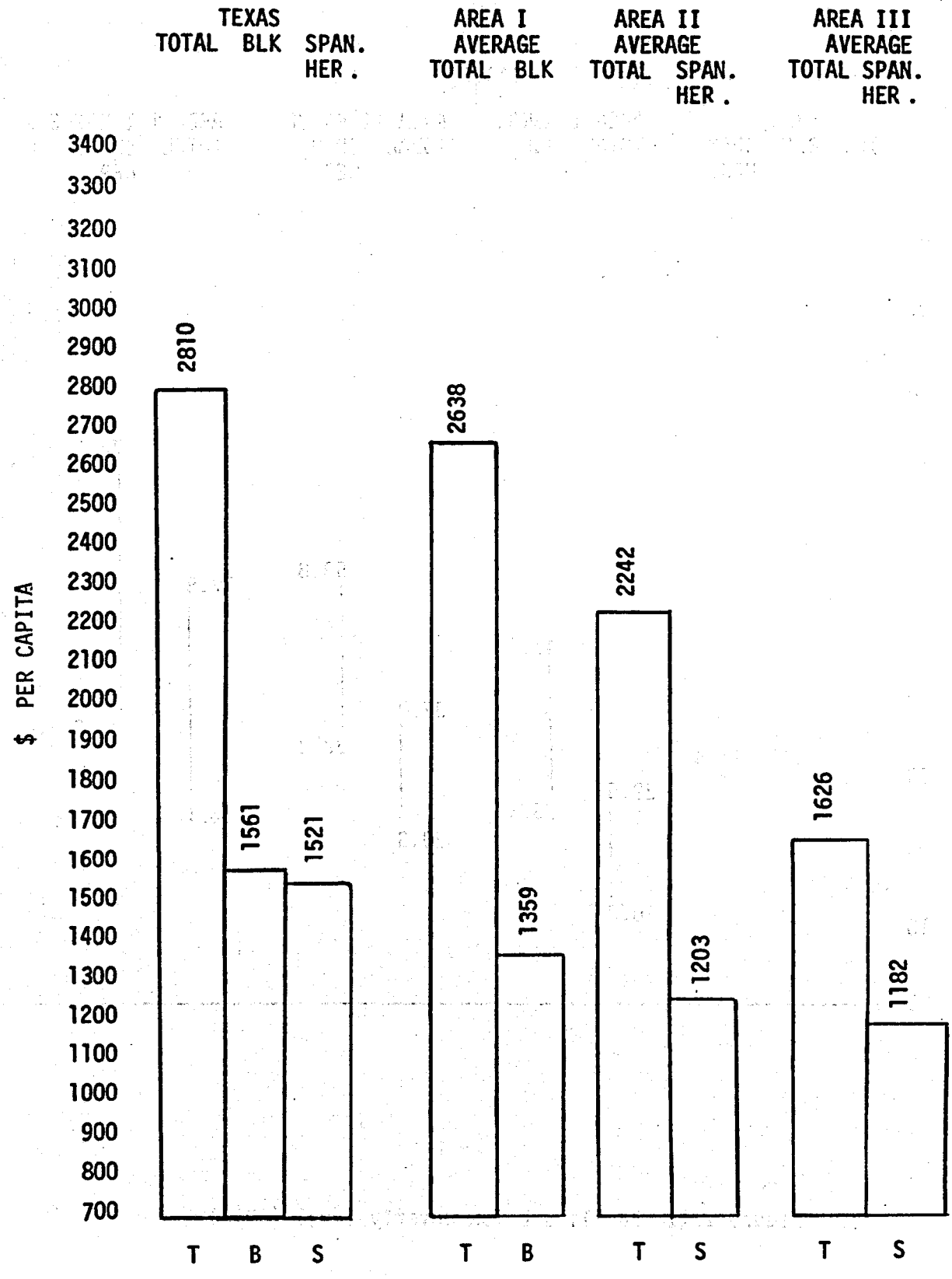


Figure I.10 Per capita income (1970).

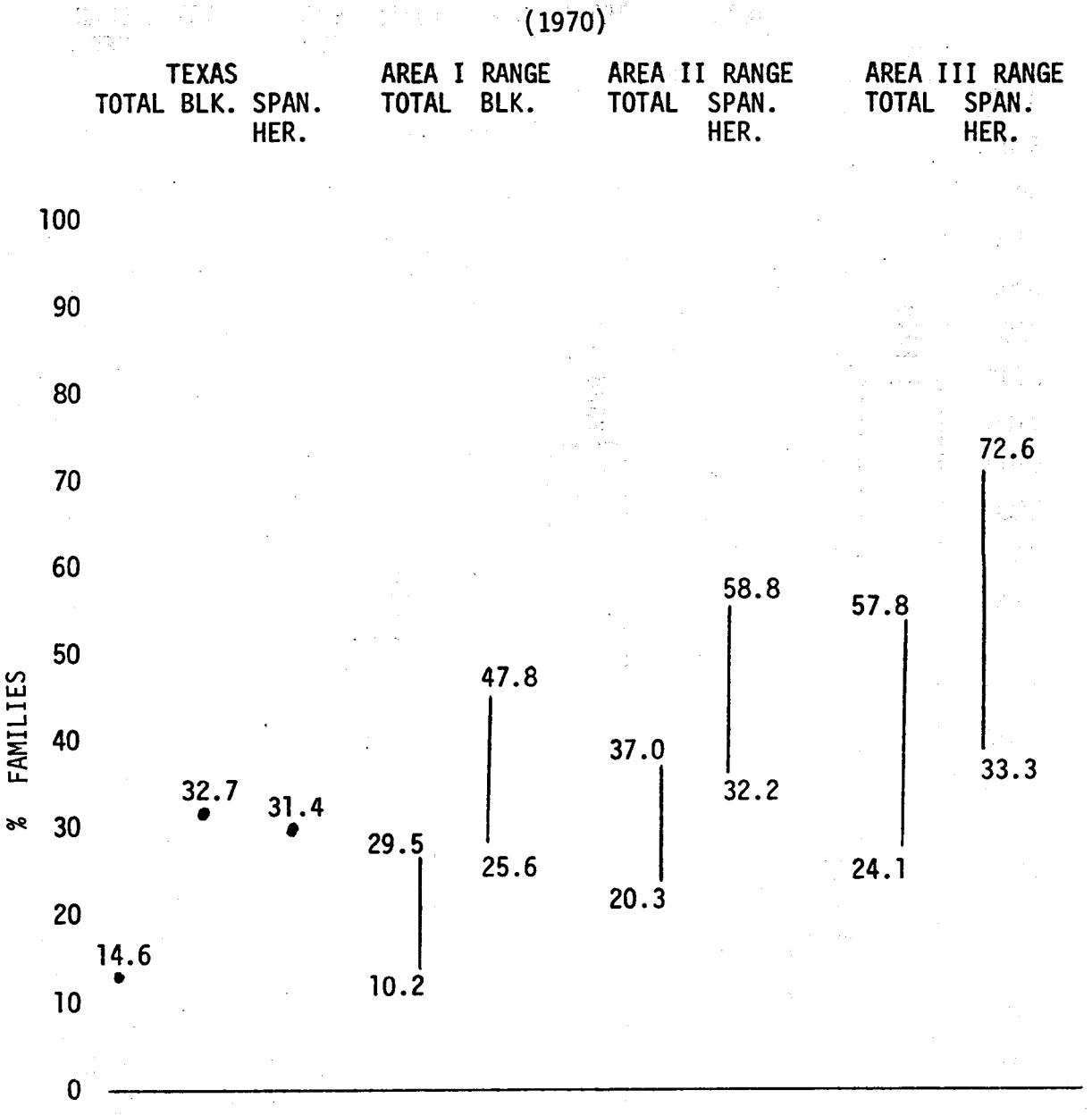


Figure I.11 Families below poverty level (1970).

Table I.1

AREA I. EASTERN COASTAL ZONE

	TEXAS	AREA I	BRAZORIA	CHAMBERS	FT. BEND	GALVESTON	HARDIN	HARRIS	JEFFERSON	LIBERTY	MONTGOMERY	ORANGE	WALLER
I. Demographic													
Population Total	11,195,431	2,527,308	108,312	12,187	52,268	169,812	29,996	1,741,912	244,817	33,014	49,479	71,226	14,285
Population per square mile	43		76	20	60	426	33	1,011	259	28	45	198	28
% Urban	79.8		61.3	46.4	55.3	89.9	25.7	95.5	95.0	45.5	24.2	66.3	28.1
% Net Migration (1960-1970)	1.5		10.4	6.1	8.9	7.8	8.9	21.6	-12.6	-9.7	75.7	1.0	10.6
Birth Rate	19.3		19.3	19.0	19.6	18.1	19.2	21.6	16.9	20.9	16.4	18.9	14.7
Death Rate	8.5		5.8	8.9	6.5	8.5	9.2	6.9	8.9	11.8	8.7	7.1	9.5
% Spanish Heritage	18.4	9.8	9.9	3.8	26.6	12.0	1.6	10.7	4.5	1.3	3.3	3.1	3.5
% Black	12.5	19.8	9.9	20.4	16.9	19.6	15.2	20.2	24.9	21.1	12.4	9.2	52.6
II. Education													
% Population 3-34 enrolled													
Total population	52.1		52.6	49.9	49.0	55.5	49.9	51.9	58.3	50.1	49.7	53.0	66.7
Black population	53.0		48.9	49.0	51.4	58.1	55.5	52.4	57.2	56.2	47.5	56.2	76.6
Median School Years Completed													
All Males	11.7		12.1	10.5	9.5	11.4	10.6	12.2	11.8	9.8	11.4	11.5	10.5
Black Males	9.3		8.7	6.4	8.1	9.2	8.1	9.9	8.4	7.1	7.6	8.6	8.9
All Females	11.6		12.1	10.5	9.8	11.6	10.8	12.1	11.5	10.3	11.3	11.2	11.3
Black Females	10.0		8.8	8.6	8.4	10.2	9.3	10.6	9.4	8.6	9.0	9.2	10.2
III. Labor Force													
% Civilian Work Force Unemployed 1970													
All Males	3.0		2.0	3.1	2.0	3.2	3.7	2.4	3.3	3.2	2.4	3.5	4.6
All Females	4.7		4.9	3.9	3.5	4.7	7.8	4.0	6.4	5.5	3.2	7.9	4.1
Black Males	4.9		4.4	6.5	3.8	4.8	5.4	3.8	7.3	7.3	3.1	7.8	7.5
Black Females	7.0		12.1	5.3	5.6	8.1	11.4	6.2	11.6	11.9	5.3	9.5	4.7
% Unemployed, July 1975	6.5		4.4	3.7	3.8	5.6	10.6	5.3	9.3	6.0	4.0	10.3	6.7
Male Workers, weeks worked in 1969													
Total # Workers	3,088,769	697,938	30,870	3,394	1,389	47,195	7,606	495,942	67,293	8,355	12,984	19,133	3,777
Total # Black Workers	314,950	114,672	2,252	573	1,878	7,466	848	82,554	13,306	1,411	1,153	1,316	1,915
% Working 27-52 Weeks													
All Workers	87.2	88.6	88.2	86.3	85.4	87.2	91.0	89.0	87.9	87.5	90.2	89.6	68.5
Black Workers	84.7	85.7	73.6	83.6	77.8	83.4	88.7	87.0	86.8	87.3	90.2	82.6	49.7
% Working 26 weeks or less													
All Workers	12.8	11.4	11.8	13.7	14.6	12.8	9.0	11.0	12.1	12.5	9.8	10.4	31.5
Black Workers	15.3	14.3	26.4	16.4	22.2	16.6	11.3	13.0	13.2	12.7	9.8	17.4	50.8

Table I.1 (cont'd.)

	TEXAS	AREA 1	BRAZORIA	CHAMBERS	FT. BEND	GALVESTON	HARDIN	HARRIS	JEFFERSON	LIBERTY	MONTGOMERY	ORANGE	WALLER
Occupational Categories													
Total Employed	4,141,529	995,871	39,811	4,291	17,887	65,011	10,061	711,749	89,848	10,884	17,090	24,428	4,811
Black Employed	475,660	178,176	2,871	785	2,476	11,862	1,221	131,372	19,447	1,999	1,780	2,150	2,213
Black as % of Total Employed	11.5	17.9	7.2	18.3	13.8	18.2	12.1	18.5	21.6	18.4	10.4	8.8	46.0
Professional, Technical													
% of All Employed	14.3	16.1	13.6	12.9	10.2	17.3	11.6	16.9	14.5	9.0	12.8	12.7	19.0
% of Black Employed	7.2	7.8	4.4	2.2	2.9	8.4	2.5	8.0	6.4	3.1	5.1	4.7	23.6
Managers, Administrators													
% of All Employed	8.7	8.5	7.7	6.8	7.2	7.4	7.6	8.9	7.9	7.4	10.2	6.7	6.5
% of Black Employed	2.1	2.3	3.0	1.5	3.1	1.6	3.3	2.3	2.3	3.7	.6	1.4	2.6
Sales Workers and Kindred													
% of All Employed	7.8	8.0	4.8	5.7	5.5	6.3	5.6	8.7	6.9	5.4	6.6	6.5	4.4
% of Black Employed	1.9	2.3	.5	2.4	2.5	2.2	.5	2.5	2.0	.8	.3	1.7	.6
Clerical Workers & Kindred													
% of All Employed	17.4	18.0	12.3	10.3	12.7	16.7	10.5	19.5	14.9	11.9	13.6	12.7	13.5
% of Black Employed	8.8	10.1	2.4	2.2	4.8	8.0	3.8	11.4	6.9	5.3	2.8	4.1	12.7
Craftsmen, Foremen													
% of All Employed	14.3	15.8	21.5	17.8	16.9	17.1	22.3	14.6	17.5	17.9	21.1	25.4	10.4
% of Black Employed	8.8	9.5	7.5	8.3	8.2	7.6	10.7	9.8	9.7	8.6	8.1	8.0	5.6
Operatives (excl. Transport)													
% of All Employed	11.1	10.5	13.4	11.4	14.8	10.4	16.7	9.6	12.7	13.0	10.5	15.1	7.0
% of Black Employed	14.3	12.0	10.8	11.2	13.4	9.4	16.5	12.3	12.4	9.6	9.9	11.6	6.4
Transport Equipment Operatives													
% of All Employed	4.0	3.9	3.5	3.4	3.6	3.1	4.6	4.0	3.8	6.6	5.6	3.1	3.1
% of Black Employed	6.9	8.4	6.7	3.9	6.4	6.0	6.6	9.0	6.9	9.5	10.6	2.8	2.8
Laborers (excl. Farm)													
% of All Employed	4.9	5.3	5.8	6.0	7.3	6.4	8.3	4.9	6.6	8.9	6.2	5.9	6.2
% of Black Employed	11.3	13.1	18.4	11.2	15.2	15.8	21.1	13.5	16.3	20.8	16.6	21.3	10.2
Farmers, Farm Managers													
% of All Employed	2.0	.5	1.1	5.1	4.4	.2	.5	.2	.3	2.3	.7	.4	5.4
% of Black Employed	.4	.2	.4	--	2.0	.1	--	.2	.1	1.0	.2	.2	1.3
Farm Laborers, Foremen													
% of All Employed	2.0	.4	1.1	6.2	3.5	.3	.3	.2	.4	3.4	1.6	.3	6.2
% of Black Employed	2.3	.9	4.8	19.5	6.7	.8	.9	.4	1.1	4.6	4.6	1.0	5.4

Table I.1 (cont'd.)

	TEXAS	AREA I	BRAZORIA	CHAMBERS	FT. BEND	GALVESTON	HARDIN	HARRIS	JEFFERSON	LIBERTY	MONTGOMERY	ORANGE	WALLER
Service Workers													
% of All Employed	11.1	10.7	10.5	11.0	11.0	12.8	9.5	10.5	11.9	10.6	9.0	9.4	13.4
% of Black Employed	23.8	23.5	22.6	21.9	18.9	31.5	19.2	22.9	24.9	17.6	22.0	28.0	18.9
Private Household													
% of All Employed	2.2	2.1	2.2	3.4	3.0	2.0	2.4	2.0	2.5	3.7	2.2	1.6	5.0
% of Black Employed	12.1	10.0	18.5	15.7	15.8	8.7	15.0	9.4	10.4	15.8	17.8	15.0	9.9
IV. Standard of Living													
Median Earnings													
For All Males	6,824		8,853	7,550	6,576	8,024	7,557	7,981	7,860	6,794	7,738	8,311	4,964
Black Males	4,518		4,708	3,490	4,141	4,765	4,847	5,252	5,009	4,611	3,845	4,860	2,738
Earnings--Males in Selected Occupations													
Professional, Managerial													
Total	10,106		11,364	9,402	9,504	11,342	8,846	11,645	10,653	8,852	10,627	10,043	9,049
Black	6,681		6,810	...	...	6,382	...	7,284	6,759	...	...	...	3,556
Craftsmen, Foremen													
Total	7,260		9,558	8,641	7,634	8,650	8,099	8,192	8,629	7,532	8,023	9,195	6,606
Black	5,137		6,141	...	5,917	5,300	5,739	5,659	5,647	5,974	4,310	5,758	5,208
Operatives, Transport													
Total	5,956		8,631	7,944	6,336	7,596	7,591	6,788	7,616	6,698	6,940	7,957	5,105
Black	4,950		4,946	...	4,733	4,773	5,585	5,573	5,372	4,605	3,877	5,649	3,625
Laborers (excl. Farm)													
Total	3,636		4,351	3,853	4,205	4,644	4,271	4,302	4,482	3,926	3,714	5,031	2,143
Black	3,955		4,338	...	4,391	4,703	3,793	4,620	4,687	4,303	3,836	4,329	1,747
Farmers, Managers													
Total	4,705		5,367	6,167	3,673	7,192	...	5,235	5,417	3,420	6,600	...	4,275
Black	1,198		...	--	...	...	--	2,602	...	...	...	--	...
Farm Laborers, Foremen													
Total	2,607		3,024	3,008	2,544	2,441	...	2,832	2,542	3,485	1,957	...	3,313
Black	2,003		2,548	2,821	1,750	...	...	2,385	2,271	...	...	...	3,029
Median Earnings													
For All Females	3,241		3,202	2,433	2,922	3,239	2,823	3,637	2,885	2,594	3,066	3,002	1,711
Black Females	2,182		1,225	1,493	1,809	2,225	1,534	2,443	1,707	1,342	1,213	1,526	988

Table I.1 (cont'd.)

	TEXAS	AREA I	BRAZORIA	CHAMBERS	FT. BEND	GALVESTON	HARDIN	HARRIS	JEFFERSON	LIBERTY	MONTGOMERY	ORANGE	WALLER
Earnings--Females in Selected Occupations													
Clerical													
Total	3,879		4,022	3,667	4,003	3,761	3,681	4,324	3,597	3,539	3,722	3,632	2,429
Black	2,951		...	...	...	2,628	...	3,144	2,497	...	...	...	722
Operatives, Transport													
Total	3,142		2,736	...	3,176	2,847	3,054	3,162	2,219	2,750	2,678	2,787	785
Black	3,026		...	...	....	2,314	...	2,726	1,638	...	...	...	...
Per Capita Income													
Total Population	2,810		2,903	2,584	2,227	3,023	2,365	3,391	2,887	2,276	2,663	2,740	1,955
Black Population	1,561		1,243	1,158	1,144	1,655	1,315	1,785	1,54[illegible]	1,190	1,315	1,339	1,262
% Families Below Poverty													
Total Population	14.6		10.2	21.8	21.3	14.0	18.7	12.2	15.4	22.6	17.4	12.3	29.5
Black Population	32.7		35.0	46.4	42.1	29.3	36.1	25.6	32.6	42.1	47.8	34.0	38.8
Housing													
Persons Per Unit	3.2		3.5	3.1	3.7	3.2	3.2	3.2	3.2	3.1	3.3	3.4	3.9
% with 1.01 + per Room	11.1		10.9	10.5	17.7	9.6	11.5	9.6	9.1	11.8	10.5	11.3	12.1
Rooms Per Unit	4.8		4.9	4.9	4.9	4.7	4.9	4.9	5.0	4.7	4.8	4.9	4.8
% Lacking Plumbing	6.0		4.9	12.3	14.6	3.0	11.4	1.8	3.1	13.3	11.6	3.1	20.5
V. Services													
Hospital Beds per 1000	3.5		2.3	6.2	2.6	10.1	3.4	4.8	5.2	3.5	2.0	2.8	0.0
State Highway Mileage	256.5		393.1	234.3	330.3	245.6	229.7	558.1	271.2	349.1	358.5	178.9	206.5

AREA II. THE MIDDLE COASTAL ZONE

As mentioned earlier, the Middle Coastal Zone is an area of transition between the eastern urban area and the economically depressed counties to the south.

Demographics.

The Middle Coastal Zone is neither particularly densely populated, nor is it a highly urbanized area. Only three counties surpass the state average population density. Nueces County, which contains the only major metropolitan center in Area II--Corpus Christi (estimated population 215,000 as of April, 1973)--is the most densely settled county in this part of the coastal zone and is the only county more urbanized than the state average. Nueces and San Patricio Counties constitute the Corpus Christi SMSA. Neighboring Live Oak, Jim Wells, and Aransas Counties are influenced by the metropolitan activities of the Corpus SMSA, but the entire Middle Coastal Zone remains predominantly agricultural.

In contrast to Area I, the Middle Coastal Zone has been characterized by a significant degree of out-migration. Only one county, Aransas, gained population through migration during the period 1960 to 1970. The Middle Coastal Zone population is more than one-third Mexican American and only 7.2 percent Black. The Black population is concentrated in the eastern counties and becomes proportionately less in the southern counties of this area. The Mexican American population, on the other hand, increases as one looks down the coast. These minority distributions reflect the transition from the Eastern Coastal Zone which supports a high percentage of Blacks to the Southern Coastal Zone with a majority of Mexican Americans. Data in Area II are given for the population as a whole and for the Mexican American minority.

Education.

The Middle Coastal Zone lags somewhat behind state averages of school years completed, both for the total population and the Mexican American sub-group. In terms of present population enrolled in school, however, the figures for Area II are roughly the same as state figures.

Labor Force.

Unemployment in the Middle Coastal Zone varies substantially by county. Total male unemployment in 1970 was less than two percent in Jackson and Calhoun Counties, while it was nearly five percent in Goliad County. Mexican American male unemployment is consistently higher, ranging from 2.3 percent in Jackson to 9.1 percent in Goliad. Female unemployment for both the total and the Spanish Heritage populations is higher than for males and considerably higher than state figures. July, 1975, unemployment rates ranged from 4.2% in Wharton County to 10.1 in Calhoun County. The more industrialized Corpus Christi area (Nueces and San Patricio Counties) also reported higher rates than the 6.5 state figure. Part-time employment is less in Area II than for Texas as a whole.

The occupational distribution in the Middle Coastal Zone is more heavily skewed toward the lower end compared to the Eastern Coastal Zone, and this trend is even more pronounced in Area III, as will be seen. Professional, managerial, as well as skilled labor jobs grow fewer down the coast, with semi-skilled and unskilled labor, and, in particular, farm-related occupations increasing.

Almost a third of the employed in Area II are Mexican American, with those workers being disproportionately represented in lower-level occupations. For example, approximately 22 percent of the Area II labor force are in professional and managerial occupations and 18 percent are in labor and service jobs. Roughly 11 percent of all Mexican American workers are employed in professional and managerial positions, while over one-fourth are in service and labor occupations. Over five percent of the active labor force are in farm-related work, compared to a state average of four percent and an average of less than one percent in the neighboring Eastern Coastal Zone. The incidence of farm employment among Mexican Americans is particularly notable, with a high of 27 percent in Goliad County. Only in the two most urbanized counties, Nueces and Victoria, has Mexican American farm labor declined significantly below the state average. (Aransas County has a substantial fishing business, and shows negligible employment in agriculture).

Standard of Living.

The occupational distribution is reflected in median earnings. Area II counties lie below state averages, both for the population as a whole (except Calhoun County) and for the Spanish Heritage population (except Calhoun and Nueces Counties). Even more interesting, perhaps, is to note the drop from the male median earnings figures ranging from $4,964 to $8,853 in Area I, to a range of $3,852 to $7,230 in Area II. Earnings of the Mexican American population are consistently lower than for the total population for both males and females.

Per capita income is substantially lower than state figures, with a total population range from $1,997 to $2,585 and a Spanish Heritage range from $872 to $1,473. As might be expected then the incidence of poverty is high: from 20.3 to 37 percent of all families in Area II counties fall below the census-defined poverty level, compared to the state average of 14.6 percent; from 32.2 to 58.8 percent of Spanish Heritage families are so classified compared to the Texas figure of 31.4 percent.

The low incomes in the Middle Coastal Zone are reflected in housing quality. Housing in this area is overcrowded when compared to state averages. In Texas, slightly more than 11 percent of all units house more than an average of one person per room; all Area II county percentages are higher than this, up to 21 percent in San Patricio County. Moreover, a significant portion of Area II housing is substandard, as indicated by percent units lacking some or all plumbing: as high as 26.6 percent in Goliad County, compared to the state figure of 6 percent.

Services.

From the rice-farming counties bordering Area I to the agricultural land which encircles Corpus Christi, Area II has a farm-based economy. Oil and gas production significantly supplement agricultural production. The industrial developments in Corpus Christi mark a turn, however, toward a manufacturing-oriented base. As the Middle Coastal Zone develops in that direction, services in the area increase. In terms of state highway mileage, for example, the area appears to be generally as well served as the rest of the state. Personal services are also developing; medical

care, measured in terms of the number of hospital beds for each 1000 population, is on a par with the state, although some counties appear to be individually lacking in hospital services.

Table I.2

AREA II. MIDDLE COASTAL ZONE

	TEXAS	AREA II	ARANSAS	BEE	CALHOUN	GOLIAD	JACKSON	MATAGORDA	NUECES	REFUGIO	SAN PATRICIO	VICTORIA	WHARTON
I. Demographic													
Population Total	11,195,431	479,940	8,902	22,737	17,831	4,761	12,975	27,913	237,544	9,454	47,288	53,766	36,729
Population per square mile	43		32	27	34	6	15	24	282	12	69	60	34
% Urban	7.8		0	58.7	58.5	0	41.1	55.5	94.0	48.2	64.5	76.9	44.8
% Net Migration (1960-1970)	1.5		17.4	-24.6	-14.8	-16.3	-17.9	-6.2	-12.7	-26.6	-15.0	-2.8	-15.2
Birth Rate	19.3		17.2	25.4	20.6	14.8	14.4	16.9	23.3	11.6	22.5	19.8	17.3
Death Rate	8.5		10.8	7.9	6.3	13.3	9.9	7.2	7.1	6.4	7.0	8.2	9.0
% Spanish Heritage	18.4	39.0	26.6	39.1	33.4	38.5	17.7	18.5	46.3	38.0	49.1	31.5	18.8
% Black	12.5	7.2	4.6	2.7	4.7	12.0	12.8	19.4	4.7	9.8	2.4	8.0	19.9
II. Education													
% Population 3-34 enrolled													
Total population	52.1		56.7	46.9	52.3	51.8	52.3	53.9	52.6	55.2	55.7	52.3	53.7
Spanish Heritage	52.4		62.7	54.4	51.9	45.7	54.2	51.1	53.3	53.2	54.7	38.8	49.6
Median School Years Completed													
All Males	11.7		10.9	10.7	11.3	8.0	9.5	10.1	12.0	9.9	10.0	11.1	9.4
Spanish Heritage Males	7.6		5.4	5.2	7.3	5.3	5.5	5.6	8.1	5.2	4.9	7.2	5.7
All Females	11.6		11.5	10.6	11.5	8.9	10.3	10.9	11.7	10.2	10.1	11.3	9.9
Spanish Heritage Females	7.0		6.0	4.4	6.6	5.6	6.5	6.0	7.2	5.3	4.2	6.8	5.5
III. Labor Force													
% Civilian Work Force Unemployed 1970													
All Males	3.0		4.1	3.3	1.9	4.8	1.6	3.1	3.5	4.6	4.3	3.1	2.1
All Females	4.7		3.5	6.7	7.2	6.0	4.3	7.7	5.5	3.3	5.0	6.7	5.6
Spanish Heritage Males	4.7		5.7	3.5	2.8	9.1	2.3	3.2	4.7	5.3	4.4	5.3	2.6
Spanish Heritage Females	6.8		6.0	8.2	15.5	15.8	9.9	6.6	7.1	3.7	6.3	8.7	9.9
% Unemployed, July 1975	6.5		4.3	5.2	10.1	5.2	4.3	6.1	8.1	4.7	8.6	5.9	4.2
Male Workers, weeks worked in 1969													
Total # Workers	3,088,769	125,060	2,158	6,545	4,593	1,296	3,484	7,221	61,867	2,560	11,792	13,863	9,681
Total # Spanish Heritage	464,226	39,536	386	1,881	1,250	430	603	1,239	22,689	870	4,762	3,810	1,616
% Working 27-52 Weeks													
All Workers	87.2	88.7	80.1	91.0	92.0	78.9	87.0	84.9	90.2	84.6	84.6	89.9	86.6
Spanish Heritage Workers	85.9	88.0	84.2	90.0	93.0	85.3	85.1	81.2	90.2	81.1	79.6	87.8	87.0
% Working 26 weeks or less													
All Workers	12.8	11.3	19.9	9.0	8.0	21.1	13.0	15.1	9.8	15.4	15.4	10.1	13.4
Spanish Heritage Workers	14.1	12.0	15.8	10.0	7.0	14.7	14.9	18.8	9.8	18.9	20.4	12.2	13.0

Table I.2 (cont'd.)

	TEXAS	AREA II	ARANSAS	BEE	CALHOUN	GOLIAD	JACKSON	MATAGORDA	NUECES	REFUGIO	SAN PATRICIO	VICTORIA	WHARTON
Occupational Categories													
Total Employed	4,141,529	162,974	2,845	6,345	5,835	1,548	4,529	9,679	81,305	3,471	14,947	19,356	13,114
Spanish Heritage Employed	600,425	51,003	569	2,359	1,553	511	706	1,498	30,078	1,202	5,530	4,973	2,024
Spanish Heritage as % of Total Employed	14.5	31.3	20.0	37.2	26.6	33.0	15.6	15.5	37.0	34.6	37.0	25.7	15.4
Professional, Technical													
% of All Employed	14.4	13.2	8.2	12.2	12.3	11.1	10.8	11.8	14.6	9.0	11.2	13.7	11.8
% of Spanish Heritage	7.6	6.2	3.7	3.2	3.9	3.1	1.6	5.4	7.5	.1	4.9	5.8	4.0
Managers, Administrators													
% of All Employed	8.9	8.8	15.3	8.2	7.8	7.5	4.9	8.9	9.6	6.0	10.2	7.2	6.3
% of Spanish Heritage	5.8	4.7	9.5	5.0	3.1	0	3.5	8.4	5.1	.1	4.4	3.4	2.8
Sales Workers and Kindred													
% of All Employed	7.8	7.0	9.9	8.1	4.0	2.8	5.6	4.0	7.8	6.2	5.9	8.0	5.4
% of Spanish Heritage	5.7	4.7	5.3	4.4	1.4	2.7	5.1	1.0	5.2	6.1	2.7	5.4	5.8
Clerical Workers & Kindred													
% of All Employed	17.4	14.8	13.5	14.7	10.9	9.7	9.0	11.4	16.8	12.2	13.0	13.8	13.1
% of Spanish Heritage	13.7	11.0	6.9	8.4	3.7	5.1	3.8	7.1	13.4	5.5	6.9	11.1	6.4
Craftsmen, Foremen													
% of All Employed	14.3	16.0	15.5	15.5	17.8	15.4	17.8	15.3	16.1	15.1	17.0	16.7	13.7
% of Spanish Heritage	15.0	16.1	13.5	18.4	11.5	18.6	16.3	11.6	17.0	9.4	14.7	16.7	14.4
Operatives (excl. Transport)													
% of All Employed	11.1	10.0	8.1	7.4	17.3	8.6	15.7	12.6	8.9	11.3	9.2	11.3	11.0
Transport Equipment Operatives													
% of All Employed	4.0	4.0	3.8	3.3	3.0	3.1	3.2	4.0	4.1	3.6	3.6	4.6	4.8
% of Spanish Heritage	5.3	6.4	8.3	5.6	6.1	6.7	5.8	6.7	6.6	5.8	6.0	6.9	4.1
Laborers (excl. Farm)													
% of All Employed	4.9	6.8	42.2	5.5	8.3	8.5	5.5	7.7	5.7	8.4	8.0	5.3	5.5
% of Spanish Heritage	8.7	11.4	13.7	11.3	16.9	11.9	15.0	14.5	10.2	18.1	15.2	10.0	9.4
Farmers, Farm Managers													
% of All Employed	2.0	2.4	.8	4.1	2.5	13.0	7.9	4.1	.9	2.2	3.2	2.0	7.3
% of Spanish Heritage	.7	.6	---	1.2	1.0	1.8	---	---	.3	---	1.2	.6	1.7
Farm Laborers, Foremen													
% of All Employed	2.0	2.9	.9	4.5	2.6	11.5	6.4	4.5	1.2	6.3	5.6	2.0	6.9
% of Spanish Heritage	5.8	6.2	---	8.1	6.7	25.2	6.2	8.0	2.8	11.0	12.8	2.9	15.7

Table I.2 (cont'd.)

	TEXAS	AREA II	ARANSAS	BEE	CALHOUN	GOLIAD	JACKSON	MATAGORDA	NUECES	REFUGIO	SAN PATRICIO	VICTORIA	WHARTON
Service Workers													
% of All Employed	11.1	11.3	11.8	12.7	11.8	11.5	9.1	11.4	11.6	14.0	10.0	11.7	9.5
% of Spanish Heritage	13.8	16.1	16.0	19.8	16.7	14.7	11.0	16.3	16.2	20.6	14.6	16.7	12.7
Private Household													
% of All Employed	2.2	3.3	3.7	3.8	1.8	5.4	1.7	4.3	2.9	6.0	3.1	3.5	4.9
% of Spanish Heritage	2.5	4.8	19.2	7.6	3.5	7.2	6.5	4.4	3.5	12.0	6.7	5.1	5.2
IV. Standard of Living													
Median Earnings													
For All Males	6,824		5,893	4,946	7,230	3,852	6,168	6,332	6,771	5,671	6,116	6,566	5,297
Spanish Heritage Males	4,599		3,895	3,283	5,127	2,726	4,544	4,551	4,885	3,437	3,870	4,167	4,152
Earnings--Males in Selected Occupations													
Professional, Managerial													
Total	10,106		8,242	8,480	9,546	6,824	7,911	8,382	10,209	8,551	8,625	9,443	8,250
Spanish Heritage	7,698		...	4,712	...	---	...	...	6,213	...	6,250	7,167	...
Craftsmen, Foremen													
Total	7,260		6,639	5,926	8,837	4,364	7,190	7,350	7,232	7,307	7,270	6,924	6,053
Spanish Heritage	5,466		...	3,831	6,232	...	4,463	4,600	5,634	...	4,935	4,726	5,261
Operatives, Transport													
Total	5,956		5,883	5,007	7,588	3,652	6,831	6,585	5,884	6,807	6,054	6,320	5,272
Spanish Heritage	5,466		...	3,740	5,867	...	4,788	5,436	5,284	4,231	5,078	4,396	5,219
Laborers (excl. Farm)													
Total	3,636		3,756	3,135	3,895	4,541	5,286	3,903	3,455	3,576	3,541	3,343	3,622
Spanish Heritage	3,448		...	3,039	4,208	...	5,145	3,731	3,392	3,479	3,529	3,496	3,456
Farmers, Managers													
Total	4,705		...	3,338	8,028	...	4,182	6,275	6,037	...	6,914	3,731	3,754
Spanish Heritage	3,323		0	...	...	2,192	0	0	2,667	0	...	....	...
Farm Laborers, Foremen													
Total	2,607		...	2,005	2,366	...	2,167	2,877	2,454	2,870	2,008	2,581	2,768
Spanish Heritage	2,493		0	2,096	...	2,194	...	3,947	2,379	2,521	2,139	2,305	2,805
Median Earnings													
For All Females	3,241		3,034	2,306	2,789	1,819	2,237	2,549	3,220	2,534	2,582	2,613	2,323
Spanish Heritage Females	2,515		1,635	1,552	1,831	1,231	994	1,441	2,447	2,450	1,316	1,688	1,633

Table I.2 (cont'd.)

	TEXAS	AREA II	ARANSAS	BEE	CALHOUN	GOLIAD	JACKSON	MATAGORDA	NUECES	REFUGIO	SAN PATRICIO	VICTORIA	WHARTON
Earnings--Females in Selected Occupations													
Clerical													
Total	3,879		3,413	2,879	3,504	...	2,511	3,467	3,891	3,420	3,278	3,341	3,320
Spanish Heritage	3,229		...	1,536	...	...	...	...	3,068	...	2,433	3,127	...
Operatives, Transport													
Total	3,142		...	...	1,856	...	...	2,306	2,703	...	2,100	1,994	1,957
Spanish Heritage	2,700		0	...	1,870	...	...	...	2,640	...	...	1,440	...
Per Capita Income													
Total Population	2,810		2,585	2,015	2,302	1,997	2,207	2,260	2,527	2,284	2,039	2,332	2,111
Spanish Heritage	1,521		1,031	947	1,261	872	1,468	1,234	1,473	1,238	1,064	1,338	1,305
% Families Below Poverty													
Total Population	14.6		21.3	29.3	20.3	37.0	26.2	24.4	21.5	25.5	32.6	21.8	30.6
Spanish Heritage	31.4		41.3	53.9	32.2	58.8	35.8	39.0	34.7	45.3	54.3	39.7	37.9
Housing													
Persons Per Unit	3.2		3.0	3.5	3.6	3.1	3.2	3.2	3.5	3.3	3.7	3.4	3.3
% With 1.01 + per Room	11.1		12.0	14.0	17.0	13.5	12.0	11.6	15.9	15.4	21.0	14.1	14.3
Rooms Per Unit	4.8		4.4	4.7	4.7	4.8	4.9	4.7	4.8	4.8	4.6	4.9	4.9
% Lacking Plumbing	6.0		3.5	12.9	5.6	26.6	10.8	11.9	4.8	11.4	18.1	7.5	16.2
V. Services													
Hospital Beds per 1000	3.5		0.0	3.2	4.0	7.0	3.8	0.0	5.4	4.2	2.8	6.3	6.0
State Highway Mileage	256.5		73.1	270.6	170.3	238.4	262.3	300.4	407.5	184.3	299.1	231.6	369.5

AREA III. THE SOUTHERN COASTAL ZONE

Long-standing social and economic problems, such as the underdevelopment of human resources in terms of levels of education and job training, language and cultural differences stemming from close proximity to Mexico, remoteness from centers of economic activity, and scarcity of fresh water, have been barriers to economic development in South Texas. Due in large measure to the lagging nature of South Texas development, numerous studies are available describing the area and its problems. The most pertinent of those studies are referenced at the end of the present volume. In the present chapter only an overview of the area is given, as was done for the Eastern and Middle Coastal Zones.

Demographics.

The fourteen-county Southern Coastal Zone is predominantly a rural, farm and ranch area. Population densities are extremely low. Only two counties exceed the state average figure for population per square mile: Cameron and Hidalgo. Cameron County contains the Brownsville-Harlingen-San Benito SMSA, and Hidalgo is the present extent of the McAllen-Pharr-Edinburg SMSA. Both of these SMSA counties rely heavily on agribusiness and some food processing industries. The Laredo SMSA encompasses Webb County. While Area III as a whole appears from census statistics to be somewhat heavily urbanized, this pattern is due to the tendency for the population to cluster in small villages and towns. That the area is not, in fact, urbanized can be seen from the population densities, which reach a low in McMullen County of one person per square mile.

The Southern Coastal Zone has a high degree of out-migration among the population. In the decade 1960 to 1970 the counties in the area experienced population loss through migration of from 8.6 to 42.2 percent. As would be expected of the border region, Area III counties consist largely of Mexican Americans and have small percentages of Blacks. U.S. Census reports for 1970 show from 40 to 98% persons of Spanish Heritage for all counties in the area except Kleberg. As a whole, the Southern Coastal Zone population is nearly three-fourths Mexican American. Language and cultural differences of this segment of the population add to the social

and economic problems of the area, especially in the areas of labor and education. The already predominant Mexican language and culture are constantly reinforced by immigration, both legal and illegal, across the border. Mexican immigration to the U.S. from 1964 to 1973 numbered 475,409. It is impossible to know how many Mexicans enter illegally each year, but at least 78,981 were apprehended and deported in the same 10 year span (Immigration and Naturalization Service, 1973). Some estimates place the number of detected and undetected illegal immigrants at one million annually (Portes, 1974). This influx of immigrants places an added strain on the employment and educational situation.

Heaviest out-migration occurs among Anglos, with nearly a fifty percent loss between 1960 and 1970 (Pan American University, Division of Business and Economic Research, 1973). Significant population loss is witnessed, too, in the younger age groups (20-29) among Mexican Americans. As the younger and better educated population leaves the area, the result is an increasing concentration of older, unskilled or semi-skilled workers. A "vicious cycle" is evident as productive growth industries experience this population change as a deterrent to southern location, and the lack of industrial development in turn spurs further out-migration.

The high birth rates and relatively low death rates (Fig. I.12) mean, however, that the area continues to grow in population due to natural increase. State population projections show that even with continued population loss through migration, the Southern Coastal Zone population will increase by roughly 30 percent from 1970 to 1990 (Governor's Office of Information Services, 1974).

Education.

Educational attainment (median school years completed) in South Texas is far below standard for the state. This pattern holds for the total population as well as the Spanish Heritage population, for males and females. Low educational attainment among Mexican Americans stems partially from the fact that, historically, this group has not been able to place a great deal of emphasis on education, as poor economic conditions often forced students to drop out of school early to enter the job market and help support the family. The problem was further compounded by the language

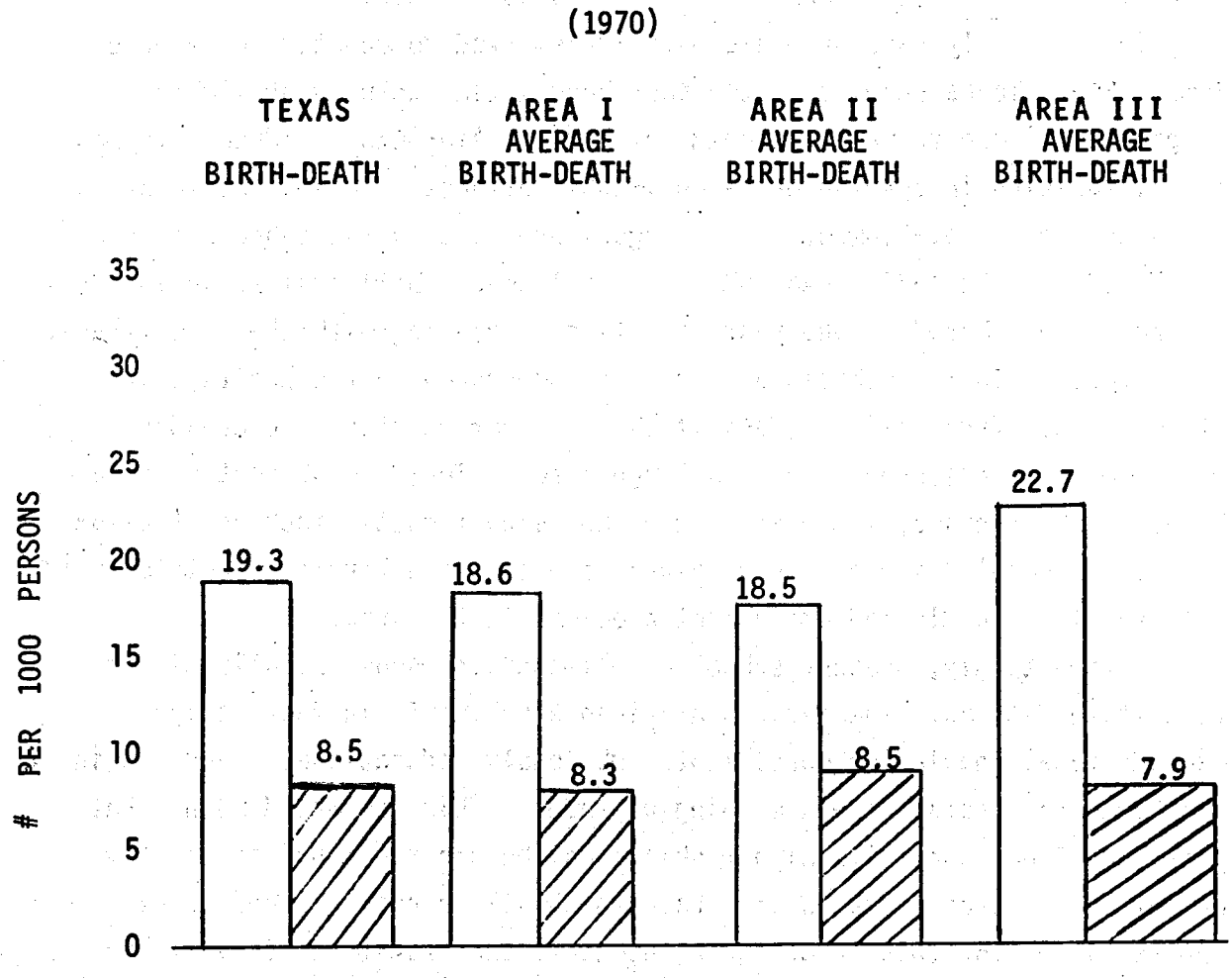


Figure I.12 Birth and death rates (1970).

barrier, including the lack of basic English skills. Inability to understand what is going on in a classroom causes students to lose interest quickly and fall farther behind with each school grade.

Only recently have programs been implemented to counter these problems. South Texas schools in the past have often excluded or limited programs designed to meet the needs of Mexican American children. In many cases, speaking in Spanish was a punishable offense. Today, the emphasis is switching to development of bilingual programs in the schools (see Moore, 1970). In 1972, Texas HB 121 established a bilingual education program to be phased in one year at a time, beginning with the first grade.

Problems in the schools are further compounded by the constant influx of immigrants from Mexico. Facilities in border counties are crowded. Most immigrant children require bilingual education, and dropout rates are high. In most cases, immigration does not significantly increase the tax base of a school district. Educational and language barriers contribute to the overall economic and employment problems in the area.

Interestingly, present school enrollments are substantially higher than state figures. The Mexican American enrollment, in fact, slightly exceeds total population enrollment. Obviously, educational standards in the Southern Coastal Zone are being upgraded. This new trend means that a potential labor pool with higher skills may be created. Unless the development of the area proceeds at a rate which will provide occupational opportunities for this labor force, however, the result is likely to be increased out-migration. The better educated population is the first to leave the area in order to find suitable jobs. In another vein, it is this better educated population which provides a source of possible leadership for political organization. The development of education without the development of a suitable market place for skills learned has, then, several unintended consequences, among which are population dislocations and/or a volatile political situation.

Labor Force.

A surplus of unskilled labor is one major factor in the lagging economic development of South Texas. The problem developed as agriculture, historically the major industry of the region, became more mechnaized,

leaving many workers unemployed and without salable skills needed in the labor force. Thousands of South Texans joined the migrant labor stream with its low wages and poor working conditions. Others remained unemployed in the region.

The seasonal nature of agricultural work and the large numbers of displaced farm workers, are contributors to the high percentages of part-time employment. Texas data shows that 12.8 percent of all male workers age 16 and over and 14.1 percent of Mexican American workers were employed half the year or less during 1969. For Area III, however, the percentage was 17.2 for the total male work force, and 18.9 for Mexican Americans. Part-time employment rates are highest (32.2%) in Starr County, which also has the highest percentage of persons of Spanish Heritage (97.9%).

Census data for 1970 showed male unemployment in Area III counties substantially above the Texas rate of 3.1%. Kenedy County, with 2.7%, is the only county with a lower rate than the state; others range from 3.7% (Kleberg) to 7.5% (Starr). Unemployment in the Spanish Heritage population is generally higher than that for the total population. Total unemployment had increased sharply by July, 1975, reaching a high of nearly a quarter of the labor force in Starr County (see Figure I.8).

Area III is heavily dependent on farm employment, with over 12 percent of the employed population in farm occupations compared to a state total of 4 percent. Among Spanish Heritage workers, nearly 20 percent are involved in agricultural work. As can be seen from Table I.3, median earnings for Mexican Americans are exceedingly low in those occupations. At least part of this low reported income is due to the semi-feudal nature of a large part of the Southern Coastal Zone. Many workers receive much of their sustenance commodities in kind from the large ranches and farms which employ them. They live in ranch-furnished houses, receive food from ranch-backed stores, and in some cases are entitled to ranch-based medical services.

The area differs from the state less substantially in other categories. If we combine the top two categories, Professional and Technical, and Managers and Administrators, we find that 20.6% of Area III workers fall in this high category, compared with 23.3% of Texas workers. Mexican American workers, however, are better represented in Area III (14.3%) than

in the state (12.6%) for these categories. Sales and clerical workers comprise 21.6% of the total Area III working population and about 20% of all Mexican American workers--again above state percentages. The Craftsmen and Foreman category, indicating skilled labor, is under-represented in Area III, as are Operative professions. Mexican Americans in the area fall further behind the state average in these two categories than does the total population.

Standard of Living.

Median earnings for both males and females in both the total and Mexican American populations fall substantially below state median. Median earnings (1970) in Texas are $6,824 for the total population and $4,599 for Mexican Americans. Area III counties range from $1,966 (Kenedy County) to $5,731 (Jim Wells) for the entire population and from $1,938 (Kenedy) to $4,593 (McMullen) for population of Spanish Heritage. Generally speaking, median earnings in all occupational categories in Area III are lower than the median for Texas, and the median earnings for Mexican Americans are below those for the total population.

A large influx of legal and illegal immigrants from Mexico constantly reinforces the already large surplus of unskilled labor, and commuters who live in Mexico and work in Texas add to the competition in the job market. This large scale immigration and border commuting contributes not only to the displacement of Texas workers and the depression of wages in the area, but also to the concentration of a large, unskilled Mexican American population in South Texas. This group has the added problems of cultural and language differences which are additional barriers to entrance to the labor market.

The main reason for the large number of immigrants and commuters is the economic discrepancy between the U.S. and Mexico. Mexico has a high unemployment rate, a lower wage scale, and one of the highest population growth rates in the world, which are added incentives for taking advantage of higher wages and better living conditions in the U.S. through immigration.

Some Mexican workers enter the country illegally; others obtain permits to live in Mexico and commute across the border to work, thus taking

advantage of higher wages in Texas and lower living expenses in Mexico. Often they work for lower wages than American workers. Before an employer is allowed to hire these "Greencarders", he is required to certify that a shortage of American workers in that particular occupation exists. Nevertheless, commuters still constitute competition for U.S. citizens in the job market.

The effects of immigration and commuting from Mexico on the labor market and the economy of South Texas are important. The major impacts are in competition for jobs, especially low-skilled jobs, and the resulting depression of the wage scale. On the one hand, immigrants pay little or no taxes, but add to the need for human services such as health, education and welfare. Commuters and immigrants often send money earned in the area back to relatives in Mexico, creating a drain on the economy. On the other hand, immigrant workers usually fill only the lowest paying jobs, live in the poorest conditions, and are often exploited in the U.S. market in terms of wages and working conditions.

Special trade agreements between the U.S. and Mexico also have an effect on the South Texas economy. Products produced by U.S. firms can be exported for assembly and re-enter the U.S. if the condition of the parts has not changed. Duty is assessed only on the value added, which is equal only to the wages paid to workers. The result is a growing number of U.S. manufacturing plants positioned just across the border in Mexico, where wages are one-third of the U.S. minimum wage. Again, the victims are Mexican American and other semi-skilled workers in Texas. Also, the plants attract more Mexican workers to the border than are needed, with the result that many cross over to Texas seeking work.

The high birth rate discussed earlier, and the educational and economic situation in South Texas, contribute to a very low per capita income. All counties in Area III have 1970 per capita incomes well below the figure for Texas ($2,810); the lowest being Starr County with $1,123, and the highest, Kleberg, with $2,149. In all counties, the per capita income for the Spanish Heritage population is lower than for the total population. The state figure for Spanish Heritage per capita income is $1,521, and Area III counties range from $880 (Willacy County) to $1,768 (McMullen).

Percentage of families below poverty level in Area III counties for 1970 are extremely high, especially for the Mexican American population. Less than 15% of Texas families are below poverty level; the lowest figure in this area is 24.1% in McMullen County, while the highest is 57.8% in Zapata County. Percentages for Mexican American families range from 28.9% in McMullen County to 72.6% in Willacy; the state figure is 31.4%.

Poverty is also evident when quality of housing is examined. In Texas, the median number of rooms per housing unit is 4.8, and only 6% of the units lack some or all plumbing facilities. Area III counties have from 4 to 4.6 rooms per unit, and, in all but Kleberg County, more than 13% of the units lack at least some plumbing facilities. In Starr County, 46.4% of all units have inadequate plumbing. Housing in Area III is also more crowded than in the state as a whole. In Texas, an average of 3.2 persons live in each year-round housing unit, and 11.1% of the units are occupied by more than one person per room. All Area III counties are equal to or above the state figure in average number of persons per unit, and substantially higher than the state on percent of occupied units with 1.01 or more persons per room, the highest again being Starr County with 36.5%.

Services.

Eight of the thirteen counties (1970) have 0 hospital beds per 1,000 population. Of the remaining counties, all except Jim Wells (3.5) and Klebert (4.0) are below the state average, which is 3.5 per 1,000 persons. State highway mileage is exceedingly low in this area, with eight counties falling far below the state average (Kenedy County is at the bottom with 46.7 miles of state highway compared to the state average of 256.5).

Table 1.3

AREA III. SOUTHERN COASTAL ZONE

	TEXAS	AREA III	BROOKS	CAMERON	DUVAL	HIDALGO	JIM HOGG	JIM WELLS	KENEDY	KLEBERG	LIVE OAK	McMULLEN	STARR	WEBB	WILLACY	ZAPATA
I. Demographic																
Population Total	11,195,421	521,647	8,005	140,368	1,722	181,535	4,654	33,032	752	33,166	6,697	1,233	17,707	72,854	15,570	4,352
Population per square mile	43		9	157	6	118	4	39	7.5	39	6	1	15	22	26	5
% Urban	79.8		83.8	77.6	58.4	74.1	92.5	72.0	-	86.2	-	-	32.1	96.2	52.5	-
% Net Migration (1960-1970)	1.5		-27.0	-32.1	-29.0	-25.4	-23.9	-25.3	-39.5	-13.9	-26.2	-8.6	-23.9	-17.8	-42.2	-22.9
Birth Rate	19.3		20.5	29.3	21.0	31.2	18.3	22.9	15.7	26.7	16.9	9.7	30.8	31.3	24.8	18.2
Death Rate	8.5		9.6	7.7	10.0	7.3	10.1	7.8	5.7	5.6	10.8	5.5	6.7	6.9	7.2	9.7
% Spanish Heritage	18.4	74.3	79.9	76.2	84.5	79.1	91.9	64.0	70.7	12.2	40.4	60.3	97.9	85.6	76.8	91.5
% Black	12.5	1.2	1.3	1.0	0.2	0.8	1.0	1.2	0.0	4.4	1.4	0.6	0.5	1.7	0.7	0.2
II. Education																
% Population 3-34 enrolled																
Total population	52.1		58.9	55.6	56.7	57.6	47.6	51.5	51.2	55.5	53.3	63.4	53.4	53.5	59.7	59.8
Spanish Heritage	52.4		58.1	55.4	56.8	57.5	47.0	51.7	57.8	59.2	57.9	60.6	53.8	56.4	58.4	62.0
Median School Years Completed																
All Males	11.7		8.3	8.7	7.6	7.6	6.5	9.1	5.3	12.1	8.9	9.7	5.9	8.1	7.7	6.2
Spanish Heritage Males	7.6		6.3	6.0	6.9	5.2	6.1	6.2	3.7	7.9	4.6	8.3	5.7	7.0	4.4	5.3
All Females	11.6		8.5	8.4	7.9	7.0	6.7	9.5	5.8	11.5	10.1	10.2	5.9	7.1	7.3	5.7
Spanish Heritage Females	7.0		6.8	5.7	7.1	4.9	6.5	6.7	3.8	7.0	5.1	5.4	6.0	6.5	4.5	5.0
III. Labor Force																
% Civilian Work Force Unemployed 1970																
All Males	3.0		5.4	6.1	4.1	5.1	5.9	5.3	2.7	3.7	5.8	4.5	7.5	6.6	6.1	6.5
All Females	4.7		2.8	7.3	3.9	7.2	3.7	5.1	-	8.4	2.8	...	3.7	7.1	9.7	0
Spanish Heritage Males	4.7		5.5	6.6	4.4	6.3	5.9	7.4	4.5	4.9	5.7	6.8	9.1	6.9	6.6	7.7
Spanish Heritage Females	6.8		4.0	9.4	2.7	8.6	3.1	6.5	-	8.7	4.2	...	4.1	7.6	12.0	-
% Unemployed, July 1975	6.5		8.1	11.2	5.3	12.0	6.2	6.7	4.0	4.4	6.0	5.4	23.5	16.7	8.9	14.7
Male Workers, weeks worked in 1969																
Total # Workers	3,088,769	139,993	1,913	29,403	2,666	39,418	1,093	7,944	251	10,269	1,694	357	3,760	15,914	3,416	895
Total # Spanish Heritage	464,226	87,396	1,488	20,712	2,189	28,826	1,013	4,452	194	3,616	55	195	3,609	12,391	2,341	819
% Working 27-52 Weeks																
All Workers	87.2	82.8	76.3	83.2	90.1	82.0	89.5	87.2	82.1	80.7	86.5	86.8	67.8	85.7	81.1	87.5
Spanish Heritage Workers	85.9	81.1	73.3	80.8	89.2	80.3	87.8	86.5	81.4	82.8	84.6	86.2	66.9	84.3	77.6	86.6
% Working 26 weeks or less																
All Workers	12.8	17.2	23.7	16.8	9.9	18.0	10.5	12.8	17.9	19.3	13.5	13.2	32.2	14.3	18.9	12.5
Spanish Heritage Workers	14.1	18.9	26.7	19.2	10.8	19.7	12.2	13.5	18.6	17.2	15.4	13.8	33.1	15.7	22.4	13.4

Table I.3 (cont'd.)

Occupational Categories	TEXAS	AREA III	BROOKS	CAMERON	DUVAL	HIDALGO	JIM HOGG	JIM WELLS	KENEDY	KLEBERG	LIVE OAK	McMULLEN	STARR	WEBB	WILLACY	ZAPATA
Total Employed	4,141,529	150,477	2,233	40,178	3,462	52,073	1,510	10,453	298	9,656	2,070	403	4,016	18,974	4,168	983
Spanish Heritage Employed	600,425	105,232	1,792	27,927	2,937	37,340	1,389	5,404	248	4,091	637	200	3,922	16,379	2,887	916
Spanish Heritage as % of Total Employed	14.5	69.9	80.3	69.5	84.8	71.7	92.0	51.7	83.2	42.4	30.8	49.6	97.7	86.3	69.3	93.2
Professional, Technical																
% of All Employed	14.4	11.5	11.1	10.9	8.8	11.3	7.7	11.0	2.7	19.1	10.7	5.7	14.1	10.9	10.4	13.1
% of Spanish Heritage	7.6	7.8	7.8	7.1	8.8	7.0	6.8	5.5	4.0	9.5	3.5	-	15.5	9.7	5.3	9.5
Managers, Administrators																
% of All Employed	8.9	9.1	6.0	9.8	7.3	8.5	6.4	9.1	1.7	7.8	8.1	11.9	8.5	11.4	8.0	9.0
% of Spanish Heritage	5.0	6.5	2.7	6.6	4.1	5.3	6.3	5.2	-	5.6	1.1	8.0	8.1	10.3	6.3	10.7
Sales Workers and Kindred																
% of All Employed	7.8	7.6	6.7	7.6	4.7	7.7	2.5	6.5	-	5.0	4.3	2.7	6.0	9.9	4.8	39.8
% of Spanish Heritage	5.7	6.9	6.8	6.7	4.9	6.9	1.2	6.8	-	5.0	5.2	-	6.5	10.1	2.9	.8
Clerical Workers & Kindred																
% of All Employed	17.4	14.0	11.1	14.9	11.0	12.3	14.2	13.2	7.7	14.8	11.3	6.2	12.6	19.5	9.4	12.2
% of Spanish Heritage	13.7	12.9	12.4	13.6	11.3	10.2	14.1	11.0	11.7	9.5	4.2	4.0	13.1	20.6	8.1	9.5
Craftsmen, Foremen																
% of All Employed	14.3	11.3	12.0	12.3	15.5	9.5	12.3	14.9	-	14.1	15.6	5.7	8.3	10.5	9.7	10.6
% of Spanish Heritage	15.0	11.2	12.4	12.4	12.5	9.8	11.4	15.9	-	16.7	17.7	3.5	7.4	10.5	7.7	13.3
Operatives (excl. Transport)																
% of All Employed	11.1	10.4	9.3	10.4	11.6	11.8	14.8	12.4	7.7	9.1	9.3	6.9	6.6	6.3	8.4	19.3
% of Spanish Heritage	16.3	12.0	8.1	13.3	11.7	14.0	16.1	12.0	8.1	10.1	11.5	6.5	6.8	6.4	12.5	17.5
Transport Equipment Operatives																
% of All Employed	4.0	5.1	7.5	4.1	5.1	5.8	4.5	5.2	3.4	3.7	5.3	3.7	4.1	6.3	3.4	3.1
% of Spanish Heritage	5.3	6.3	9.8	5.1	6.4	7.4	4.6	7.2	3.2	5.2	10.8	3.5	5.0	6.6	4.5	4.4
Laborers (excl. Farm)																
% of All Employed	4.9	6.5	6.4	7.6	7.8	6.0	6.9	6.2	-	4.4	3.8	9.4	5.6	7.1	4.1	5.8
% of Spanish Heritage	8.7	8.0	6.7	9.7	8.8	7.1	7.6	10.3	-	7.8	5.2	18.5	6.1	7.7	5.4	7.5
Farmers, Farm Managers																
% of All Employed	2.0	2.5	1.7	2.2	4.0	2.7	3.6	2.8	2.7	1.2	8.7	1.8	3.0	.6	6.8	7.1
% of Spanish Heritage	.7	1.6	.7	1.2	3.8	1.8	4.5	2.2	-	-	1.6	9.5	2.2	.6	2.3	7.1
Farm Laborers, Formen																
% of All Employed	2.0	9.8	12.9	6.8	7.7	13.7	10.5	4.8	45.3	3.7	10.9	21.6	20.8	4.9	25.1	8.6
% of Spanish Heritage	5.8	12.6	14.2	8.9	8.8	17.6	10.5	7.1	42.3	7.4	25.1	27.0	20.0	5.2	32.5	9.0

Table I.3 (cont'd.)

	TEXAS	AREA III	BROOKS	CAMERON	DUVAL	HIDALGO	JIM HOGG	JIM WELLS	KENEDY	KLEBERG	LIVE OAK	McMULLEN	STARR	WEBB	WILLACY	ZAPATA
Service Workers																
% of All Employed	11.1	10.2	11.8	11.2	12.9	8.7	14.6	10.5	18.8	13.7	9.0	2.2	9.4	10.3	7.5	10.9
% of Spanish Heritage	13.8	11.2	13.4	12.8	14.0	10.1	15.3	11.2	21.0	17.3	7.7	5.5	8.3	9.9	9.3	10.4
Private Household																
% of All Employed	2.2	2.4	3.8	2.2	3.7	2.0	2.1	3.4	10.1	3.2	2.9	6.0	.01	2.3	2.3	.004
% of Spanish Heritage	2.5	3.0	4.9	2.6	4.8	2.7	1.6	5.8	9.7	5.9	6.4	6.0	.9	2.4	3.2	.4
IV. Standard of Living																
Median Earnings																
For All Males	6,824		3,571	4,117	3,947	3,681	3,547	5,731	1,966	5,615	5,221	4,324	3,076	3,834	3,394	3,842
Spanish Heritage Males	4,599		3,055	3,472	3,545	3,134	3,536	4,255	1,938	4,114	3,537	4,593	2,982	3,654	2,741	3,619
Earnings--Males in Selected Occupations																
Professional,Managerial																
Total	10,106		8,000	7,822	6,913	7,785	5,932	8,845	-	9,623	9,800	...	6,549	8,032	8,054	4,879
Spanish Heritage	7,698		...	6,642	6,378	5,990	6,091	7,188	-	6,379	...	...	6,244	7,388	6,300	6,308
Craftsmen, Foremen																
Total	7,260		4,045	4,474	5,621	4,187	3,750	5,668	...	6,740	6,759	...	3,750	3,981	4,401	3,700
Spanish Heritage	5,466		3,535	3,868	4,182	3,792	3,400	4,466	...	5,738	6,571	-	3,863	3,694	3,702	2,842
Operatives, Transport																
Total	5,956		4,020	3,655	4,257	3,484	3,829	5,391	...	3,478	4,756	...	3,484	3,458	2,777	4,264
Spanish Heritage	5,466		3,450	3,451	3,963	3,330	3,566	3,170	...	3,951	4,159	...	3,454	3,387	2,578	4,048
Laborers (excl. Farm)																
Total	3,636		2,900	3,681	2,941	2,662	2,038	3,350	-	3,400	...	...	2,362	2,716	1,925	...
Spanish Heritage	3,448		2,750	3,583	2,930	2,359	1,966	3,327	-	4,067	...	...	2,467	2,613	1,688	...
Farmers, Managers																
Total	4,705		...	4,224	1,971	4,452	...	7,458	...	5,500	9,200	...	2,667	...	7,667	...
Spanish Heritage	3,323		...	2,548	2,305	3,134	...	3,921	-	-	-	...	...	...	...	...
Farm Laborers,Foremen																
Total	2,607		2,037	2,038	1,844	1,848	2,673	2,914	1,708	2,087	2,820	...	1,840	1,735	2,308	...
Spanish Heritage	2,493		1,710	2,071	1,799	1,859	2,396	3,131	1,623	1,961	2,358	...	1,489	1,599	2,292	...
Median Earnings																
For All Females	3,241		2,448	2,385	1,840	2,024	1,478	2,557	...	2,631	2,409	...	1,735	2,647	1,868	1,955
Spanish Heritage F.	2,515		2,061	2,082	1,557	1,692	1,528	1,945	...	1,897	1,427	...	1,721	2,666	1,361	1,775

Table I.3 (cont'd.)

	TEXAS	AREA III	BROOKS	CAMERON	DUVAL	HIDALGO	JIM HOGG	JIM WELLS	KENEDY	KLEBERG	LIVE OAK	McMULLEN	STARR	WEBB	WILLACY	ZAPATA
Earnings--Females in Selected Occupations																
Clerical																
Total	3,879		2,929	3,117	2,483	2,656	1,700	3,299	...	2,386	3,180	...	1,240	3,139	2,659	...
Spanish Heritage	3,229		2,736	2,770	2,364	2,293	1,775	2,947	...	2,194	...	...	1,265	3,245	2,762	...
Operatives,Transport																
Total	3,142		...	1,810	...	1,686	...	2,132	...	1,521	...	...	...	1,681	...	...
Spanish Heritage	2,700		...	1,882	...	1,648	...	...	-	...	...	-	...	1,673	754	...
Per Capita Income																
Total Population	2,810		1,518	1,577	1,458	1,482	1,366	1,940	1,775	2,149	2,038	2,113	1,123	1,547	1,404	1,276
Spanish Heritage	1,521		1,123	1,091	1,258	1,006	1,190	1,311	1,411	1,298	932	1,468	1,102	1,352	880	1,121
% Families Below Poverty																
Total Population	14.6		44.7	46.0	49.0	49.8	49.8	31.5	43.9	29.4	26.4	24.1	54.9	44.7	57.2	57.8
Spanish Heritage	31.4		50.9	54.6	53.7	57.1	51.7	44.6	33.3	47.5	52.2	23.9	56.9	49.2	72.6	67.8
Housing																
Persons Per Unit	3.2		3.6	3.9	3.5	4.1	3.7	3.6	4.3	3.7	3.2	3.4	4.3	4.0	4.0	3.6
% With 1.01 + per Room	11.1		28.8	28.7	22.5	33.0	25.3	22.3	31.0	15.4	18.1	26.2	36.5	31.4	30.9	23.3
Rooms Per Unit	4.8		4.5	4.4	4.5	4.4	4.4	4.6	4.0	4.6	4.5	4.5	4.3	4.3	4.4	4.1
% Lacking Plumbing	6.0		27.0	21.3	29.9	25.1	26.0	16.3	14.9	5.7	13.4	24.0	46.4	16.7	30.1	37.0
V. Services																
Hospital Beds per 1000	3.5		0.0	0.0	2.5	2.1	0.0	3.5	0.0	4.0	0.0	0.0	12.	3.4	0.0	0.0
State Highway Mileage	256.5		116.6	510.2	293.2	649.1	143.0	256.3	46.7	141.3	325.2	139.5	217.0	308.0	209.0	106.4

AREA PROBLEMS RELEVANT TO GEOTHERMAL RESEARCH

Suggestions of broad regional differences in social and demographic characteristics arise from the preceding area descriptions. Comparisons and contrasts of the areas in terms of some variables of possible relevance to geothermal development and utilization will therefore help provide a regional outline to direct more intensive investigations of the area in which the test site is eventually located.

The population of southern and coastal Texas exhibits greatest concentration in and around the major urban areas of Houston and Galveston, Beaumont, Corpus Christi, and Brownsville. The total land area is smaller in relation to the size and spread of these urban areas in Areas I and II, i.e., the Eastern Coastal Zone is far more densely populated and less rural than central and south Texas. These differences are further heightened by the rapid migration out of South Texas, which is extremely high in all of Area III and in much of Area II. The evidence suggests that many residents formerly dependent upon agricultural occupations have moved to urban areas in search of employment.

One major population difference between the areas is their ethnic composition with the Mexican American proportion high in Area III, the Black percentage comparatively high in Area I, and Area II overlapping at each end. Some counties in the middle of Area II have roughly equal proportions of Black and Mexican American residents.

Educational attainment is lowest in Area III and highest in Area I, where school completion approached the overall Texas level. Current enrollment figures in all three areas indicate educational upgrading for the total populations and for the ethnic minorities within them.

Unemployment exceeds the state level in the majority of counties in all three areas. Again, the most widespread and severe unemployment is in Area III, decreasing somewhat in Area II, and while still high, decreasing more in Area I. The incidence of seasonal work bears out the same trend but to a more subtle degree, and (with the exception of one county) in Area I full-time workers account for a larger share of the employed population than in Texas as a whole.

Examination of the distribution of the working population among the

occupational categories reveals basic conformity in all three areas with the state's occupational patterns. The major exception is in farm occupations, however, where the three areas differ considerably. Texas workers in these occupations account for 4% of all workers; half (2%) being farmers and managers and half (2%) laborers and foremen. In contrast, 0.7% of Area I workers and 5.7% of Area II workers are in farming. In Area III, 12.3% of all workers are in farming, and almost four-fifths of those are laborers and foremen.

It is not immediately obvious from an analysis of the crude data just what the labor force situation means for geothermal development. For instance, high unemployment and seasonal participation rates may be viewed either as an economic problem or as a promising manpower resource. Further research and analysis is needed to pinpoint the specific relationships and potentials implied, before decisions are made as to which types of resource utilization should be encouraged.

Whatever the nature of the contributing factors, the major part of the Texas Coastal Zone is economically and socially depressed. Areas II and III compare quite unfavorably with Texas figures in such key variables as per capita income and percentage of families below the poverty level. On both variables, 32 of the 36 counties in this study evidence poverty relative to the state as a whole; the four exceptions are Area I counties. Other measures of the standard of living in the region confirm these patterns. Crowding in dwelling units and inadequate plumbing facilities characterize most Area II and III counties. The percentage of crowded dwellings in Area III is roughly 2 to 3 times the percentage for Texas, and inadequate plumbing is 2 to 7 times as evident. Further, the most recent Bureau of Economic Analysis (U.S. Dept. of Commerce, 1974) projections show the south Texas area continuing as a no-growth region--and as the least prosperous part of Texas--to at least 1990. Interestingly enough, the only contingency mentioned as possibly mitigating the projections would be the development of new resources in the area.

As we have seen, the economic depression of South Texas is a circular phenomenon: the surplus of unskilled labor, together with language and cultural barriers to education and employment, discourage investments, and the lack of sufficient capital, in turn, depresses the occupational/wage

structures. Several programs have been initiated to stimulate development in the area. A number of labor training and vocational education programs in secondary schools have been set up by the U.S. Office of Education, Adult Continuing Education Programs of the Texas Education Agency provide high school equivalency training, and Health and Rural Manpower Training programs are financed by federal funds. A major industrial training program is the Industrial Start-up Training Program, a cooperative effort of the Texas Industrial Commission and the Texas Education Agency. This latter program hopefully will attract new industry to the area at the same time that it improves the skill level of the South Texas labor base. The program trains workers for specific jobs in industry entering or expanding in the area. Area III is characterized by growing political awareness and activity of the Mexican American population. As this large segment of the population gains access to the decision making processes, more programs and more changes are apt to develop. Some of the major programs or studies now underway are listed below.

A. Governmental Coordination

Greater South Texas Cultural Basin Commission

Established by the Legislature in 1973 and implemented by Governor Dolph Briscoe in June, 1974 for the purpose of "stimulating orderly economic and socially desirable development." Decision-making commission composed of representatives of local citizenry, COGs, and state and federal agencies. Authorized to prepare legislative and other recommendations with respect to long and short range programs.

Interstate Compact (House Concurrent Resolution 135)

Signed by the Texas Governor in summer, 1975, this compact expresses state willingness to work with California, Arizona, and New Mexico on joint efforts to overcome problems generated by their location on the Mexican border.

HUD Project

HUD funds awarded to Greater South Texas Cultural Basin Commission (GSTCBC) through the Governor's Office Division of Planning Coordination to improve planning and coordination of government

services in the basin area.

Regional Human Resource Development Project

HEW grant to GSTCBC to develop greater capacity at the state and regional levels for planning and management of human service programs.

B. Education and Job Training

Texas Education Agency Grant to GSTCB Commission

Under provision of the Comprehensive Employment and Training Act (CETA) of 1973. To examine needs of adults qualifying for CETA assistance and to examine coordination between CETA and other adult education programs to determine their effectiveness. Jan. 1 - June 30, 1975.

Bilingual Education Program

Established in 1972 (Texas H.B. 121) to provide linguistic training to school aged children. Program being phased in one grade each year, beginning with the first grade.

Vocational Education Program

Made up of 8 major categories set up by the U.S. Office of Education to provide vocational education curriculum in secondary schools. Texas Education Agency and Texas Advisory Commission on Vocational Education.

Adult and Continuing Education Program

Texas Education Agency. Provides basic and high school equivalency training. Funding by state (40%) and federal government. Budget of $4.8 million in Texas in 1974, 26% ($1.3 million) of which was allocated to South Texas.

National Comprehensive Employment and Training Act of 1973

Federal funds to help develop health services and rural manpower training. 23.7% of its $63.5 million budget in 1975 allocated to South Texas.

Industrial Start-up Training Program

Cooperative effort between Texas Industrial Commission and Texas

Education Agency. Provides training to qualify citizens for jobs created by new or expanding industries in the area. Program director from TIC works with industry to identify training needs; local institutions (schools, colleges, technical institutions) provide facilities and instructors; special equipment and training wage provided by industry.

Texas Department of Community Affairs Grant to GSTCB Commission
Granted Nov., 1974. Project to identify basic problems and barriers to employment and economic growth and to recommend solutions. Phase I to be completed June 30, 1975, and Phase II a year later.

C. Economic Development

Rural Development Loan Program
Administered by Texas Industrial Commission. Provides businesses with establishment and operating loans at low interest rates.

Texas Water Development Plan
Research of necessary actions to provide South Texas with supplementary water supplies. Texas Water Development Board.

U.S. Department of Commerce, Economic Development Administration Grant to GSTCB Commission
To develop information useful to industrial and economic developers in South Texas.

Texas Economic Action Program
Contract with Governor's Office, Division of Planning Coordination, to provide technical assistance and to coordinate the South Texas portion of the State economic development plan.

EDA Development Grant
To GSTCB Commission to develop a program for the mitigation of unemployment caused by plant closures and layoffs, base closings, reduced federal expenditures, and border problems. To be funded under provisions of Title IX of the Economic Adjustment Act.

D. Health

Early and Periodic Screening, Diagnosis and Treatment
Amendment in 1967 to Title XIX of the Social Security Act, an addition to Medicaid. Effective 1972; administered in Texas by department of Public Welfare through interagency contract with State Department of Health. Screening, diagnosis, and treatment of health problems of children in low income or medically indigent families.

E. Migrant Programs

National Migrant Worker Program
1971; to help workers make transition from migrant work to stable non-agricultural employment. Dept. of Labor.

Texas Migrant Education
1962; to meet special education needs of migrants (for further descriptions see Marshall et al., 1974).

A more detailed review of the above programs would be helpful in understanding the effects on South Texas relevant to geothermal development. These comparisons suggest the need for further research along several lines, depending on the site chosen for geothermal development. Additional technical information will be required regarding specific uses of the geothermal resource, and thus what type industries might be attracted to the area. Possible effects of these industries on each area, especially on the labor force, could then be studied. Several further research needs must be given preliminary consideration. A closer analysis of the unemployed labor force is needed to see what types and levels of skill characterize the workers available for employment in new or expanding industries. More research into migration patterns and their relationship to the labor force is needed. Exploring the possibility that the high degree of out-migration from Area III is related to high in-migration in Area I would be valuable, as this would affect both the numbers and skill levels of available workers in both areas.

All three areas include counties which are inconsistent with the others on some variables. Kleberg County in Area III, for instance, has an extremely low percentage (12.2%) of Mexican Americans, in comparison to the

rest of the area. Another example is Aransas County in Area II, in which 42.2% of the work force is in non-farm labor occupations (the total area percentage is 6.8%), but which does not differ significantly from the rest of the area in other ways. This figure is due to the fishing-based economy of Aransas County. The county, or counties, involved in the geothermal site should be examined for their individual characteristics in more detail, so that future developments can be planned within their particular needs and resources for growth. Appendix C describes one method which would be helpful in such work. Specific research tasks are discussed at the end of the three chapters constituting this part of the volume.

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CHAPTER II

LOCAL IMPACTS OF DRILLING, DEVELOPMENT, AND PRODUCTION

Sally Cook Lopreato
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INTRODUCTION

The question of the impacts of technological change on social institutions and behavior has been addressed by numerous students of societal processes, including such scholars as William F. Ogburn (1950) and Leslie A. White (1949). Unfortunately, however, the precise relationships between different kinds of technological innovation and resultant social change have yet to be systematically investigated. The purpose of this chapter is to consider possible effects of the development of geothermal resources upon nearby communities.

The first section of the chapter reviews two studies which address similar questions for the coal and nuclear power industries. Drawing from the methodology as well as the theoretical foundations of these studies, an attempt is made to establish a perspective from which community change can be viewed. The results of these studies are used to help suggest ways of estimating possible consequences of geothermal development.

After the discussion of general factors determining development consequences, the methodology section describes an approach to the analysis of technological impact and ensuing community changes. The analysis section utilizes a case study approach based on aggregate census data and field-gathered material. Limitations of existing data sets are noted, and, based on those limitations, a plan is developed for analysis which could be used in planning for and developing additional geothermal resources.

COMMUNITY IMPACT STUDIES: A REVIEW

Research reports relevant to the potential of geothermal resources focus almost exclusively upon geological and technical factors. The major shortcoming of such reports is that they fail to answer the persistent question--What are the sociological consequences at the community level of specific types of energy exploration and development? The first step for our purposes is to determine how much of what we know about local impacts of expansion or development in other energy-related fields can be generalized to the area of geothermal exploration. In that line we examine below two pioneer local-impact studies for the coal mining and nuclear power industries.[1]

Underground Mining.

A recently completed Electric Power and Research Institute (EPRI, 1975) report on underground coal mining attempted to assess the ability of local communities to absorb and manage large-scale, unforeseen, erratic, and perhaps temporary growth. The method of analysis involved extrapolating from a case study of one "boom" town situation which arose following expansion in an underground extraction industry to another area which would be experiencing expanded coal mining.

The case study was carried out for Sweetwater County, Wyoming, which contained 10,429 square miles with a population of 18,400 in 1970. Historical mainstays of the county's economy were railroads and coal mining, interdependent activities which had declined since World War II. The county was sustained by activities such as the construction of a dam, oil and gas production, and the mining of trona (natural soda ash), which uses processes very similar to those of underground coal extraction. By no means, however, could it be said that the county was thriving; it had realized, for example, an 8.5 percent population loss over the 1960-1970 decade (EPRI, 1975:9).

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[1]Several additional studies are discussed and summarized elsewhere (see Univ. of Denver Research Institute, 1975). The methodologies, problem areas pinpointed, and conceptual frameworks of community impact works to date are extremely similar.

The beginnings of a boom were experienced by Sweetwater County in 1970 as a result of business decisions to invest large amounts of capital in trona plant and mining operations and in construction of a power plant. As one might have predicted, the most notable changes generated by these activities occurred in the labor force. From 1971 to 1974, mining employment increased 73 percent, from 1530 to 2650 workers. An increase in construction employment resulted both from the opening of new mines and construction activity at the power plant, which in turn led to secondary construction in the community. Employment in the construction sector spiraled from 400 to 4800 employees. Local and state government employees, including school teachers, increased from 880 to 1300. Available employment for women did not increase proportionately to total employment, and wives and daughters of newcomers reportedly sought jobs and could not find them. In sum, total employment in the county from 1970-74 more than doubled, from 7230 to 15,225 employees (EPRI, 1975: 5-6).

Demographic impacts were evidenced almost immediately with county population doubling between 1970 and 1974, a growth rate of 19 percent per year. This boom in population growth was exclusively attributed to in-migration of mine workers and their families. The population increase involved labor force groups specific to mining and construction activity. Most notable growth occurred in young adult male and children categories, resulting in a decrease in overall median age.

It is clear that the social infrastructure was inadequate to support the increased population. "The financial viability of municipalities and school systems deteriorated through a lack of both capital and operating funds" (EPRI, 1975: 5). Waste collection was unsatisfactory. Local sewerage treatment could not meet modern standards, and the development of new housing was encumbered with costs of additional treatment facilities. Educational and recreational facilities also proved too limited to meet the demands of a rapidly growing and increasingly younger population. The additional assessed tax valuation from new homes, even at inflated prices, did not cover the related demands made on municipal revenues (EPRI, 1975: 7).

Although the study failed to supply precise measures of density per housing unit or density per room, it asserted that crowding was an obvious

social problem. One of the most serious shortages the county experienced occurred in the housing and land market. Not only was the housing industry unable to respond rapidly to sudden demand, but much of the county land was owned by the government and a few large owners and was not opened for development. A "seller's market" ensued, and housing was subsequently priced far too high for workers, who joined the growing ranks of mobile home dwellers (EPRI, 1975: 5).

One effect of the rapid growth in the community was social disorganization, which eventually manifested itself even in the mining industry. Productivity declined substantially from 1972 to 1973. Trona tonnage obtained per work shift dropped 60 to 75 percent. Employee turnover increased to 35 percent in some companies, and in others rose to 100 percent. Recruitment efforts failed to bring in new workers. In spite of attractive competitive wages, labor supply could not catch up to demand. (EPRI, 1975: 7). The report concluded that the industry whose expansion had stimulated the process of community growth was in turn adversely affected by unplanned, unmanaged social change.

Instead of general hypotheses regarding community change, the study pinpointed major problem areas: health and safety, environment, labor, transportation, competitive sources, and the need for coordinated planning. Extrapolating from the analysis of Sweetwater County, possible impacts were then discussed for two West Virginia counties where rapid expansion of underground coal mining might occur. Major directions of community change in periods of rapid development are summarized in Figure II.1, which has been adapted from the EPRI report.

Nuclear Plants.

A second investigation of local consequences of development in energy-related industry is the community impact study of nuclear plant sitings carried out by Frisbie and Letlow (1974). In their initial specification of the broad dimensions of social change which would be studied, the authors differentiated between the short term effects of the construction phase of siting and the more permanent impacts of long term operation of the nuclear facility. For each time period four broad categories of variables were examined: demographic, socioeconomic, political/

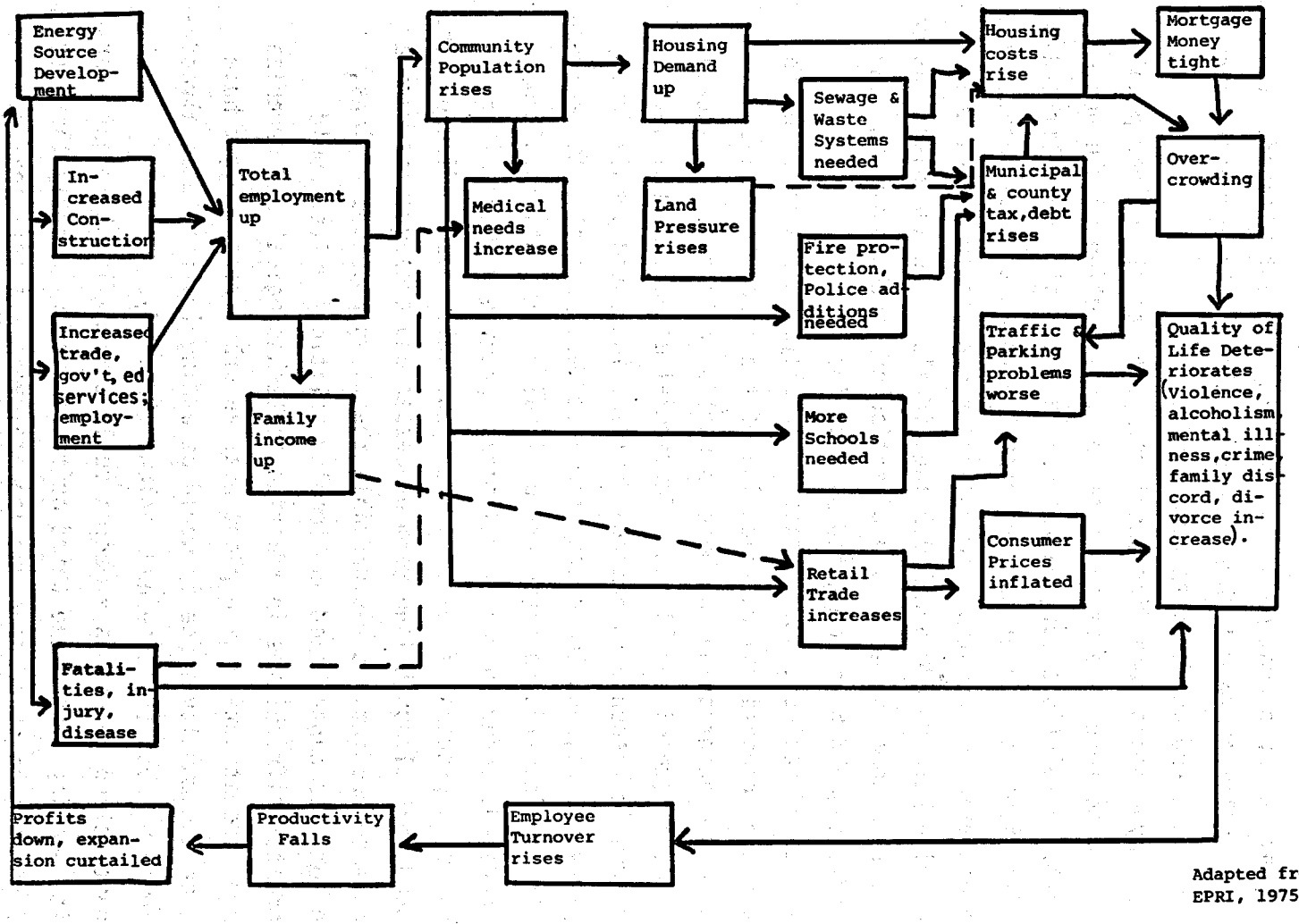

Figure II.1 Possible Community Impacts of Resource Development

administrative, and social psychological. Any indicator of community change under these dimensions would ideally be measured at three points in time--prior to siting, during the peak of the construction phase, and several years after operation of the facility was established. The study tried to follow these data parameters by using both aggregate census data where possible and an in-depth case study.

The major hypotheses regarding short term effects of nuclear plant siting were related to choice of the site and construction of the nuclear complex itself. Predictions for the demographic dimension were limited to population distribution. Counties were expected to experience substantial waves of in-migration of construction workers and engineers, with the project employing between 600 and 2,000 individuals. The age distribution was predicted to become skewed in the direction of youth, since in many instances workers would be accompanied by families.

In the area of socioeconomic impacts, unemployment was expected to decrease, and the occupational distribution of the labor force was expected to show concentration in the construction category. An increase was anticipated in school enrollment. Commercial establishments were expected to grow in response to demands from the increased population. Wages, property values, and the county tax base were predicted to increase.

Since the administrative structure of local governments is often relatively underdeveloped in more rural areas, precisely where siting is likely to occur, a process of political reorganization was predicted. The authors argued that although long term processes and consequences were at best difficult to predict, it was probable that less populous regions, administered by less centralized and complex political units, would encounter greater difficulties in adapting to technological and organizational change. Construction of a plant near an urban center might have less impact on a community since it would be adding impetus to an already-existing growth process (Frisbie and Letlow, 1975: 17).

The construction phase was expected to last from five to eight years with activity peaking around the third or fourth year. Shortly thereafter, a stream of out-migration of construction employees was anticipated. Incoming permanent operating staff would be limited to a group of 100 or 200, consisting primarily of technical and professional workers. The major

long term demographic effect was predicted to result from new or expanded industrial activity in the area, which would produce another wave of in-migration.

Long term socioeconomic predictions included increased size of labor force, upgraded occupational distribution, and higher employment rates, wages, and disposable family income. The administrative infrastructure would continue to expand. In the social psychological dimension, as workers migrate into the community, a lack of shared values with the present population can lead to latent or open hostility. Change of any sort is always met with resentment from some individuals. These attitudes can be expressed in many forms, including the development of special interest groups.

An attempt was made to examine the extent to which the above predictions could be supported by aggregate data gathered from census publications. Units of analysis were eighteen counties in which nuclear power plants were in operation by 1970. Unfortunately, since the plants' start-up dates ranged from 1957 to 1970, and since census data are gathered at ten-year intervals, it was not possible to measure the variables for each of the counties precisely at the three desired points in time, i.e., before construction, during construction, and after plant operation had begun. Thus, census statistics for many of the counties did not show impacts of the construction phase of growth as differentiated from more permanent effects. What could be discerned from the data was a general picture of the counties both before and after siting. The great variety in the geographic location of the sites, and in the type and capacity of the reactors installed, forced the researchers to be extremely tentative in their interpretation of results.

Briefly, the results of the aggregate data analysis were as follows: Given the national tendency for rural populations to decline between 1960 and 1970, the siting of a nuclear power plant was felt to have converted what might otherwise been population-loss counties to population-gain counties. For the four counties in which the construction phase could be differentiated from other effects by an overlap with the 1960 census, an increase in population was observed. This population growth rate, thought to be in part due to in-migration of construction workers, was indeed

temporary, as 1970 data then evidence a decrease in growth rates. Positive relationships were also discovered between siting of nuclear power plants and both employment rates and personal and community affluence.

A detailed case study of one community in which nuclear facilities had been in operation for sixteen years was carried out. Results of this analysis were similar to the findings in the aggregate analysis. The county's population growth consisted primarily of families of child-bearing age. Shortly after the plant began operation, the county gained several additional industries, resulting in a substantial increase in percent of the labor force employed in manufacturing.

Construction employment increased by 1800 workers during the peak years of 1957 and 1958. Permanent employees, while fewer in number, had grown to 400 by 1975. Nearly all of the employees became or already were residents of the community or the neighboring community to the east. Unemployment decreased, while the demand for skilled laborers increased. Land values soared, resulting in a tax boost for the county. Since the industrial and economic base of the county was practically stagnant before construction of the power plant, it was concluded that in this case the effects of nuclear plant siting were significant and positive.

Case study comparison.

Conclusions of the nuclear and coal studies are dissimilar. The study of trona mining impacts on a relatively undeveloped area and subsequent generalizations to the coal industry explicated negative community impacts of great magnitude. It was found that growth occurred so rapidly that the community was unable to adjust its services to meet the demands of the incoming population. Social disorganization occurred to such an extent that mining activities almost came to a standstill. The nuclear impacts study, on the other hand, indicated that large development projects can help stimulate a dragging economy and impact local communities in a positive way. The variable which appears most influential in explaining the difference is the ability of the community to absorb incoming workers.

Although neither of the studies dealt with the development of geothermal resources per se, they are both directly relevant to this research since the point of interest is identical to the purpose of this

chapter--to address the question of community impacts of development in an energy industry. These case studies demonstrate the nature of the effects which can be expected when large-scale construction projects are placed in relatively under-developed, rural regions. These analyses can be used to gain insights into analogous activities along Texas coasts. Of course, that is not to say that people who now live in the latter areas will react in the manner of persons who live in other parts of the country where major mining or nuclear construction projects have occurred. However, researchers can use those previous studies as a point of reference for collecting information which can be used to make more precise estimates for specific cases.

In terms of the methodology employed, the coal mining report is an example of a case study in which impacts of development in the trona mining industry on one community were generalized to impacts on other communities in a different part of the country by expansion in the coal mining industry. Naturally, there are serious problems inherent in this type of study. To begin with, the use of a single case for analysis of a complex issue is at best a risky procedure. The fact that the case of Sweetwater County was an extreme sample has both advantages and disadvantages. By choosing a county in which change occurred at an unprecedented pace and magnitude, the investigators guaranteed their ability to actually pinpoint specific kinds of community impacts. Unfortunately, "boom" towns are the exception rather than the rule in times of expansion within a particular industry, so the generalizability of the impacts which they identified is in doubt.

Another shortcoming of the coal mining study is that impacts which resulted from expansion in one industry were assumed likely to result from expansion in a different industry. It is true that trona mining and coal mining are both extraction industries, and that similar technologies are required for both processes. On the other hand, the actual chemical content of trona and coal is different, indicating that, at a minimum, health hazards and environmental impacts may not be similar. The generalizability of impacts of one extraction industry to another is at best hypothetical and untested.

A final drawback of the coal study is found in its cross-regional

assumptions. By extrapolating from one county in Wyoming to counties in West Virginia, the investigators take gross liberties with their data. The study pointed out the need to control for the size of the county populations, for the rural concentration of the populations, and for population density. Yet the three counties were not truly comparable on these measures, not to mention a score of other variables which tend to vary dramatically with region of the country.

The nuclear power report drew generalizations from available case studies of community consequences of the siting of generating plants, but there were at least two major drawbacks to that approach. First, much of the literature appeared to be biased in perspective. The studies were not, typically, the endeavor of a team of social scientists interested in technology and social change. Naturally, each of the communities examined had experienced a degree of conflict as to the pros and cons of locating a nuclear plant in the vicinity. The resulting reports were often the product of an individual or group of individuals who already had taken a stand either for or against the industry. A second problem encountered in the analysis of case study reports was that even though several communities had been investigated, each case study was singular in the impacts which it deemed important. Thus, it was not possible to derive from the available literature one conceptual framework or model within which to measure community impacts. In general, however, some broad dimensions for assessment of community impacts were uncovered.

In the nuclear impacts report, the analysis of aggregate statistics for eighteen communities which had nuclear generators in operation was perhaps the most valuable contribution. Unfortunately, an analysis based on data of this type is limited to description. Even with a good conceptual framework and a vast amount of published data available at the county level, the conclusions were extremely tentative because of a serious time-lag problem. Nuclear power plants were being constructed and put into operation at various points in time from 1958 through 1970. Because census data are collected every ten years, in one county the data were measured three years after the installation went into operation, and in another county the measures were taken seven years after initial impact. The need for data measured <u>before</u> onset of development, <u>during</u> the development

period, and after start-up of active production could not be exactly met. In contrast the geothermal project has great potential for allowing more precise measurements. Despite shortcomings, however, the two community impact studies reviewed here suggest some basic hypotheses which will be useful in predicting and gauging the impacts of geothermal development.

ESTIMATES OF COMMUNITY IMPACTS

The above review points out two major factors which, in combination, can be used for a first-cut estimate of community impacts of a development. First are the size and requirements of the development, in terms of such factors as number of workers required, transportation facilities used, land taken, and so on. A subcategory here should be the relative attractiveness of the development for other industrial activities. This factor is essential in determining the range and time span of community impacts. A coal mining operation, for example, may rate low in attracting other industries to the same area, whereas a geothermal field could rate high since some byproducts are useful only in close proximity to the wells (e.g., process heat generated by high temperature water). For the coal operation the short-term impacts on the community infrastructure would be greater than long-term impacts (leaving out of consideration at this point environmental and occupational health issues). The geothermal field would be associated with more long-term than short-term impacts.

The second major factor is the social and economic overhead capacity of the community; that is, the degree to which the area can absorb the development and support growth. Variables of importance here would include the nature of the local work force and levels of employment, the state of housing, schools, hospitals, and other services, the nature of existing land use, and so on. Perhaps the key component of community adaptability, however, is the attitude on the part of the population toward the development; is the community willing to commit itself to expansion in services, to adjustment of zoning laws, to some short-term crowding of facilities, and to potential growth in general? It is frequently stated that the smaller the community--by which is meant the more rural--the greater the impacts of any given development. That type of statement is oversimplistic to the point of being wrong. Impacts, in the first place, can be positive or negative, and they must be identified as short-term or long-term. In the second place, it is essential to differentiate between utility of the community and utility for the community.

Utility of the community refers to the degree to which the community as a social organization benefits from something. Utility for the community refers to the degree to which individuals or categories of

individuals in the community benefit (see Pareto, 1935). The two utilities are related, but they are quite distinct and frequently are in conflict. A given development (whether it be a geothermal field, a petrochemical plant, a manufacturing plant, or whatever) may strengthen the community as a unit (through added tax revenues, for instance) and be detrimental to parts of the citizenry (if, for example, sections of residential land drop in value due to air pollution).

Rural areas can be more flexible than urban areas in terms of such variables as available land, population density, pollution levels, labor supply, and type of economic investment. The impacts of initiating automobile manufacturing in Philadelphia would be greater, and more negative, than locating such manufacturing in Round Rock, Texas. Traditional values which might impede development are often associated with rural residents (we return to this point below), but the attitudes of urban dwellers can be a greater barrier as they fight what they see as "excessive" growth of their city.

From a planning perspective, too, it should be easier to align the utility of a small rural community and the utility for its inhabitants than those of a major urban center and for its diverse residents. At any rate, the particular development and its needs must be studied in relation to the specific community and its capabilities before any exact estimation of impacts--positive or negative--can be made.

METHODOLOGY

Large-scale development projects induce or alter processes of change in the demographic and socioeconomic structures of the proximate communities. The perspective from which this process of change will be approached in the present study is that of systems analysis. A system in sociological work is thought of as a complex or network of interrelationships among social structures. A system is composed of identifiable parts which are bound together in mutually interdependent relationships. The parts of a system are assumed to be identifiable and the boundaries to it delimited such that a system may be analyzed as separate or "closed" for research purposes. In reality, no system is closed, but is interdependent with other systems at the same level as well as being included in systems at a higher level.

One of the most important characteristics of this type of analysis is its emphasis upon the concept of equilibrium. The properties or dimensions of a system are assumed to exist in a state of "balance" with each other. As a modification to a system is imposed from the outside, disequilibrium results, and some degree of predictability is lost. Although a system may undergo some modifications and alterations without visible effects, it is assumed that abrupt and drastic changes produce observable social disorganization, as the various parts are influenced and strive to regain an equilibrium line. The goal of a systems analysis is to develop a model in which the important structures are identified and measured, and the hypothesized interrelationships within the system empirically tested and tied to larger systems.

Partial modeling, or a first approximation, is the most practical approach to a system analysis when previous research is sparse. A partial model can describe a system in several ways. It may be limited to a small portion of the interrelationships which would ultimately be included in the analysis, or it may be focused on only a single level of the system (Pareto, 1935). It is important to note that where a partial model is used, specific hypotheses or precise predictions of change in one variable given change in another variable are premature and difficult to formulate. Research based on a first approximation is essentially exploratory, and

results of such a study must be fed back into the model to further refine it.

The first step in investigating the community as a social system is to identify major structures or dimensions constituting its organization or interdependencies. Various attempts have been made to empirically determine the dimensions along which communities vary by using a factor analytic technique on a large number of community variable measures available in official statistical reports (Jonassen and Peres, 1960; Hadden and Borgatta, 1965; Bonjean, Browning, and Carter, 1969). These studies show that community change can be studied in terms of conceptually distinct dimensions which can be labeled socioeconomic status, residential mobility, urbanism, poverty status, family life cycle, manufacturing concentration, commercial center, educational center, and foreign born concentration.

While most community studies produce some commonality of dimensions, by no means can it be said that the analyses produced identical results. The scheme of community dimensions which was defined by Bonjean, Browning, and Carter (1969) will be utilized in this analysis for several reasons. First, Jonassen and Peres (1960) limited their study to counties in only one state, while the Bonjean, et al. article included all U.S. counties. Hadden and Borgatta (1965) on the other hand, limited their work to cities. Factor analyses are typically not generalizable to different units of analysis, such as from city to county--the unit to be used here. The Bonjean, et al. study also appears to encompass most of the variables brought to light in our previous review of community impact studies. The dimensions of community change, along with the names and computation procedures of the highest loading variables in each dimension, are as follows:

Differentiating Dimensions of Community Impacts

(Factors and Variables)

I. Socioeconomic Status

Median family incomes*

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*Unless otherwise specified, variable is direct from County and City Data Books.

Dwelling condition - % Of homes not dilapidated
% Housing units with telephone
Poverty - % Families with income < $3000
Per capita income
High school education - % Persons 25 years and older with high school education
Well-to-do - % Families with income > $10,000
School years completed
Home value - Median value, owner-occupied, single-family
% White collar workers
Median rent - Median gross rent, renter-occupied

II. Age Composition or Family Life Cycle

% 21 and over**
Median age
% Under 5 years
% Population of school age
Kindergarten and elementary enrollment
Population per unit
% 65 years and over
Crude birth rate
Mean family size - Total population/total number of families
% Non-white

III. Governmental Revenues and Expenditures

Local expenditures per Expenditures/Active population 21-65 years
Local revenues - Revenues/Active population 21-65 years
Local expenditures for education per Education Expenditures/Active population 21-65 years
Local tax revenue per pupil - revenue x percent tax/expenditures/number pupils

IV. Residential Mobility

Dwelling newness - % Increase in units in last ten years
% Migrants from a different county
% Occupied units moved into in last 2 years before census
% Population increase
% Net migration

V. Urbanism

Heterogeneity - % Foreign-born plus three times % non-white
Population size
Population density - Persons per square mile

**For 1970, the item is 18% and over.

VI. Manufacturing Concentration

% Employed in manufacturing
Per capita value added by manufacturing
Industrial Bureaucracy - % Manufacturing establishments with < 100 employees

VII. Commercial Center

% Employed working outside county of residence
% Employed in wholesale and retail trade
Per capita retail sales - All retail sales/population

VIII. Unemployment

% Unemployed
% Employed in agriculture
% Population living on farms
% Active population employed - Total employed/active population

The first part of the analysis utilizes an on-site case study. Data are limited primarily to manpower and division of labor statistics which were gathered from direct observations of geothermal operations by a member of the research team. Interspersed with personal observations are statistics gleaned from telephone interviews and second-hand verbal reports. Although the data are crude and at best preliminary, they are included because of the dearth of published information shedding light on the issue.

The second part of the analysis utilizes as closely as possible the conceptual scheme previously designated. Data are computed from 1960 and 1970 County and City Data Book publications. Two counties which have experienced geothermal exploration--Imperial County, California, and Sandoval County, New Mexico--will be described at each of the two time periods in an attempt to approximate a longitudinal analysis describing changes in community dimensions over time. It should be noted that even if dramatic change in some of the dimensions can be demonstrated, the change cannot be directly attributed to geothermal development since no control group of similar counties without geothermal development are included in this limited study.

Speculation as to whether geothermal development has indeed fostered consequences for the few communities in which it has occurred, as well as

speculation as to the potential magnitude of the changes which might be expected for future areas of development, is premature without a systematic investigation of the data which are now available. The Phase 0 project attempts to outline how such an investigation could be carried out. The descriptive approach utilized here is lacking in statistical analysis, but it demonstrates a methodology and initiates the work that is needed to determine community level impacts of geothermal development.

ANALYSIS

One example of private-sector geothermal resource development is found in an area known as the Geysers, located in Sonoma County, California. Since that county has undergone substantial geothermal research and development (with 41 wells drilled between 1955 and 1965 alone), it would be thought to be a prime target for the kind of secondary data analysis which this study undertakes. A brief glance at the 1960 and 1970 census data for Sonoma County, however, indicates that it is not a good candidate for such an analysis. Located only 75 miles north of San Francisco, the tremendous growth experienced in the last twenty years is in large part an effect of overflow from the bay area. Many workers commute to the San Francisco area. Since a census description of the county could not differentiate between effects of the urbanization process due to its proximity to San Francisco and effects of geothermal development, more detailed information on its geothermal facilities were gathered by on-site observations of a member of the Phase 0 research team.

The actual production of electricity at the 25,000 acre Geysers site is in the hands of Pacific Gas and Electricity, a San Francisco power company. The on-site observer noticed that with eleven units producing a total of 550 MW, there were surprisingly few workers. For the day shift there could be observed five or six inspectors, four machinists, three electricians, and two plant engineers. At night control was consolidated to one central watch with only two or three additional staff. The entire operation appeared to require no more than nineteen men.

The drilling of new wells at the Geysers is contracted out to Union Magma Thermal Drilling Company. Manpower requirements for this activity were small at the time of the on-site visit. New drilling was estimated to require three operators, five men on the rig, one or two managers, and two to five truck drivers. Drilling activity, lasting up to six months, utilized a maximum of fifteen workers.

Two kinds of construction activities occur at the Geysers. First, as new wells are drilled, constructors are hired to build new pipelines. The observer indicated that eight to ten employees would be required for a period of three to four months to produce two miles of new pipeline. Of these workers, only two or three would be unskilled. A more extensive

construction process has occurred at the site as new generating units have been added to the facility. For a new unit and cooling tower, a maximum of twenty-five to thirty workers can be expected to be hired at one time. Over a period of thirteen to fifteen months, it would be reasonable to expect thirty pipefitters, twelve electricians, four to six boilermakers, twenty carpenters and steelworkers, and two to three laborers working on the site. Even with these limited data it can be observed that maximum geothermal activity in Sonoma County in the areas of construction, drilling, and electricity production requires less than one hundred workers. Given the growth already underway in the region, it is unlikely that labor force impacts of geothermal development can be shown to be at all significant.

Other than the jobs which geothermal activity creates directly, the most obvious local impact is upon the tax structure. Since taxes are levied on the estimated present value of the geothermal resource rather than the amount of the resource which is recovered and used for generation during any one year, the county has experienced a tremendous tax boost.

The approach specified in the methodology section may give more information based on two less urbanized counties which have experienced geothermal resource development. Results of the data compilation appear in Table II.1. Since the counties are quite disparate in population size, region of the country, and type of geothermal resource, each county will be described separately. Where change or difference is described, it refers to change in one specific variable for one specific county over the ten year period, 1960-1970.

Imperial County, California, is agricultural, isolated from major urban centers, and made up of small towns. The county has had a long history of geothermal exploration with two wells drilled as early as 1927. The county is now the location of at least two major test sites for geothermal development. The East Mesa test site, under the jurisdiction of the U.S. Bureau of Reclamation, consists of four or five experimental wells and a desalination laboratory. It is not expected that the site will ever be used to produce electricity for commercial purposes. The Niland test site is owned by San Diego Gas and Electricity, and plans have been made for generation of electricity in the near future (see El-Ramly, Peterson and Seo, 1974: 31-38 for well sites and drilling dates to 1973).

On the whole, the socioeconomic status of Imperial County showed slight positive gains between 1960 and 1970. Median family income increased from $5507 to $8256, and the proportion of families with less than $3000 annual income decreased from 21% to 11.5%.[2] The more affluent group--families with more than $10,000 annual income--increased from 15.4% to 38.5%. As home values and monthly rent increased, dwelling condition was upgraded to nearly 100% undilapidated.

The population grew younger as the proportion of school age increased from 26.1% to 33.9%. The proportion of the population under five years of age, however, decreased from 12.4% to 9.8%, consistent with a decrease from 27.7 to 22.4 births per one thousand women.

Local governmental revenues per person in the active population increased from $819 to $1242, and expenditures increased from $820 to $1181. Not only do these figures indicate an increase in community services, but they also demonstrate that the incoming funds more adequately met necessary expenditures. Both educational expenditures and local tax revenue per pupil also increased.

No consistent direction of change occurred among the residential mobility variables. Movement within the county between housing units increased, but construction of new dwellings slowed from 18% to 9.4%. The county showed a net migration of -11.8% in 1960, a trend which continued through 1970 when there were 15% more migrants going out of the county than there were moving into it. This net out-migration is also reflected in the slowing of population growth from 14.5% to 3.3%. During the last decade the county showed little evidence of urbanization, with relatively small changes in population size and density.

Manufacturing concentration remained very low in the county, and the proportion of the population employed in manufacturing activities increased only 1.1%. Per capita value added by manufacturing decreased slightly by 1970. Although manufacturing activities did not increase, the

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[2]Income figures are not given in constant dollars. The change in terms of real purchasing power is not as great as may first appear.

county did meet more of its own commercial needs, evidenced by increases in the proportion of those employed in wholesale and retail trade as well as by per capita retail sales. The proportion of employees traveling outside the county for work increased. As might be expected from an area with a large net out-migration, the proportion of the population actively employed decreased from 77.4% to 62.2%. The size of the farm population also declined sharply.

One conclusion from the preceding analysis which can be stated unequivocably is that Imperial County can by no stretch of the imagination be considered in the midst of a "boom". In general, it can be said that the county is depressed economically. If rapid out-migration continues, the county is likely to resemble even more closely the bleak picture of "population loss" counties. This case study indicates almost no impacts from geothermal research and initial development. It should be remembered, however, that until very recently the only geothermal development in the county was limited to government-sponsored research on a small scale. Any major impacts would be unlikely to surface in census data until 1980. Also, labor force effects of temporary or short-term construction activity could be realized in the next couple of years, as geothermal development increases, and then be missed entirely by 1980 census data.

A second example of an area with an active geothermal drilling program is Sandoval County, New Mexico, where Bacca Land and Cattle Company first initiated drilling around 1960, and renewed their efforts in the early 1970's. Bacca now has an estimated fifty wells on its private land to explore the potential for geothermal development. If plans are being made for electricity generation, they are still unannounced.

Some slight gains in community economic status were evidenced between 1960 and 1970 by increases in median family income and the proportion of families with less than $3,000 annual income. Dwelling condition improved from 66.8% dilapidated to 65.7% undilapidated. The population grew older, evidenced by an increase in the median age from 18.6 to 21.2. The elderly population increased from 5.9% to 7.1%, as younger people migrated out. The crude birth rate declined sharply from 32.4 to 27.0 births per thousand women.

It is quite unlikely that community services expanded at all, due to

insignificant changes in the county revenues and expenditures. More new dwelling units were being constructed, however, and more occupied units moved into in recent years. More importantly, net out-migration slowed from -14.1% to -1.9%.

The county experienced only slight evidence of urbanization. Manufacturing concentration remained almost nonexistent. The county became even less of a commercial center, as the proportion of employed working outside the county increased from 29.9% to 43.8%. Unemployment remained unusually high. It can be concluded that Sandoval County is even more depressed economically than Imperial County.

The following points summarize the brief two-county analysis attempted here.

1. Socioeconomic status improved slightly in both areas over time, but the data cannot be interpreted to show to what extent, if any, geothermal development contributed to that improvement.

2. While one of the counties demonstrated a trend toward a younger age structure, the age pyramid for the other county shifted dramatically toward an older population. The aging was clearly the result of out-migration in younger age categories.

3. Governmental revenues did increase for Imperial County, but for the more rural and depressed Sandoval County, both revenues and expenditures remained virtually stationary.

4. Residential mobility increased for both counties, but the data are unable to demonstrate if any of the increase is due to geothermal activity.

5. Neither of the counties showed marked signs of urbanization.

6. Manufacturing activities were limited and remained stable.

7. Wholesale and retail trade increased only slightly for Imperial County. Sonoma County became even less of a commercial center over the ten-year period.

8. Employment was nearly unchanged for both counties.

These findings are not definitive in any way, but we will tentatively advance one generalization: geothermal research and exploration in early stages will produce few impacts, positive or negative, on communites where they are carried out. Manpower, equipment, and construction required are negligible in comparison to other types of energy developments, such as a nuclear plant or coal mining operation. Existing community services probably will support the few incoming personnel. Still, surveys of housing availability, school enrollments, and so forth would help insure that the community would not suffer from crowding in its various facilities. Temporary housing and health facilities could be planned in advance to allow rapid accomodations if needed. Phase 1 research should detail all areas of possible impact and outline strategies for dealing with those impacts, including community, private industry, state and federal government cooperative efforts.

Communities should be advised on what to expect from the geothermal development in terms of the numbers and types of people who would be joining the community, and how long such people would be in the community. Resources should be available, both monetary and professional planning personnel, for the community to call on. In addition, the community should gain wherever possible from the development. Local labor, for example, should be exploited to fill jobs created by the resource exploration. Additional tax revenues from the resource facilities ideally would be distributed among the communities which actually bear the "costs" of the development. Early community involvement and continued dissemination of information to the community are required. With these conditions met, few negative community impacts of the resource development would be projected.

While goethermal exploration and development activities are predicted to produce minimal impacts at the local level, the same is not necessarily true of commercial production stages. The same methodology and hypotheses sketched out in this report are applicable to production of the geothermal resource. The major criterion is scale, or size of development. Let us clarify by way of example. Assume that four wells are producing 25 megawatts of electricity. The wells are positioned around town X, population 2,500. The electricity produced is used to supply power to an urban area of 50,000 people located 50 miles away, and the spent water is reinjected

into abandoned oil reservoirs near the geothermal wells. In this situation, town X probably would experience only increased traffic during the time of drilling and connecting to a grid. The local cafe might experience a short-lived "boom" in lunch business. Suppose, however, that the water could be used for process heat before reinjection. Two industrial factories, employing a total of 250 people, locate just outside the city limits of X. The town itself furnishes 50 workers. Additional workers benefit briefly from the construction period. 200 workers migrate to the town from neighboring counties. These workers are accompanied by young families, average size - 3.53[3] - for a total added population of 706. Town X has grown in size by roughly 28 percent.

It should be obvious that local utilization of geothermal energy or its byproducts can quickly turn a "no impact" situation into a "substantial impact" one. It has been estimated that a major geothermal field can create, directly or indirectly, from several hundred to a few thousand jobs (Grabbe and Kamins, 1975: 5). In general, the smaller the community and the greater the utilization of the resource, the larger the impacts.

Although the results of the present analysis were often in the opposite direction of predicted findings, it must be stressed that the hypotheses were not disproved. Arguments presented in the methodology section and supported in the analysis of the data emphasize the primitive nature of investigations of this type. The more important contribution of the analysis is the development of a framework for future analyses. Suggestions for needed research on community impacts of geothermal development emerge from the work presented up to this point, and will be discussed following the final chapter of Part II.

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[3]Average size of the U.S. family in 1972, taken from the Statistical Abstract of the U.S., U.S. Bureau of the Census, 1973.

Table II.1

TWO U.S. COUNTIES WITH GEOTHERMAL DEVELOPMENT

Differentiating Factors and Variables	Imperial County, California 1960	Imperial County, California 1970	Sandoval County, New Mexico 1960	Sandoval County, New Mexico 1970
I. SOCIOECONOMIC STATUS				
Median family income ($)	5507	8256	2409	5465
Dwelling condition	58.3	94.5	33.2	65.7
% Units with telephones	65.9	74.3	24.0	49.1
Poverty	21.0	11.5	58.3	28.1
Per capita income	1623	2459	704	1543
High school education	33.8	43.1	22.0	39.4
Well-to-do	15.4	38.5	4.6	22.0
Median school years completed	9.0	10.8	8.1	10.3
Median home value ($)	9900	13838	5000	9815
% White collar workers	30.0	43.0	25.3	41.2
Median rent	61	89	38	74
II. AGE COMPOSITION				
% 21 and over	57.2	58.2	46.0	55.0
Median age	26.4	23.9	18.6	21.2
% under 5 years	12.4	9.8	15.9	11.3
% Population of school age	26.1	33.9	33.3	33.9
Kinder. and element. enrollment	14251.	16915.	3431	4098
Population per unit	3.6	3.5	4.5	4.2
% 65 and over	7.0	7.5	5.9	7.1
Crude birth rate	27.7	22.4	32.4	27.0
Mean family size	4.7	4.3	5.3	4.7
% Non-white	7.9	6.1	42.0	39.8
III. GOVERNMENTAL REVENUES AND EXPENDITURES				
Local expenditures per person ($)	820	1181	322	413
Local revenues per person ($)	819	1242	323	425
Education expenditures per person($)	275	402	286	373
Local tax revenue per pupil ($)	610	692	31	42

Table II.1 (cont'd)
pg.2

Differentiating Factors and Variables	Imperial County, California 1960	1970	Sandoval County, New Mexico 1960	1970
IV. RESIDENTIAL MOBILITY				
Dwelling newness	18.0	9.4	12.0	44.3
Net migration (%)	-11.8	-15.1	-14.1	-1.9
% Occupied units moved into	42.9	57.7	23.8	41.2
% Population increase	14.5	3.3	14.2	23.2
V. URBANISM				
Heterogenity	60.1	56.0	128.2	125.0
Population size	72105	74492	14201	17492
Population density	17.	18.	4.	5.
VI. MANUFACTURING CONCENTRATION				
% Employed in manufacturing	5.6	6.7	14.2	14.9
Per capita value added ($)	357	295	D	74
Industrial bureaucracy	.04	.18	.11	--
VII. COMMERCIAL CENTER				
% Employed outside county	1.9	3.7	39.9	43.8
% Employed wholesale & retail trade	17.9	24.6	15.9	14.4
Per capita retail sales	1945	2081	266	308
VIII. UNEMPLOYMENT				
% Unemployed	6.2	7.0	9.9	9.0
% Employed in agriculture	38.8	NA	7.1	NA
% Population farm	7.6	2.3	4.5	3.9
% Active population employed	77.4	62.2	44.6	46.9

D = withheld to avoid disclosure
- = zero
NA = not available

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CHAPTER III

A POLITICAL AND INSTITUTIONAL SURVEY AND ANALYSIS OF THE DEMONSTRATION AND DEVELOPMENT OF GEOPRESSURED-GEOTHERMAL ENERGY ALONG THE TEXAS GULF COAST

INTRODUCTION

The concern of this chapter of the Phase 0 report is the interests of various institutions in the demonstration and development of geopressured-geothermal energy along the Texas Gulf Coast, and the potential for those institutions by virtue of those interests to significantly affect the development of the resource. Little formal methodology is available to researchers attempting to determine which governmental agencies and special interests will ultimately become involved in the development of a new energy resource. A list of the various divisions of government potentially concerned with the development of geopressured-geothermal energy was compiled by examining studies of other development or assessment projects (Texas Coastal Management Program, 1975; National Commission on Water Quality, 1975) and by surveying available directories of governmental agencies and responsibilities (United States Government Manual, GPO 1975; Guide to Texas State Agencies, 4th ed., Bureau of Government Research, L. B. J. School of Public Affairs, 1972). (This compilation is found in Appendix D.) The first section of this chapter examines the coastal area generally. A case study of a potential demonstration site surveys local politics and institutions in the second section. Major federal and state agencies as well as issues of local concern gained from the case study are examined in the final issues section.

THE TEXAS COASTAL AREAS

Suspected geopressured-geothermal resources underlie roughly thirty-six counties along the Texas Gulf Coast and extend approximately sixty miles into the Gulf of Mexico. (See Chapter 1 for description and boundaries of areas.) Coastal prairies and Gulf Coast marshlands or wetlands are the prevalent physical features of the coastal counties. The coastal prairie is a nearly level, slowly drained plain, usually less than 150 feet in elevation,

characterized by grasslands which support farming and ranching, as well as slow moving rivers, creeks, bayous and sloughs. The wetlands are areas of low wet marsh found surrounding a complex system of bays, lagoons, and estuaries, interspersed with dunes (Suter, 1971).

The ownership of these lands, where the demonstration of geopressured-geothermal energy is most feasible, is of importance due to legal uncertainties surrounding ownership of the resource. Sites on state-owned lands offer the fewest impediments to demonstration of the resource. The state owns approximately 16%, or 4,156,735 acres in the coastal area. Of these, 3,858,522 acres are submerged lands or islands. Figure III.1 indicates the location of the state-owned lands along the coast. (The figures are courtesy of the Coastal Management Program, Division of Planning Coordination, Office of the Governor. While the inland boundaries shown on the figures are not those of the coastal study area of the present project, land ownership patterns along the coast are applicable.)

Figure III.2 shows the location of federally owned land along the coast. The federal government owns approximately 2%, or 450,532 acres in the form of parks, refuges, military installations, and properties of the U.S. Corps of Engineers.

Local governments, including counties, municipalities, and special districts, own another 1.5%, or 388,803 acres along the Texas Gulf Coast. These lands are shown in Figure III.3. However, these governments often affect much more land through jurisdictions of watersheds, navigation, municipal water supplies, city boundaries, and extra-territorial authorities.

The number and types of special districts existing in Texas is indicative of the local nature of government in the state. General governments, i.e. counties and municipalities, are constitutionally constrained, especially in the areas of finance, administration, and geographic jurisdiction, giving rise to an increase in reliance upon special districts (Thrombley, 1959). Such districts are usually created to perform a utility function which a general government cannot provide and are authorized to tax and/or incur debt to provide these services. While the increase in reliance upon nonschool special districts is not limited to Texas, the state ranks fourth in the numbers of special districts, preceded by Illinois (2,407), California (2,223), and Pennsylvania (1,777). Texas has 1,215 districts (U.S. Bureau of Census, 1972).

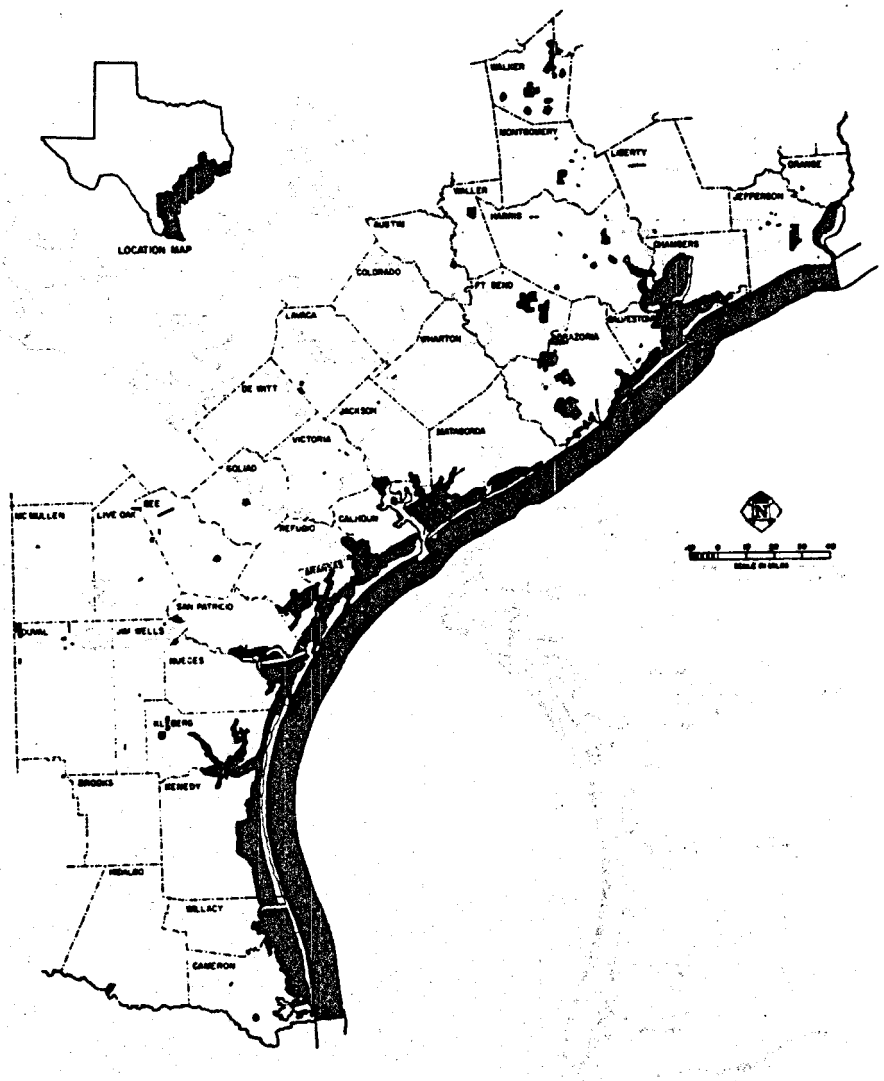

Figure III.1 State Land Ownership.

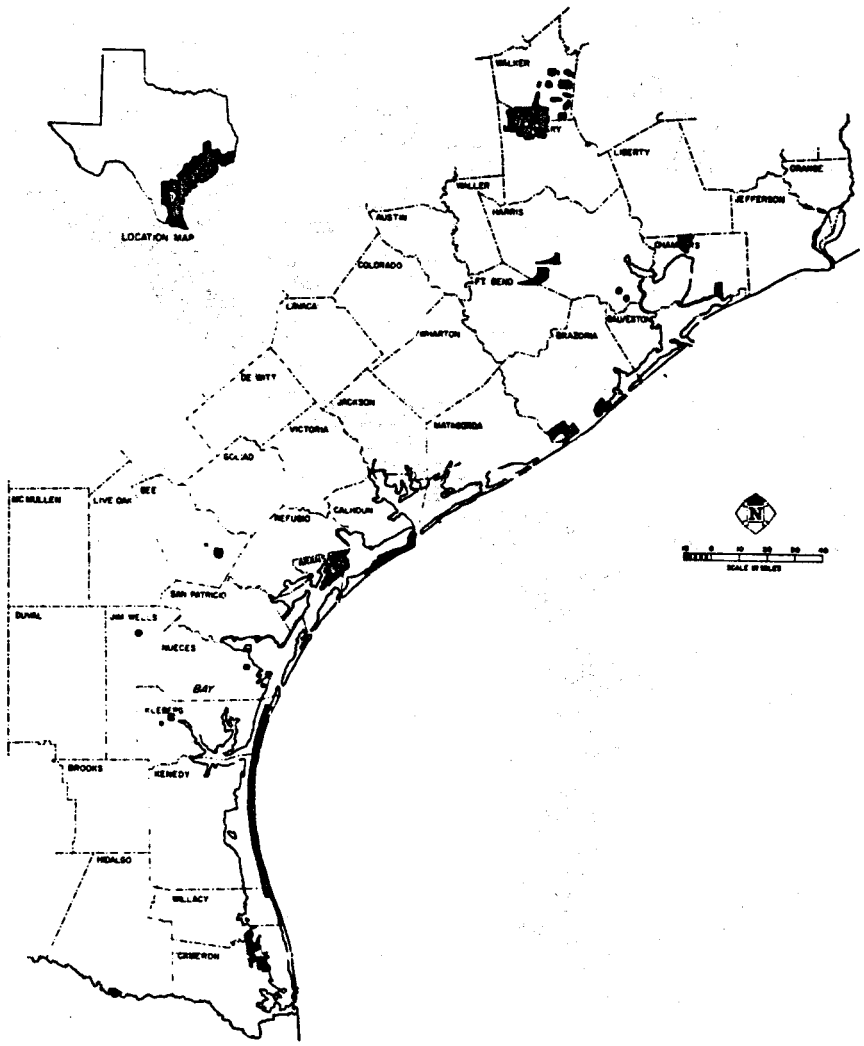

Figure III.2 Federal Land Ownership.

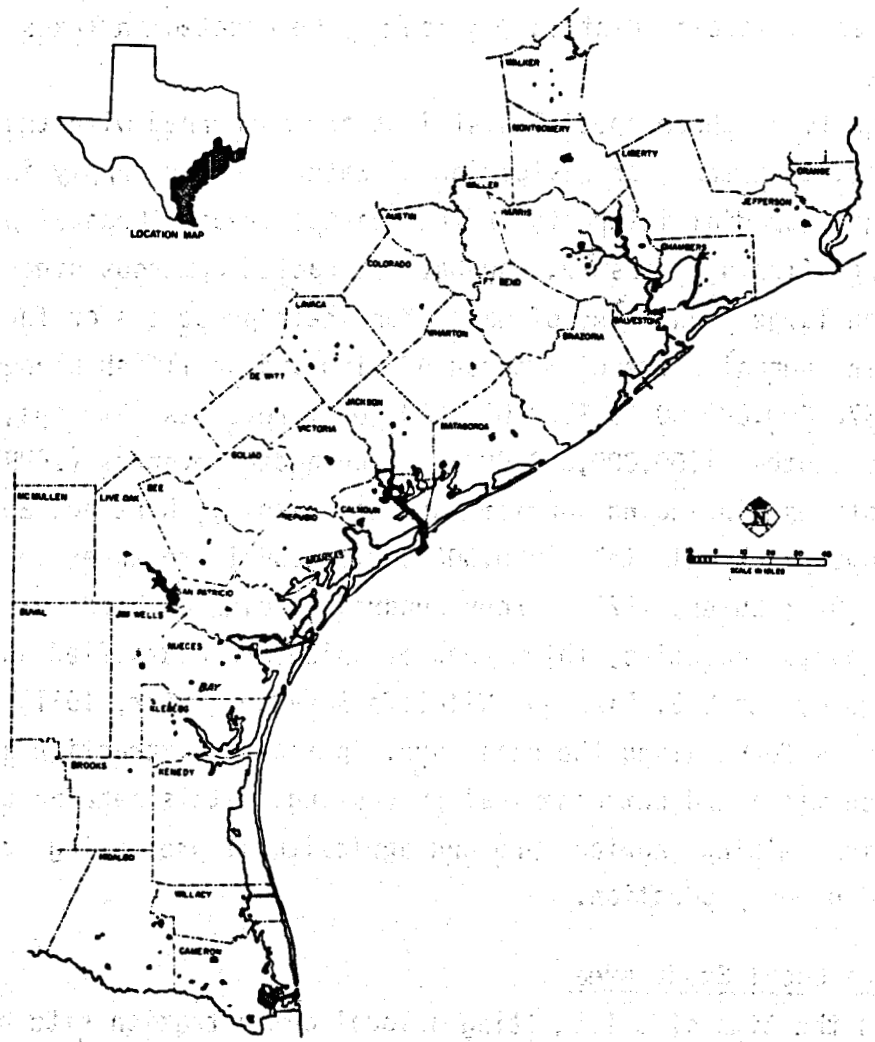

Figure III.3 Local Land Ownership.

The counties of Harris, Galveston, Brazoria, and Chambers, for example, have experienced a pronounced increase in the number of water districts required to supply water to fringe areas of Houston. In 1940, three water districts existed in the four-county area. In 1950, the number had increased to seven. By 1960, there were twenty-five. Today there are more than 300 water districts (L. B. J. School of Public Affairs, 1975). A list of the different types of special districts which may be created in Texas is found in Appendix E.

The majority of these special districts are concerned with the conservation, supply, treatment, or navigation of water. Water supply is also a major concern of special interests in the coastal areas. Coastal waters support a large fishing industry, and have attracted numerous other industries dependent upon large quantities of water for their processes or for transportation. The annual commercial catch of fish and shellfish along the coast ranges from $70,000,000.00 to $100,000,000.00 in revenues (Stevens, 1976) and generates another $100,000,000.00 in value-added revenues (ICNRE,1970). Leisure industries, including tourism, sports, fishing, hunting, and bird watching, produce approximately $290,000,000,000.00 in revenues in the coastal area (ICNRE, 1970; Suter, 1971). Four hundred species of birds have been seen in the coastal counties, thirty-one of which are classified as rare and endangered by the U.S. Fish and Wildlife Service (Suter, 1971). Other major industries found along the coast are: petroleum extraction and refinement, chemical and petrochemical processing, metals manufacturing and fabrication, mining, agriculture and agricultural processing, shipping, ranching, and power production.

Selection of a Local Study Area.

Since at the time of this writing a local demonstration site had not been selected, researchers were free to choose a local site from those initially selected for resource appraisal which would best fit the needs of a political and institutional survey. Four areas were initially selected by the Resource Assessment groups: Matagorda County; Aransas, Nueces, and San Patricio Counties; Kenedy County; and Cameron, Hidalgo, and Willacy Counties.

Matagorda County, situated in the upper Coastal Bend area of the coast, is predominantly rural, containing approximately 30,000 persons, one-half

of whom live in the county seat of Bay City. The farming of rice in the marshy areas of the county is a major source of income, as is the production of petroleum, sulphur, and other mineral resources. These industries are spread throughout the county. Special interest group activity in the county has been limited to the activities of farming interests. The Matagorda County Rice Farmers Cooperative was the only group to appear at public hearings concerning the planned construction of a 2,500 Mw nuclear plant in the county (Speaker, 1975). Matagorda County is situated approximately 90 miles from Houston, the largest population center in the state.

Aransas, Nueces, and San Patricio Counties, located in the Coastal Bend of the Texas Gulf Coast, are a mixture of urban and rural populations, agrarian, manufacturing, mineral, and fishing interests. Industry in the area is centered around Corpus Christi Bay, a potential geothermal demonstration site. Represented are chemical and petrochemical manufacturing, metals manufacturing and fabrication, mining, agricultural product processing, shipping, fishing, and tourism.

The largest city in the three-county area is Corpus Christi, with approximately 205,000 persons. The corporate offices of Central Power and Light Company, the electric utility serving all four of the areas initially selected, are located in Corpus Christi. The public in the area appears highly organized in trade, professional, civic, and environmental groups. The three counties are part of an Economic Development District designated by the Economic Development Administration of the U.S. Department of Commerce.

Kenedy County, situated near the lower end of the Texas Gulf Coast, is one of the least populated counties in Texas. Petroleum production and ranching are the principal income producers for the county's 699 people. Sarita, the largest town in the county, contains only 185 people. The remainder are housed on large ranches in the county.

Cameron, Hidalgo, and Willacy Counties are located in the southernmost tip of Texas, along the Mexican border. Cameron and Hidalgo Counties are heavily populated, with the majority of the population found in small but densely occupied towns scattered throughout the counties.

Industry is concentrated in the cities of Brownsville, Harlingen, San Benito, Edinburg, McAllen, and Weslaco, and includes limited gas refining, steel fabrication, and chemical production. Other industries present in the area include fruit and vegetable processing, clothing manufacturing, beef

production, milk products production, and seafood processing. The three counties, like Aransas, Nueces, and San Patricio Counties, have been designated an Economic Development District.

CASE STUDY: ARANSAS, NUECES, SAN PATRICIO COUNTIES

The Aransas, Nueces, and San Patricio Counties area was selected for the local political and institutional survey because of a concentration of potential electrical and nonelectrical uses of geopressured-geothermal resources and because of the existence of large numbers of special interests in the area.

The three counties cover 1,801 square miles of coastal plains, wetlands, and waters. Approximately 311,000 persons live in the three counties, concentrated generally around Corpus Christi Bay. County government in the area is similar to that found elsewhere in Texas. Aransas County is thought to be more environmental-minded due to dependence upon fishing and tourism. and the existence of a large federal wildlife refuge in the county. Nueces County and the City of Corpus Christi maintain close relationships as evidenced by a movement towards combining the two institutions' jail facilities and other essential services. The City of Corpus Christi (population 204,525; 1970) lies on the west and south of the bay in Nueces County. Corpus Christi, a home-rule city governed by a council-manager administration, has one of the most stable administrations in the state. The present city manager has held his position for eleven years. Using the powers of a home-rule city, Corpus Christi has maintained an active annexation program primarily northwest, south, and southeast of the city. The city, in a two-part program beginning in 1950, annexed Nueces Bay, Corpus Christi Bay, and approximately five miles of the Laguna Madre to control petroleum extraction, gathering, and transportation in the waters surrounding the city. Those submerged lands, shown on the accompanying map of the three-county area, are owned by the State of Texas and administered for the state by the General Land Office.

Petroleum activity on those lands is now declining. The city's Department of Petroleum Inspection administers the city's ordinances governing petroleum activity in the submerged and land areas controlled by the city. The department inspects wells annually. There are 315 wells currently producing in the submerged lands regulated by the city, down from a peak of 434 in 1970. There are approximately 300 land-situated wells producing in

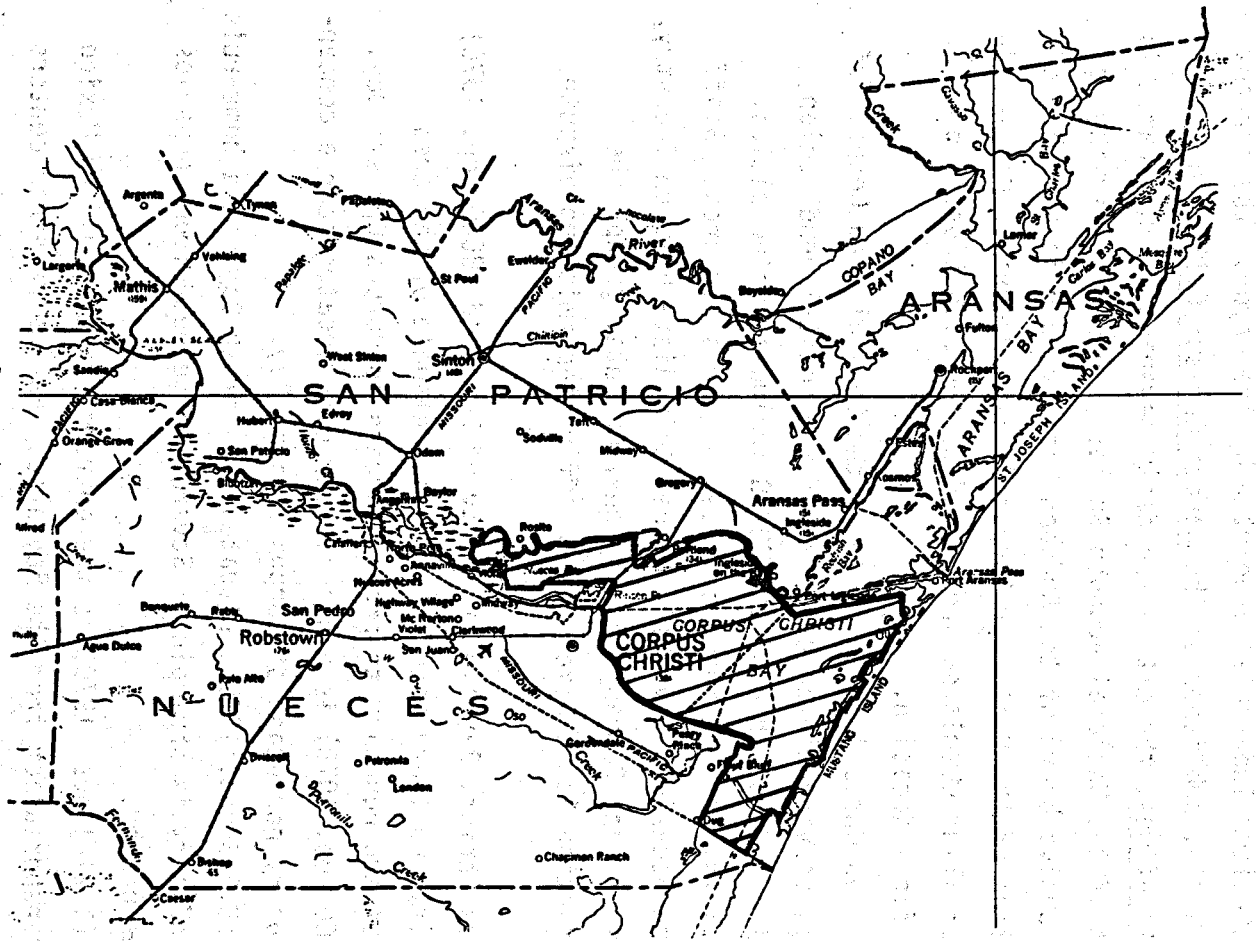

Figure III.4 Three-county case study area indicating submerged areas annexed by the city of Corpus Christi.

the city, down from 619 in 1967 (Conn, 1975). Figure III.5 traces the production of oil and gas inside the city limits from 1968 to the present.

Exceptions to the city's regulations are referred to the Bay Drilling Committee, created by the same ordinances. The committee is made up of six members, one-half nominated by industry and approved by the mayor, one-half from nonpetroleum industries appointed by the mayor. The current chairman is Edward Harte, publisher of the Corpus Christi Caller and Corpus Christi Caller-Times, the city's two daily newspapers. Mr. Harte is also past President of the National Audubon Society, currently serving as Chairman of the Executive Board of the Audubon Society, and is a member of the Steering Committee of the Goals for Corpus Christi Program. Recommendations of the Bay Drilling Committee are passed to the City Council of Corpus Christi for final decision.

The city of Corpus Christi is the home of the Coastal Bend Council of Governments (CBCOG), serving eleven counties of the coastal bend region, shown in Figure III.6. Membership of the CBCOG includes twelve cities, seven special districts, and the three counties of the study area. Staff of the CBCOG, on one occasion, have been forced to mediate between industry, E. I. DuPont de Nemours and Company, and an environmental group, the Coastal Bend Conservation Association, in an effluent-permitting dispute (Buckner, 1975).

North of Corpus Christi Bay lies the city of Portland (8000 pop. 1970). Also a home-rule city, Portland annexed a small rectangle of bay area adjacent to its southern boundary to provide access to Corpus Christi Bay.

Ingleside (4000 pop. 1970) is a general law city located near a concentration of new industry northeast of Corpus Christi Bay.

Aransas Pass (5,923 pop. 1970), situated on Redfish Bay, is a home-rule city whose major industry is shrimping. Several large petroleum companies maintain tank farms nearby.

Port Aransas (1,218) pop. 1970) is the entrance to the Gulf of Mexico for water-bound transportation from the Bay area. Marine research centers of the University of Texas and agencies of the federal government are housed within the city limits.

Other cities and towns and their respective populations located in the three-county area include:

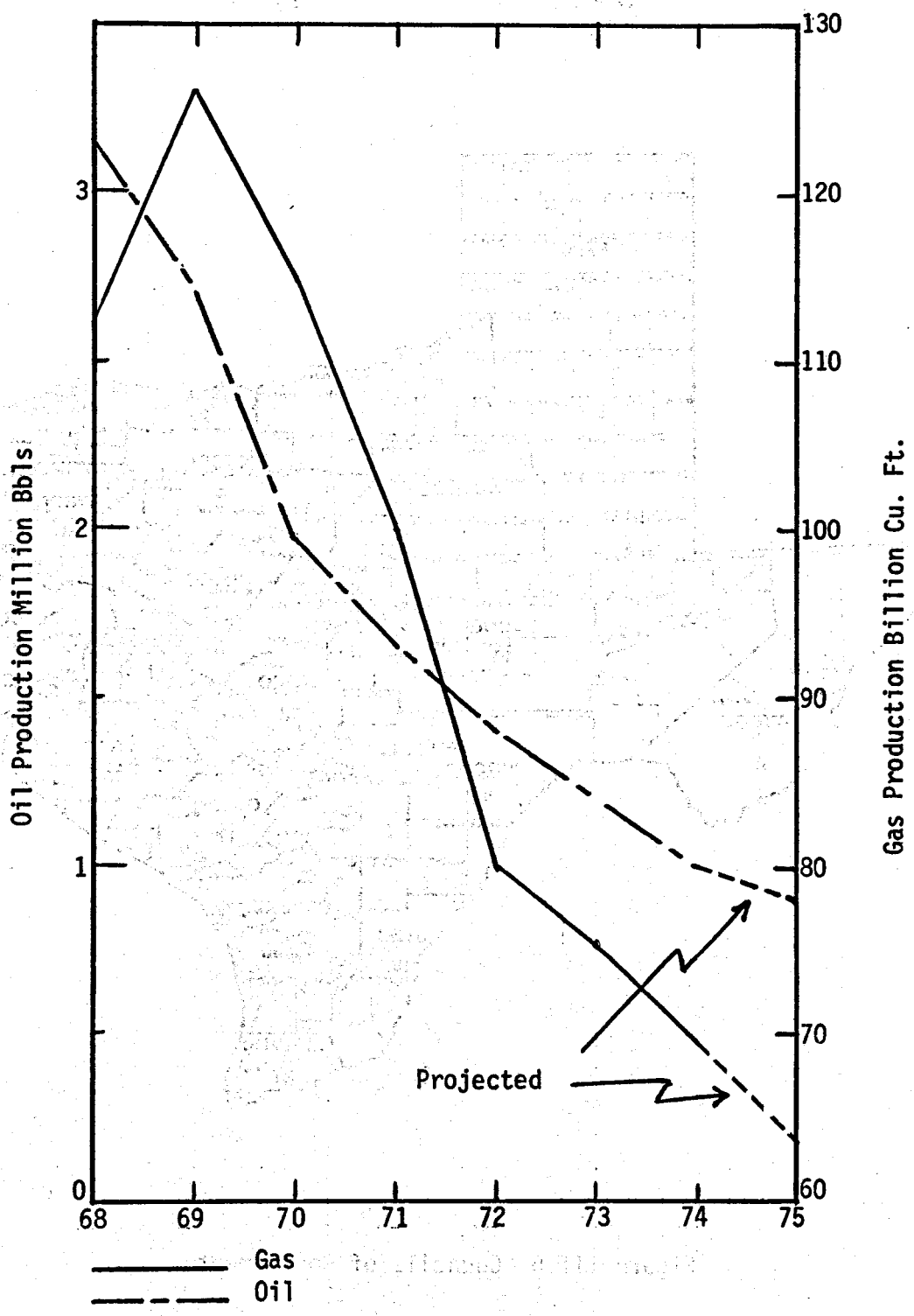

Figure III.5 Annual oil and gas production inside city limits. From Dept. of Petroleum Inspection, City of Corpus Christi, Mar. 13, 1975.

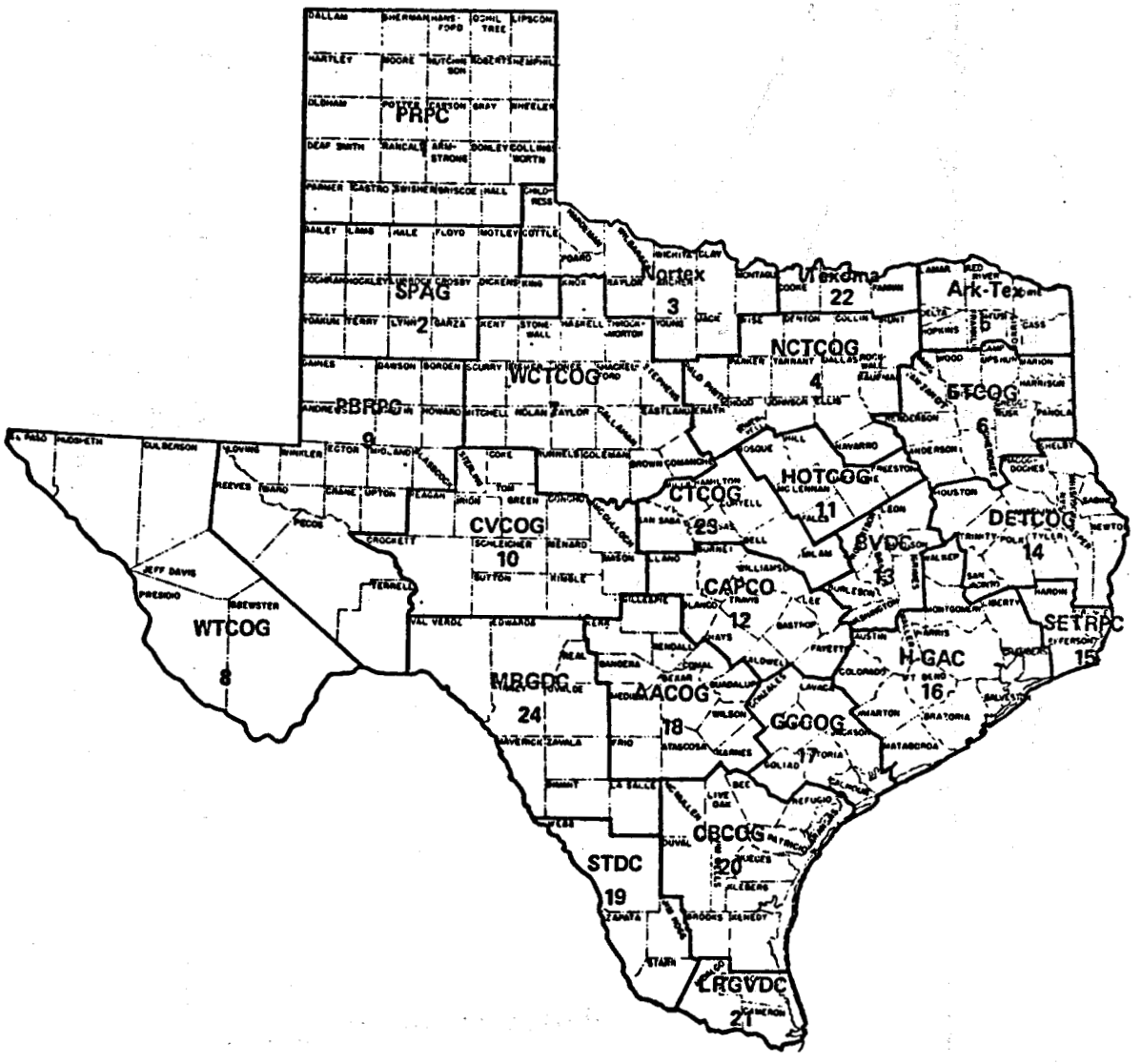

Figure III.6 Councils of Government.

COUNTY	CITY	POPULATION
Aransas County	Rockport	4007
	Fulton	1141
	Lamar	150
Nueces County	Robstown	16394
	Bishop	4000
	Agua Dulce	742
	Driscoll	626
	North San Pedro	2229
	South San Pedro	3065
San Patricio County	Sinton	5940
	Gregory	2300
	Mathis	5625
	Odem	2200
	Taft	3300
	Taft S.W.	2050

Approximately fifteen special districts exist in the three-county area. The last compilation was made in 1971 by the CBCOG. Since that time several have merged and several more have been created. The numbers and types of special districts in the area are listed in Appendix F. Two districts demand special attention. These are the Nueces County Navigation District No. 1 and the Lower Nueces River Authority. The navigation district owns and operates the Port of Corpus Christi and promotes the development of industry through its ability to issue revenue bonds to finance certain industrial improvements, notably environmental control facilities. The process also works to allow the Navigation District to build facilities based upon the credit of its supporting industries.

The Port of Corpus Christi is currently working toward developing a multipurpose deep-draft inshore port, a controversial undertaking. The Nueces County Navigation District, like other such districts in the state, was formerly able to buy surplus state lands and lease these lands for industrial sites. Criticism caused the Texas Legislature to terminate this practice in 1973. Navigation districts may still lease state lands for navigation purposes.

The Lower Nueces River Authority (LNRA) is the only district in the three-county area with a multicounty jurisdiction, including Nueces and San Patricio Counties. The LNRA is not as powerful as some river authorities, lacking ad valorem taxing authority. Its potential as a prominent institution

in the area is derived from authorities concerning pollution control planning and abatement within its basin; supply and distribution of water; and generation of power.

Industry.

A strong supporter and likely large, direct user of geopressured-geothermal energy in the local study area is Central Power and Light Company (CP&L), an investor-owned electric utility serving an area which includes all four possible demonstration sites described previously. CP&L currently relies on natural gas for boiler fuel. Only one of the company's plants is equipped to burn oil on a permanent basis. In October 1975 company officials expressed fear that a cutback or cutoff of gas as a boiler fuel would soon be ordered by the Railroad Commission of Texas (Speaker, 1975). A first step toward that cutoff came in December 1975, when the commission ordered a halt to new long-term gas contracts for the use of gas as a boiler fuel (R.R.C. Gas Utilities Docket No. 600, December 17, 1975). While the company is currently investing heavily in a cooperative effort in a nuclear plant in Matagorda County and in coal-fired electricity generation facilities elsewhere, officials suggest that those two resources will serve only 45 percent of customers' needs in 1985 (Speaker, 1975). A successful demonstration of geopressured-geothermal energy would help alleviate the utility's struggle to supply electricity to its franchise area. CP&L maintains a AA rating with Moody's Bond Rating Service. While many utilities, including some in Texas, fell in their bond ratings as the energy crisis progressed, CP&L continued in a strong financial position despite serious problems with fuel supplies.

CP&L's willingness to increase its investment in geopressured-geothermal energy along the Texas Gulf Coast in either the demonstration plant or later developments will, of course, depend upon the cost per kilowatt generating capacity of a plant utilizing the resource. Currently investors are considering utility ventures in plants of up to $1000 per kw capacity (Davis, 1975). No firm cost figures are yet available for geopressured-geothermal development, but members of the Phase 0 Resource Utilization Group have suggested that geopressured-geothermal costs may approximate those of a nuclear venture (currently $650-$750 per kilowatt-generating capacity).

Other possible large direct users of geopressured-geothermal energy are large chemical companies which might use the resource for in-house electricity

generation, as Dow Chemical in Freeport, Texas is contemplating doing; or as raw materials; or for a combination of uses. Many large companies concentrated along the shipchannel in Corpus Christi have power requirements large enough to suggest that they may eventually invest in the resource, pending a successful demonstration.

Petroleum companies experiencing declines in petroleum production in fields in and around Corpus Christi Bay may also become large direct users of geopressured-geothermal fluids for increased recoveries in those fields. The largest declining field in the immediate area is the Mustang Island field, operated by Atlantic Richfield Corporation and others. Located across the mouth of the bay, the field contained approximately eighty gas wells in 1966. The opportunity for the formation of consortia of companies able to use the resource either for electricity production or process heat or raw material will certainly exist. Speculation of such users has run from space heating and cooling of buildings to shrimp and oyster farming (see the Resource Utilization volume of the Phase 0 Report for a more detailed discussion of possible uses of the geopressured-geothermal resources). A large supportive industry, including drilling firms, well-logging firms, mud and tool suppliers exists in the area.

Industry, professions, and trades in the area are represented by chambers of commerce and numerous other groups. A partial list of these groups is found in Appendix G. The Area Development Committee of the Corpus Christi Chamber of Commerce and the Board of Trade/Port of Corpus Christi are two of the most active and influential groups concerned with industrial development.

Civic Groups.

The term "civic groups" describes those groups whose purpose is to increase participation in government, usually by informing the public. Such a group, entitled "Goals for Corpus Christi" was created and funded by the Area Development Committee of the Corpus Christi Chamber of Commerce to assist the City of Corpus Christi in gathering public opinion to create a new comprehensive plan for the city. Approximately 140 persons were selected to represent the city and communities surrounding the bay in formulating questions of public concern. Questions were raised in the areas of population and economy, recreation and culture, design of the city and land use, transportation, education, local government, housing, the environment,

health and social welfare, and crime. Results of an informal voting process thus far indicate an overwhelming desire for economic development in the area, including support of a deep-draft inland port. However, the program is controversial and its impact on local planning is uncertain (Lewis, 1975).

Another large civic group in the area is the League of Women Voters. Active in following developments in politics and environmental matters, the group on one occasion initiated a city referendum concerning the form of local government for Corpus Christi. Other civic groups in the area with more narrowly defined interests include: Concerned Neighbors, originally concerned with forced busing; the Good Government League; Familias Unidas, an arm of La Raza Unida, located in Robstown; G.I. Forum, originally concerned with the affairs of minority veterans, now with broader concerns; and LULAC, concerned with gaining representation of Mexican Americans in the community, state, and nation. LULAC was originally established in Corpus Christi in 1929. LULAC and G.I. Forum each have approximately 200 active members (Bonilla, 1976). Familias Unidas is reported to be in a state of disorganization at this time. LULAC and G.I. Forum, as opposed to Familias Unidas, are basically nonpolitical groups, but this fact is obscured by intensive political activity on the part of individual members of the groups. Mexican American office holders in the area include one state representative, one Nueces County commissioner, and two Corpus Christi city council members. Mexican Americans are heavily represented in the city councils and mayorships in some smaller cities in the area, such as Mathis, Robstown, and Driscoll.

The mayor of Corpus Christi, Jason Luby, now in his second term, is familiar with the Mexican American culture and speaks fluent Spanish. His support generally comes from recently annexed areas of the city and from the Mexican American population of the city. The mayor is often in opposition to the majority of the council (observations are from 1974 during the mayor's first term).

Mexican American leaders in Corpus Christi have often found themselves at odds with what they term a provincial establishment in the city. The latest controversy surrounds the location of a Mexican American Cultural Center. Mexican Americans desire the center to be constructed in the downtown area by the bay so that tourists and others can gain from it. Proposals from other groups suggest that it be constructed in a large Mexican American

section of the city (Bonilla, 1976). Many labor union leaders in the area are Mexican American, and are often members or leaders in a Mexican American group, leading observers to associate the interests of labor and Mexican American Affairs.

Eleven neighborhood groups have also been created in Corpus Christi, primarily in Mexican American and Black sections of the City, to improve neighborhoods and impact the political processes of the city. Planning, zoning, and capital improvements are the major interests of these groups.

Environmental Groups.

The largest environmental group in the area is the Coastal Bend Conservation Association, with membership in excess of 600 residents of the bay area. The association grew out of opposition surrounding an effluent permit application by E.I. DuPont de Nemours and Company, a large chemical concern then completing construction near the City of Ingleside. The company had requested a permit allowing them to discharge effluents their processes did not produce, in amounts in excess of their needs. Area residents, enraged over the application, formed the association, and with the mediatory efforts of staff of the CBCOG, achieved a compromise with the chemical company, resulting in an effluent permit reflecting the company's actual needs (Buckner, 1975). In another dispute, the association worked to prevent approval of an application for a solid waste disposal permit for a site near the Nueces River by a disposal firm from Houston (Frishman, 1976). The current president of the association is Steve Frishman, a marine geologist turned publisher of the South Jetty, a weekly newspaper in Port Aransas. The association's attention is now turned toward the deep-draft inland port.

An environmental group historically active in issues of bay-front construction, now concerned with broader issues of clean water, open spaces, and regulated growth is the Organization for the Preservation of an Unblemished Shoreline (OPUS). The group, numbering 150-200 active members, is politically oriented, having recently successfully lobbied the City Council of Corpus Christi to halt growth around the Cayo del Oso, a large estuary in the city (Suter, 1976). Other concerns of the group are regulating bay-front signs, limiting development on Padre and Mustang Islands, rehabilitating

the city's downtown area, limiting industry's use of water, and the proper placement of spoils from port dredging (Corpus Christi Caller Times, November 13, 1975).

Two groups of Audobon members are also active in the area. The Audubon Club of Corpus Christi, an associate of the National Audubon Society, has a membership of 200, including: Dr. Hans Suter, a professor at the local community college and writer of an environmental column for the Corpus Christi Caller and Times; Pat Suter, current president of the club; and Edward Harte, Chairman of the Executive Board of the National Audubon Society and publisher of Corpus Christi's two daily newspapers. A local chapter of the National Audubon Society, the Coastal Bend Audubon Society, also exists in the area, with a membership in excess of 100. Overlap in membership of the two organizations is placed at one-third (Suter, 1976). A chapter of Ducks Unlimited also exists in the area but holds only annual meetings (Corpus Christi Caller, October 31, 1975).

Several recreational navigation groups, the Corpus Christi Sailing Club and the Corpus Christi Yacht Club, are interested in matters of bay area construction and activity. The Yacht Club was a large part of a controversy surrounding the placement of petroleum facilities in the bay. In 1965, following passage of ordinances extending the Corpus Christi city limits and imposing restrictions on petroleum activities in the bay, a petroleum operator asked that city ordinances be revised to allow the construction of a production platform in the bay. The navigation groups, interested in sailing in the bay, became concerned that "blanket permit" practices of the U.S. Corps of Engineers would allow such platforms to be constructed on each of the eighty-eight tracts of submerged lands in the bay, provided only that construction did not interfere with commercial shipping. The controversy created a "mass hysteria" according to one observer, resulting from a lack of understanding on the part of the public and a failing on the part of the petroleum companies to inform the public (Hutchinson, 1966). As the controversy progressed, tourism and city beautification interests joined the controversy on the side of the navigation interests, now facing all the petroleum companies of the area. The Bay Drilling Committee, discussed earlier in this report, was created and eventually recommended that joint operation of clustered production platforms be required of bay

operators, among other restrictions. The recommendations of the committee were adopted by the City Council of Corpus Christi in June of 1966.

State and national environmental groups also appear at local forums in the area. Among these are the Sierra Club, Lone Star Chapter, and the Texas Environmental Coalition (TEC), representing 126 diverse member organizations across the state. Member groups and friends of the coalition includes The Sportsmans' Club of Texas, the Outdoor Writers Association, the Texas Society of Architects, the Nature Conservancy, the Texas State Farm Bureau, the Texas and Southwestern Cattle Raisers Association, the Texas Tourist Council, the Audubon Society, and the Sierra Club (Stewart, 1976). State and national organizations such as these require a local foothold to have a significant impact on local issues. Representatives of the TEC were present at hearings concerning the South Texas Project, the nuclear plant in Matagorda County, but because of a lack of local controversy did not make any remarks (Stewart, 1976). Affiliate groups present in the three-county study area could provide such a foothold. In addition, a local chapter of the Sierra Club was recently formed in the area. No information is yet available concerning its membership or goals.

ISSUES

Federal, State, and Local Regulation.

Participants in a conference called by staff of the Coastal Management Program of the General Land Office (Corpus Christi, Dec. 9, 1975) claimed that the permitting processes of federal regulators, chiefly the U.S. Corps of Engineers, were largely responsible for retarding new plant construction along the Texas Gulf Coast. Only expansions of existing facilities had been undertaken by industry in the last several years. An attempt by Mobil to construct a new polyethylene plant in Beaumont had been delayed three years, according to these industrial representatives. This was verified by Coastal Management Program staff in telephone conversations with Mobil officials (Jeffery, 1975). Phase 0 researchers found that two Texaco petrochemical plants are under construction at this time in the Port Arthur-Port Neches area of the upper coast. Conference participants specifically complained of the review process for construction permit applications, suggesting that a single exception to an application could delay the process up to eight

months (Martin, 1975).

The potential for such exceptions to occur with regard to the demonstration of geopressured-geothermal energy is high, given the uniqueness of the project, the publicity certain to accompany the demonstration of the resource, and the large number of governmental and nongovernmental institutions potentially concerned with development of the resource.

A new development in the regulatory arena occurred with the passage of the Coastal Zone Management Act of 1972 (16 U.S.C.A. 1451-64.). This act, administered by the National Oceanographic and Atmospheric Administration for the federal government, provides that all federal agencies except the EPA conform their activities in or affecting coastal areas to federally approved state coastal management plans. Texas is currently in the process of devising such a plan, with recommendations to go before the legislature in January, 1977. The Texas Coastal Management Program, administered by the General Land Office of Texas, has held public hearings throughout the coastal area in an effort to determine the residents' desires for use of the coastal areas. These efforts have, to date, culminated in the nomination of "Areas of Particular Concern" by the member agencies of the Interagency Council on Natural Resources and the Environment and others, including environmental groups. Such areas include Air Quality Maintenance Areas, Forest Areas, water quality Stream Segments, "Section 208" Water Quality Planning areas, historical coastal waters, and coastal waters of particular environmental concern. These areas will be scrutinized at further public hearings before being finalized (Jones, 1975). A permitting process allowing multiple uses of the coastal areas is expected to be created in the zone. The zone covers most of the counties included in the suspected geothermal band following the coastline.

A large number of state agencies concerned with water appropriation and conservation may also impact the demonstration and eventual development of geopressured-geothermal energy either directly, through regulation, or indirectly, through delay caused by jurisdictional disputes. One jurisdictional dispute may occur between the Texas Water Development Board (TWDB) and the Railroad Commission of Texas. The TWDB has indicated a claim for jurisdiction over the amount of water withdrawn from geothermal wells in the state. The Railroad Commission of Texas, on the other hand, is charged with regulating the disposal of brines from oil and gas wells and with

regulating geothermal energy production generally. Officials of the commission suggest that the power to regulate the withdrawal of fluids from geothermal wells is the power to regulate the production of those wells.

Another potential conflict may arise between the Railroad Commission of Texas and the Texas Water Quality Board. As previously mentioned, the Railroad Commission regulates the disposal of brines and other nuisances from oil and gas wells. The Texas Water Quality Board regulates effluent disposal generally. Conflict between the two agencies has existed regarding this arrangement since the passage of the Texas Water Quality Act which created it. Jurisdiction of disposal from geothermal wells has not been firmly established at this time, and disposals differ greatly from brine disposal from oil and gas wells, suggesting the TWQB might move to regulate geothermal disposals. Added to these potential conflicts is a reorganization process initiated by the Texas Legislature in 1975. The Joint Advisory Commission on Government Operations, created for that purpose, is reviewing the authorities and jurisdictions of all state agencies, and has determined that the abundance and overlap of the water-related agencies are among its greatest concerns (Haynie, 1975).

The General Land Office and the School Land Board will also be deeply involved in the regulation of geopressured-geothermal energy along the coast. The Geothermal Resources Act of 1975 requires those agencies to promulgate rules and regulations governing certain activities regarding the resource on state lands. At this time, no rules or regulations have been written. Delay in promulgating rules may cause demonstration and development to be slowed, since a lengthy period is required for writing and hearing of rules. The two agencies also face the problem of the lack of a model upon which to base their rules. The School Land Board may find itself in conflict with the Railroad Commission since both are given regulatory powers over production from geothermal resources.

Historically, however, the state agencies of Texas, including those mentioned in the preceding statements, have been able to resolve most jurisdictional conflicts through "gentlemen's agreements." Nor is the lack of rules and regulations of the General Land Office and the School Land Board expected to result in a delay for demonstration of geopressured-geothermal energy. Staff of the General Land Office and its elected commissioner suggest that demonstration can occur without extensive regulation.

Any difficulties would be handled in the terms of a lease (Hill 1975; Armstrong, 1975).

Another promising feature of Texas state government was noted while the institutional survey was being compiled. A number of advisory and administrative boards and commissions concerned with geopressured-geothermal energy development are generally made up of the same officials. For instance, the commissioner of the General Land Office serves on the General Land Board, the School Land Board, the Board for Lease of University Lands, the Antiquities Commission, the Interagency Council on Natural Resources and the Environment, and the Governor's Energy Advisory Council. The governor, lieutenant governor, the attorney general, the comptroller, members of the Railroad Commission, and other officials also serve on multiple boards and commissions. The "overhead democracy," those elected and appointed officials pursuing the public's interest in Texas, is smaller than is readily apparent, potentially serving to speed the processes of government and the demonstration project.

Local regulation is another matter. Many of the special districts in the state were created by special legislation of the Texas Legislature. Others were created by actions of the Texas Water Development Board. Still others were created by county commissioners' courts and municipalities. Their powers, policies, and interests differ even when created by the same authority. Municipalities, while having authorities similar to one another, differ in the use of those authorities.

Public Expectations of the Resources.

Admittedly speculative, but demanding of serious attention, is the possibility that the public along the Texas Gulf Coast has come to expect great economic benefits in the form of lower utility bills to accrue from the development of geopressured-geothermal energy. For a number of reasons, that expectation is probably greater in the Corpus Christi area than elsewhere in the state. Activities designed to promote interest in alternative sources of power, especially geopressured-geothermal energy, by members of the CES organization; research activities in the area by the Phase 0 political and institutional study group; and the presence of a private sponsor of the geopressured-geothermal energy project in Corpus Christi have increased the public's knowledge of the existence of the resource. Additionally,

the legislative sponsor of the state's Geothermal Resources Act of 1975, Senator Mike McKinnon, represents the senatorial district encompassing the area. Newspaper articles accompanied the introduction and passage of the act.

While the information distributed by these sources was optimistic, it was not misleading. But optimistic reports of geopressured-geothermal energy, coupled with public discontent with rising utility bills, may have led to overexpectation of the energy resource. Current and projected residential electric rates are shown in Figure III.7. As demonstration of the resource progresses, public expectations will probably increase. Visible drilling operations and continued coverage by the news media will tend to strengthen expectations.

Continued public support is necessary to the success of the project, but that support must be well founded. A sudden loss of confidence caused by the public's finding that geopressured-geothermal energy will not lower utility bills; or that an influx of people into an area will overcrowd a school system; or that environmental hazards are much greater than anticipated could easily turn public sentiment against the project and its sponsors.

FUTURE RESEARCH NEEDS

The interrelationships among technological innovation, industrial development, and social change have been the recipients of both popular and scholarly attention, but it has unfortunately been the case that most observations are made from an a posteriori perspective. In the area of energy resource development, the few sociological studies previously conducted have been case studies, primarily based on after-the-fact conclusions using inadequate data (see, however, the recent report by Stoloff and Stoloff, 1975, for a different approach--referenced in Chapter II). The possible development of geothermal resources in the Coastal Zone can provide a rare opportunity for social scientists to plan for, monitor, and evaluate the impacts on specific areas of a major development process. The approach outlined here for consideration of community change is based on the assumption that data-gathering and analyses will be conducted systematically at several points in time to insure that conclusions describe a longitudinal

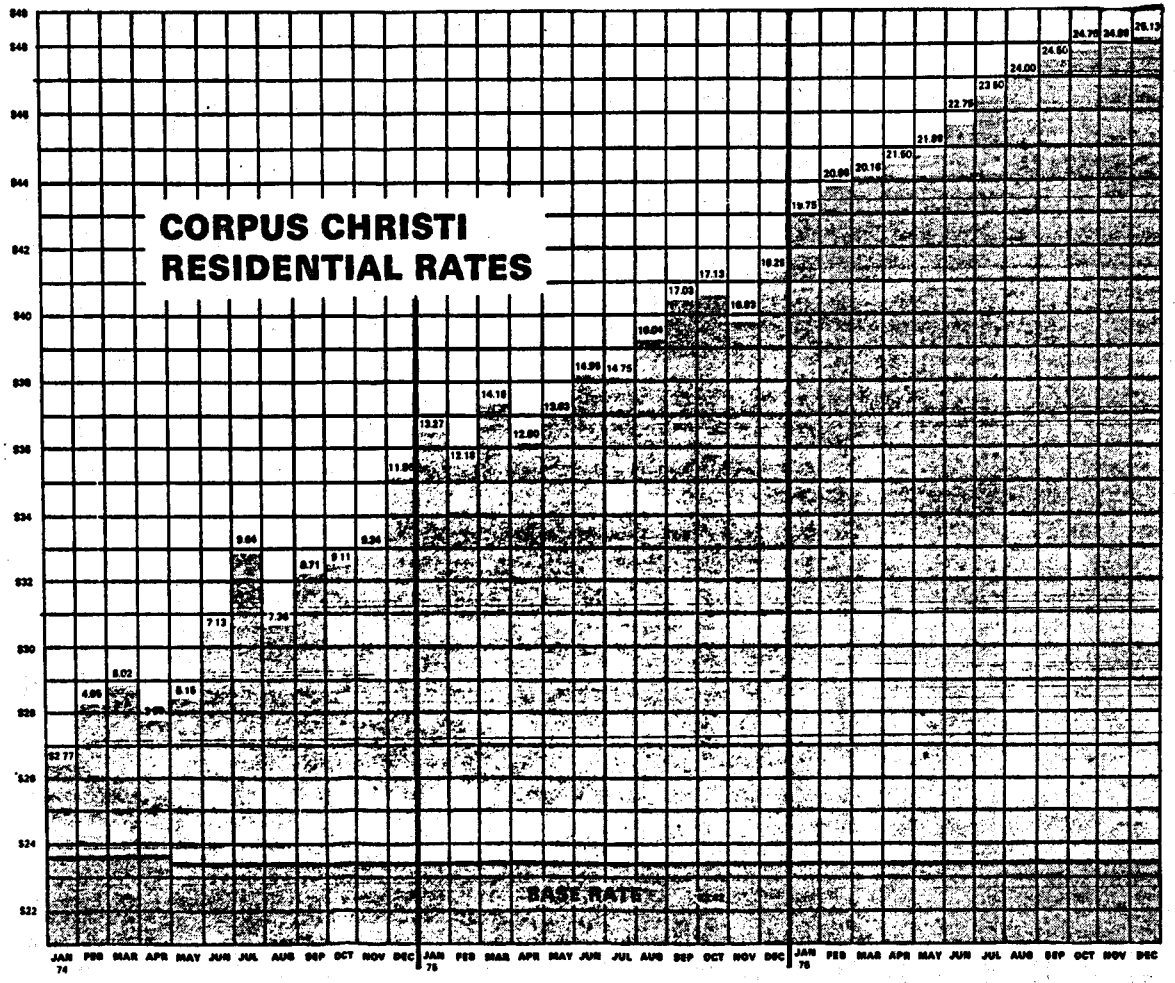

Figure III.7 Chart illustrates impact of fuel adjustment clause on basic residential bill, based on 1,000 kilowatt hours a month. Reprinted from Corpus Christi Caller-Times, Oct. 28, 1975.

process. Several key research tasks can be distinguished from the work reported in this chapter and the preceding one (see Figure III.8).

Many of the research recommendations which emerge from the work done in these three chapters are subject to a "sliding time scale" because needs will vary depending on decisions to require an Environmental Impact Assessment or an Environmental Impact Statement for the initial test well. It is important, however, that some tasks be completed before the first well is drilled--some even before the final announcement of site selection is made--in order to assure full credibility of results. The following items are listed in order of temporal priority.

1. Local Baseline Analysis.

An in-depth look at the chosen site area should be carried out along the lines suggested in Chapter II. Requirements for drilling and testing would be evaluated against the local service capabilities. Numbers of incoming workers--resident and commuting--amount of traffic, health hazards, and so on would be compared to the housing, transportation, and health facilities available, for example. Both positive and negative impacts would be considered and evaluated through a form of cost-benefit matrix. Consideration must be given to both utility for and utility of the community as discussed above in Chapter II.

The analysis should be carried out in cooperation with the legal and environmental research. For instance, it will be important, as legal problems of property rights in geopressured-geothermal resources are resolved, to study who in the local areas will be beneficiaries. If the situation should arise that local farmers, for instance, do not own property rights in the resource that is being developed, but are encroached upon as construction takes place, then resistance can be expected.

The local study should begin investigation of various types of industrial development which might accompany the geothermal activity. It would be shortsighted indeed to examine community adaptability for the geothermal drilling only--particularly since that activity may well entail relatively few incoming workers. As has been frequently stressed in this report, for this particular resource development and utilization must be studied and planned for concurrently.

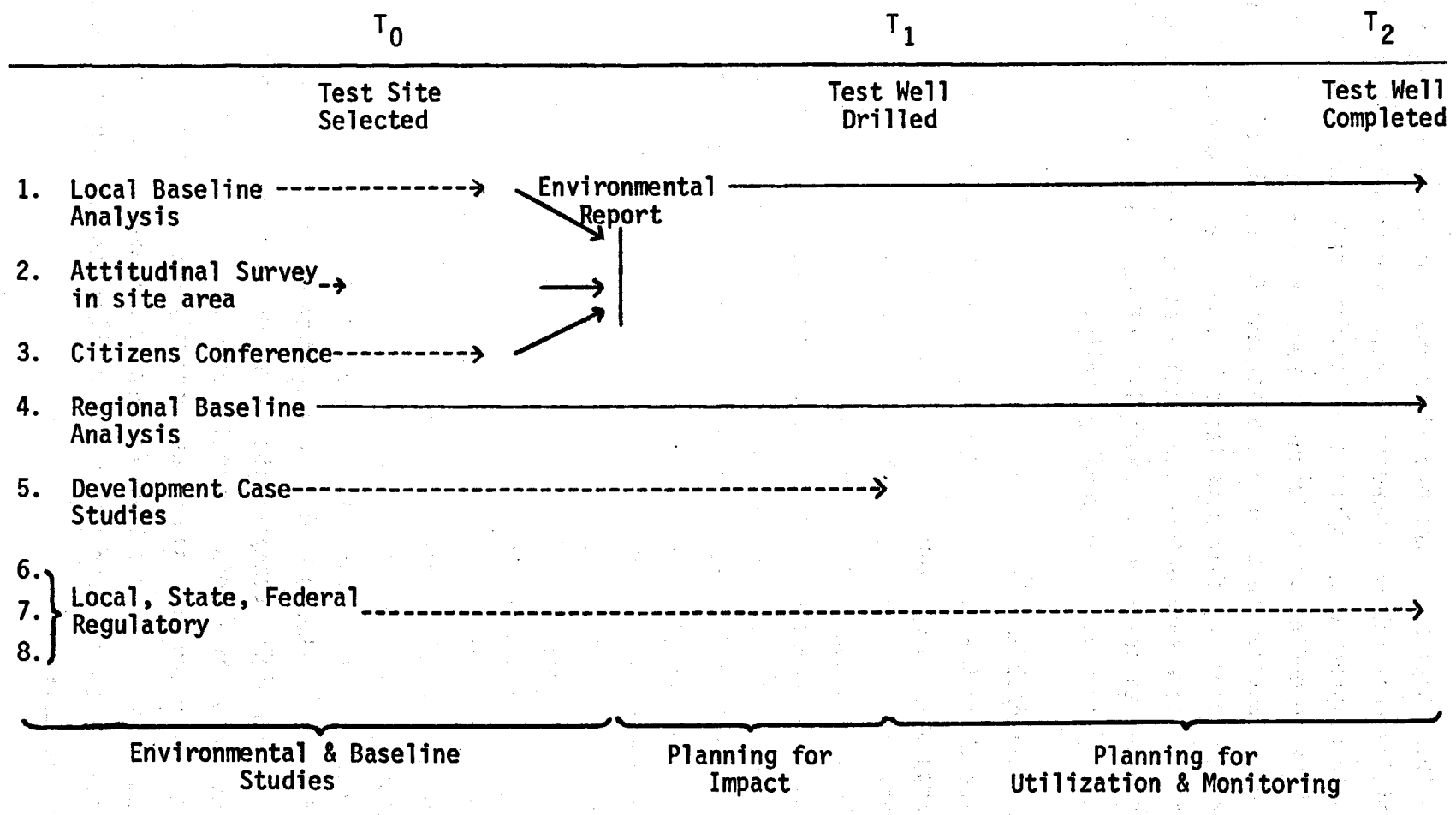

Figure III.8 Phase 1 Research Tasks

This work would form an essential part of any environmental report required. Analysis is expected to take 8-12 months and should be completed before the first well is drilled, although there will be ongoing components of the research.

2. Attitudinal Survey at Site.

Before the test-bed site is finally determined, a random sample survey of citizens in the potential site area should be conducted. This survey would identify attitudes toward and expectations of the resource development. Public expectations of great economic benefits at little environmental cost could impede continued demonstration of geopressured-geothermal energy if the public comes to feel at some point that it has been misled. The public must understand the beneficial and the detrimental aspects of the development of this alternative energy resource, including the range of possible environmental hazards. The only credible means of knowing public perception is through survey analysis.

Cultural values are expressions of that which is considered desirable in social life processes. The cultural values common to rural residents and those prevalent among urban dwellers differ, and these differences show up in the ways in which values influence behavior. Kahl (1968:6; Chapter II references) notes that "traditional values are compulsory in their force, sacred in their tone . . . They call for fatalistic acceptance of their world as it is . . . Modern values are rational and secular, permit choice and experiment, glorify efficiency and change, and stress individual responsibility." In general, traditional values, associated with rural life, could be expected to reinforce the status quo, while modern, urban values would be more amenable to change. Although, as pointed out above, this theoretical polarization of values may not hold up under the actual data, it hopefully indicates the importance of examining cultural values.

Questions on the survey should cover a range of subjects: from abstract queries regarding the relationship between man and his environment to specific questions regarding the willingness to adapt community services to accomodate the demands of growth, the expectation of financial benefit, and attitudes toward "outsiders" entering the community. This attitudinal analysis would, together with the aggregate data analysis discussed above, complete the initial process of modeling relationships within these communities which may be affected by geothermal development. Identical data-gathering and analyses

should be conducted at two additional times: following the drilling and construction phase, and after geothermal development has been completed and commercial production has been underway for several years.

In addition to the random sample, which would be gathered through mail questionnaires, personal interviews would be conducted with representatives of affected sectors in the community, e.g., industry, labor, finance, services, special interest groups, and local government. The data could be used to provide a more comprehensive environmental report, and they would allow planners to understand better the needs and orientations of the community and the constraints and limitations within which development will occur. It is absolutely essential that an initial survey be conducted before announcement is made of definite site selection.

Following the initial baseline survey, a series of additional samples would be drawn to determine changing public perceptions as the resource is developed. Estimated time requirement for initial survey is 6 months.

3. Citizen Conference.

During the period when an environmental report is being conducted for the test site, a Citizens' Conference on Geothermal Development should be held in the area. All geothermal research groups might be involved as informants, with the sociocultural and institutional groups working most closely on conference organization with the citizens. A variety of interest groups should be represented, and the conference should be open to the area public. The conference would provide a mechanism for disseminating information to the public body likely to be most affected by early resource development and would offer an opportunity for input from the populace. Professional input should be energetic and yet simple enough for the layman to grasp basic technical, legal, and institutional issues surrounding the potential development An educated and involved public will be less likely to respond negatively to an innovative energy resource than would an uninformed group.

A similar conference was held in November, 1975 in Galveston, Texas. "Citizen's Look at Galveston Bay" conference was funded by the Department of Health, Education and Welfard, under the Environmental Education Act of 1970. The conference was developed by The Citizens'Environmental Coalition Educational Fund, Inc., which is composed of 40 area groups, ranging from the

Allied Civic Clubs of Houston to the Harris County AFL-CIO Council. (Similarly, a geothermal conference should be the prime responsibility of local citizens' groups.) The conference was well attended by people from various social strata--from industrial executives, to senior citizens, to congressmen. The professional and technical presentations provoked a substantial exchange of ideas with the citizens present. Such conferences can be extremely valuable in allowing citizens an opportunity to participate in the utilization and management of their natural resources. Input from citizens could become an integral part of the project's environmental report. The conference should be held after data is collected in the attitudinal survey (see item 2 above). Funding for the conference per se should be solicited by involved citizens' groups from various government and perhaps private industry sources (e.g., HEW in line with the Environmental Education Act of 1970).

4. Regional Baseline Description.

Before the geothermal development process can be evaluated, the structure of the region before the time of impact must be known. Using 1970 census statistics on each of the geopressured zone counties as baseline data, a regression model could be developed to predict per capita income, community revenues, and other key indicators of community status from specified independent variables. This analysis would be important in planning for the location of future geothermal-geopressured sites, particularly commercial production facilities. Planning for resource utilization would be based in large part on this baseline data. Trends in such factors as population movements, educational standards, work force distribution, and so forth, set parameters on the optimal type of development in a region. A regional input-output model is a good supplementary tool to use in work (see General Land Office, 1975; Bender and Coltrane, 1975; Haynes, 1975--references in Chapter II). Coordinated research with Louisiana should be organized for analysis of border areas. Estimated time: on-going; initial analysis complete in 15 months.

5. Development Case Studies.

Comparison of development projects in Texas would be extremely useful in developing a method to analyze the local economic and social impacts of

major investments and a theory of the system relationships involved. Such theory and methods would help guide public sector planners and decision makers as they approach similar problems. Economic effects and population descriptions before and after investments are made provide some information and would be used as data, but the actual processes of change must be studied in order to be able to predict impacts. While unique problems with regard to geothermal-geopressured resources do exist--for instance, the issue of property rights--and preclude a definitive prediction of impacts of development in that resource from impacts of other kinds of projects, certain aspects of even highly diverse activities are comparable. The installation of refineries, nuclear power plant construction, and other industrial developments could be studied to great advantage in attempting to understand the social impacts of development. Local level analysis as described above in item 1 should be carried out on several projects already completed, or nearing completion, in Texas. Three possible candidates are: (a) a major dam construction project, e.g., Toledo Bend in East Texas; (b) nuclear power plant construction, e.g., Allen's Creek in the Middle Coastal Zone; and (c) natural gas drilling and production, e.g., recent Laredo discoveries.

6. Federal Regulatory Analysis.

Phase 0 research indicates substantial delays in permitting construction projects and effluent disposal by federal regulators, resulting in a lack of new plant construction in the Texas coastal areas. It is recommended that a detailed analysis of regulators--their interests, policies, and activities--be commissioned in a Phase 1 effort to be coordinated with the requirements of other components of the geopressured-geothermal project. A minimum of two carefully selected case studies should be sufficient to gain a working knowledge of federal regulatory activities. These case studies should examine the activities of regulators surrounding the preconstruction, construction, and early operational phases of (1) a new power plant situated on the coast and (2) a new or significantly altered chemical, petrochemical, or metals manufacturing plant situated on the coast. Such activities must have occurred within the last two years to measure fully the impacts of regulations. The study should be complete within eight months.

7. State Regulatory Analysis.

The passage of the Geothermal Resources Act of 1975 (Vernon's Ann. Cov. St. art. 5421 Sec 1-5), required that regulations governing geothermal activity be established by the Railroad Commission of Texas. The commission has issued eighty state-wide rules in accordance with that act. Regulations of other state agencies, such as the Texas Air Control Board, the Texas Water Development Board, and the Texas Water Quality Board are likely to be issued during or following demonstration of the resource. The rules issued by the Railroad Commission of Texas and any others subsequently issued by the commission or other agencies should be examined for their impacts upon the demonstration of geopressured-geothermal energy as well as for their consistency with existing regulation. Engineering, environmental, and legal expertise will be solicited as required from other components of the CES organization. The project is expected require one year.

8. Local Political and Institutional Survey and Analysis.

Following the selection of a demonstration site, regional and local institutions must be identified and their jurisdictions, policies, and procedures surveyed and analyzed, much as in the Phase 0 case study of the Aransas, Nueces, and San Patricio Counties area but in far greater depth. Significant political factors must be identified and an ongoing relationship established to ensure acceptance of the project. Special attention will be given to the special districts of the area selected, since each district is unique. The study requires a six-month time frame.

Summary.

These Phase 1 tasks would, in sum:

1. Provide aggregate socioeconomic data on the communities most susceptible to geothermal impacts
2. Describe attitudinal data for communities proximate to one or more possible sites
3. Establish documentation of potential political/institutional conflicts and barriers
4. Establish a broader theoretical understanding regarding the impacts of geothermal development

At the completion of Phase I, predictions of impacts on specific communities could be made and site-specific analyses continued, based on the

conceptual framework and methodology developed and tested in Phases 0 and 1. The baseline data and attitudinal surveys should be done in Louisiana using the same approach followed in Texas. Findings could then be compared across states, with the goal of furthering joint planning programs where needed.

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APPENDIX A

EXPLANATION OF DATA

EXPLANATION OF DATA

Spanish Heritage.

Includes persons of Spanish language combined with persons of Spanish surname. Spanish language includes persons of Spanish mother tongue and all others in families in which the wife or head of family reported Spanish as mother tongue. Spanish surnames were from a list compiled by Naturalization and Immigration Service and updated by the Bureau of the Census.

Percent Black.

Percent who identified themselves as Negro or Black.

Urban Population.

Includes all persons living in places of 2,500 inhabitants or more, incorporated or unincorporated by cities or towns, and those living in other territory included in urbanized areas.

Net Migration.

Difference between number of persons moving into an area and number moving away. Net migration is estimated by subtracting natural increase from the total population change. Our tables express net migration as a percentage of the 1960 population; positive figures represent in-migration and negative figures out-migration.

Unemployed: 1970, 1975.

Expressed as the percent of the civilian labor force (16 years and older, employed, and unemployed, excluding armed forces) who were not working at the time of the census, who had been looking for a job during the preceding four weeks, or who reported that they were available to

accept a job or were waiting to be called back to a job from which they had been laid off. 1975 figures from Texas Employment Commission.

Number Weeks Worked.

Number of weeks during which a person did any work, full or part-time (including vacation and sick leave) for pay or profit, or worked without pay for a family farm or business.

Occupational Categories.

Derived from a list of 441 specific occupations reported grouped into 12 major groups.

Median Earnings.

Given for several of the major occupational groups. Earnings refers to income before deductions for income tax, Social Security payments, union dues, etc.

Per Capita Money Income.

Computed by dividing aggregate money income by the total population.

Families Below Poverty Level.

Percentage of families falling below poverty levels set by the Social Security Administration and Federal Interagency Committee. Poverty level refers to a range of incomes adjusted by family size, sex of family head, number of children under 18, and farm and non-farm residence. (Figures are computed on a national basis and are not corrected for state and regional characteristics). Poverty level for a non-farm family of four headed by a male, for example, was $3,745 in 1969.

School Enrollment.

Refers to percentage of the population age 3 to 34 enrolled in a regular school or college, full or part-time. Vocational, trade, and business schools are not included.

Average Persons Per Unit.

Average number of people in occupied year round-units.

Median Number of Rooms Per Unit.

Includes whole rooms used for living purposes in all units, vacant and occupied, intended for year round use.

Occupied Units with 1.01 or More Persons Per Room.

Number of persons divided by number of rooms for each occupied unit.

Occupied Units Lacking Some or all Plumbing Facilities.

Percent of occupied units lacking one or more of such facilities as piped hot or cold water inside, flush toilet, shower or bath, and those units in which toilet and bathing facilities are used by occupants of other units.

Birth and Death Rates.

Ratios per 1,000 persons estimated from state certificates.

Hospital Beds per 1,000.

Data for year ending, September 30, 1969. Data on number of beds is from the American Hospital Association.

APPENDIX B

ORGANIZATIONS CONTACTED

ORGANIZATIONS CONTACTED

Bureau of Business Research, University of Texas at Austin

Bureau of Natural Resources and Environment, University of Texas at Austin

Central Power and Light, Inc.

Council for South Texas Economic Progress

General Land Office, Coastal Zone Management Program

Greater South Texas Cultural Basin Commission

Governor's Office of Information Service

Governor's Office of Planning and Coordination

L.B.J. School of Public Affairs, University of Texas at Austin

Rice Center for Community Design and Research

South Texas Research Institute

Texas Education Agency

Texas Employment Commission

Texas Industrial Commission

APPENDIX C

STATISTICAL CLUSTERING OF TEXAS COASTAL COUNTIES

STATISTICAL CLUSTERING OF TEXAS COASTAL COUNTIES*

The three coastal zone areas described in Chapter I were arrived at by visual perusal of the data presented in Tables I.1, I.2, and I.3. The sociocultural group undertook a more rigorous approach to area delineation during the Phase O extension period. The primary task was to use statistical techniques in clustering the 36 counties based upon socioeconomic similarities and to compare the results with the three areas described in the body of the text.

A computer-assisted procedure was used to cluster counties into groups with maximum homogeneity within groups and maximum heterogeneity between groups with respect to social and economic data. The procedure was applied to two data sets. First, counties were clustered according to their similarity on all 77 variables (standardized) in the original data tables. Second, the clustering technique was applied to a reduced set of 16 selected variables in order to examine the effects of weighting factors. The county groups resulting from these analyses were then compared with the areas delineated for discussion in Chapter I (see Figure I.2).

Method.

The clustering procedure used is a statistical technique for modeling data. The cluster program is an exploratory device to assist in a systematic search for regularities in large sets of unstructured data. It is designed to be used in discovering natural associations among variables, natural groups among counties, and category structures.

The process clusters counties at 25 levels of similarity. The first level groups those most similar on all dimensions; counties clustering at the second level are somewhat less similar, and so on. The resulting output includes a statistical "tree" which visually represents "families" of similar counties.[1] The measurement of similarity between data points

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*This analysis was carried out by Paula Ramsey, with programming assistance from CES staff members Jerry Avey and William Lesso, Jr.

[1]See Figure C.1

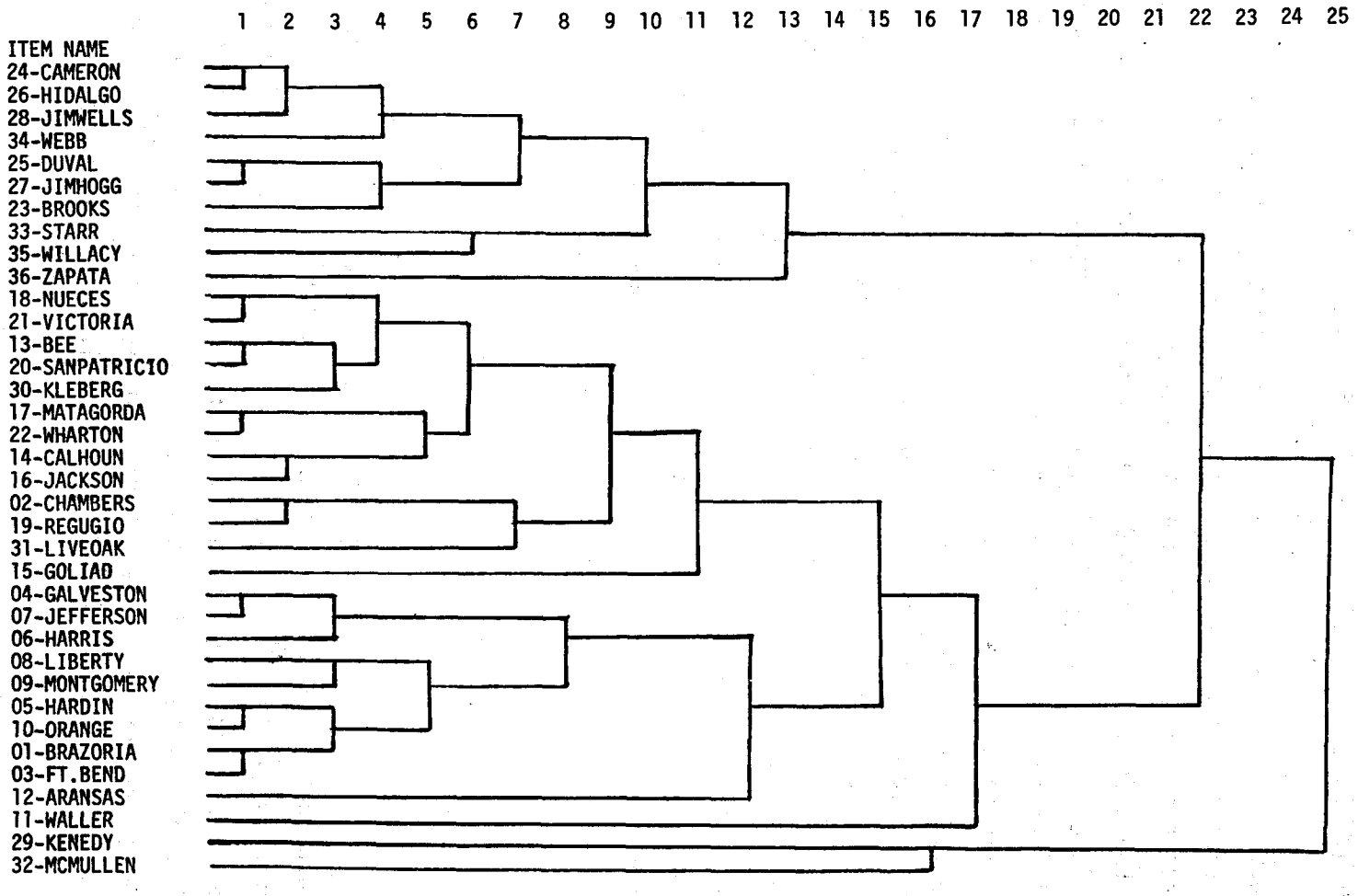

Figure C.1 Texas Coast County Cluster - Standardized. Mean within group sum of squared deviation in the new cluster is minimum. Print criterion is the total within groups sum of squared deviation.

(counties) may be based upon various mathematical criteria. The county data in the present study were analyzed numerous times, each time using a different criterion.

The data set was then reduced in order to see what effects weighting had upon the clustering, as well as to provide a more manageable set of indicators for future analysis. Elimination of redundent data was accomplished through two steps. The first step was examination of a correlation matrix in which correlation coefficients[2] were computed for each pair of variables in the original data set. Groups of highly correlated variables ($r \geq .80$) were distinguished from other variable groups which appeared to yield relatively independent information about the county populations. A factor analysis of the data was then checked for similarities of components; the results reinforced the conclusions drawn from the correlation matrix. Within each independent variable group identified, the measure most strongly associated with the others was selected to represent the group (dimension). In this manner fifteen indicators emerged for the major components of variation among populations. This precedure, in effect, reduced the weighting within the data to approximately equal values for each major independent component of variation.

Additionally, an index was constructed by which each county could be assigned a single "score" on occupational level. This index provided a sixteenth variable in the reduced list, and was computed as the sum of the following occupational categories using the indicated weight factor.

OCCUPATIONAL CATEGORIES	WEIGHT FACTOR
% Professional & Technical	x 6
% Managerial	x 5
% Craftsmen & Farmers	x 4
% Clerical & Sales & Operatives & Transport Operatives	x 3
% Service Workers	x 2
% Laborers & Farm Laborers & Private Household Workers	x 1

[2]Pearson Product Moment Correlation.

The following list shows the original categories from which the measures were taken, as well as the dimensions for which they are now indicators.

A. Demographic		
1.	% net migration	
2.	Birth rate	(1) Demographic
3.	Death rate	
4.	% Spanish Heritage	(2) Ethnicity
5.	% Black	
B. Education		
6.	% pop. in school	(3) Education
7.	Med. school years completed by ethnic males	(4) Ethnic Status
C. Labor Force		
8.	% all males unemployed	(5) Unemployment
9.	% all females unemployed	
10.	% full-time workers	(6) Seasonal/full-time work
11.	Occupational level (constructed index)	(7) Occupational level
D. Standard of Living		
12.	Med. earnings-ethnic males	
13.	Med. earnings-ethnic females	(8) Ethnic incomes
14.	Per capita income-ethnic pop.	
E. Services		
15.	Hospital beds per 1000	(9) Services
16.	State highway miles	

The reduced data set was analyzed by the same cluster procedure as was the 77 variable set.

Findings.

The more complete 77 variable data set clustered the counties with a high degree of consistency across trials using different criteria. The map in Figure C.2 shows the three major county groups. As can be seen in

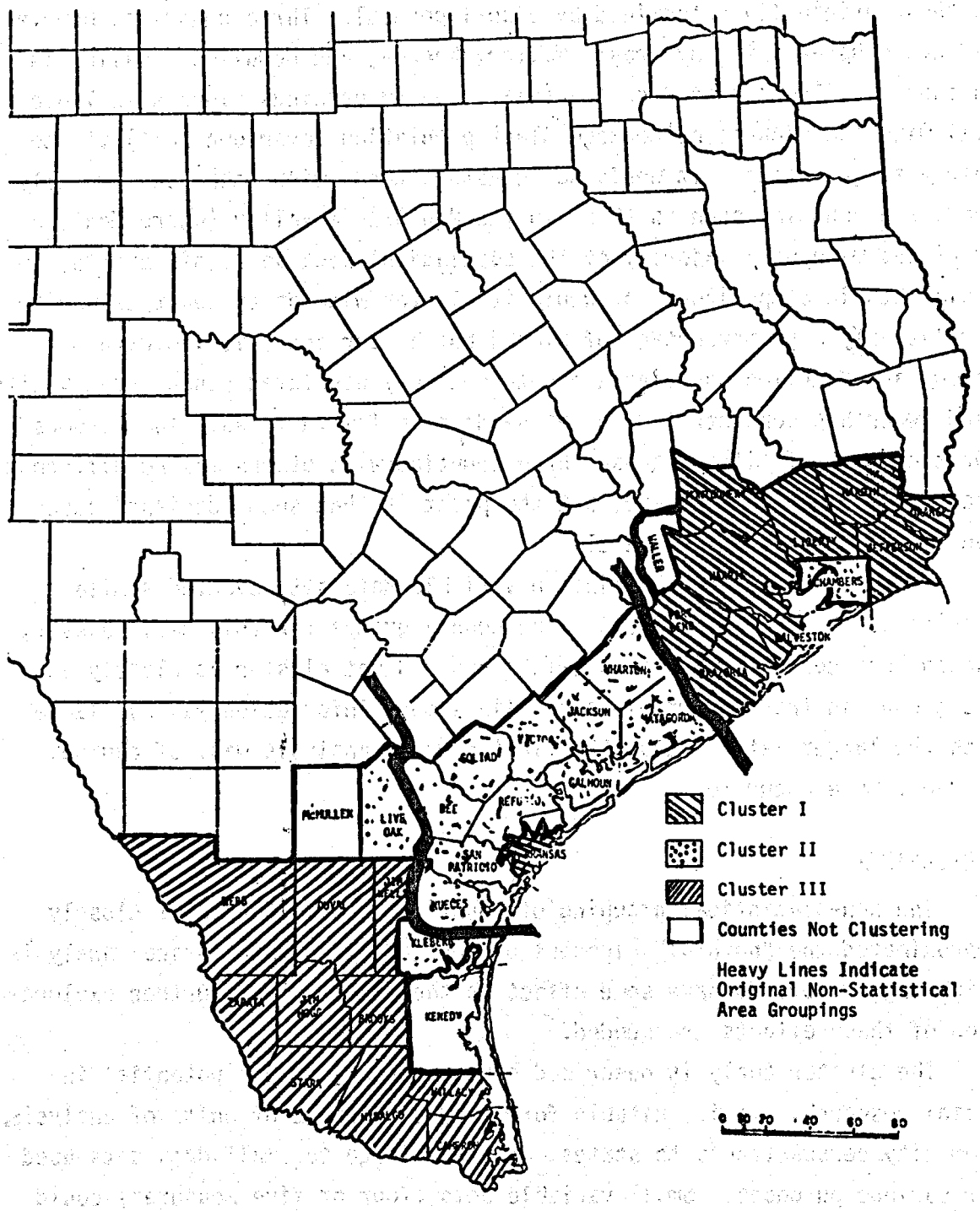

Figure C.2 Clusters on 77 variables.

the map, the area boundaries derived from cluster analysis are very similar to those originally determined by visual perusal. Three counties, however, did not cluster into any area: Waller, Kenedy, and McMullen. Waller is an economically depressed county (viz., median earnings figures in Table I.1) with the highest percentage Black population (over one half) of the thirty-six counties. It would not cluster, then, with other economically depressed counties such as those in the Rio Grande Valley (where Mexican Americans make up a majority of the population) because of differences in racial/ethnic compositon, nor would it cluster with other counties having a relatively high percentage of Blacks but better economic indicators. Kenedy and McMullen Counties are both sparsely populated ranch country with land ownership concentrated in the hands of a few families. The reasons for the "lack of fit" of these three counties with others may be different from the ones suggested here, but the point is that such "deviant" cases can often be analyzed separately.

The clustering for the sixteen variable data set revealed similar results as shown in Figure C.3. The county groups for this set, however, showed less consistency across trials and did not cluster as closely as the groups in the 77 variable set. Since more information was available with the larger set of data, the first cluster analysis was, of course, somewhat more accurate.

Conclusion.

The non-statistical grouping of counties used in Chapter I closely approximated the "natural" clusters discovered by the statistical analysis. Weighting factors do have some effect on the results, and further exploration of these effects are needed.

The cluster analysis described here has considerable potential in social research. It is suitable for study of a range of units of analysis, from city census tracts to states, and from large to small data sets used for various purposes. Small variable sets (four or five measures) could be used to cluster regions on specific social conditions for more detailed analysis. Further, these could be weighted differently to highlight changes in certain social conditions hypothesized to follow particular technological developments. Perhaps most interesting, further, would be

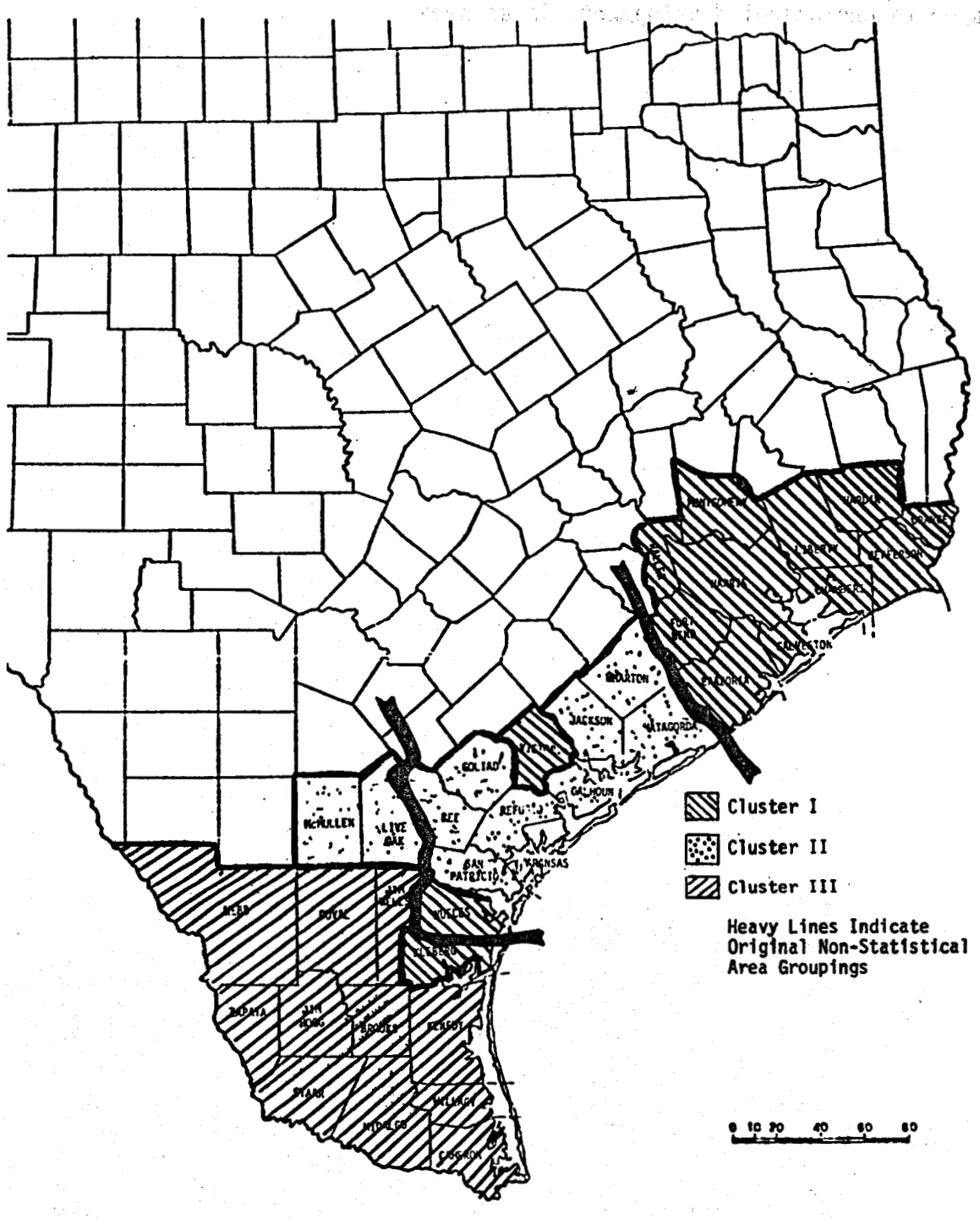

Figure C.3 Clusters on 16 variables.

the use of the technique to map "before" and "after" patterns involving major technological developments in an area.

APPENDIX D

SURVEY OF GOVERNMENTAL INSTITUTIONS

SURVEY OF GOVERNMENTAL INSTITUTIONS

FEDERAL INSTITUTIONS

Atomic Energy Commission.

Conducts and promotes research in specialized areas of geothermal energy. Activities assumed by ERDA and NRC.

Department of Agriculture. (Excluding Forest Service)

Conducts surveys, investigations, and research relating to the character of soil erosion and the preventive measures needed;

May undertake emergency measures for run-off retardation and erosion prevention as may be needed to safeguard lives and property from floods and erosion on watersheds suddenly impaired by fire or natural force;

Furnishes financial aid to persons or agencies to take preventive measures against soil erosion;

Assists local organizations technically or financially in preparing and carrying out plans for works of improvement (flood prevention, conservation, development, utilization, and disposal of water; or conservation and proper utilization of land);

May make loans to state and local public agencies and designated local nonprofit organizations to conduct research relating to land conservation and land utilization;

Provides technical and financial assistance to rural communities for the installation of measures and facilities for water quality management, control of agriculture-related pollution, and for disposal of solid wastes.

Department of Commerce.

Economic Development Administration. (79 Stat. 552; 42 USC 3121) as amended.

Carries out provisions of the Public Works and Economic Development Act of 1965, by aiding in the development of public facilities

and private enterprise through public works grants and loans, business loans, and technical assistance to areas designated as Redevelopment Areas within Economic Development Areas. Additional funds are made available to Growth Centers within the Redevelopment Areas.

National Oceanographic and Atmospheric Administration.

Administers the Coastal Zone Management Act of 1972;
May designate marine sanctuaries on the continental shelf for the purpose of preserving or restoring areas for their conservation, recreational, ecological, economical or esthetic values;
Regulates activities within marine sanctuaries;
Conducts programs to develop ports and port facilities.

Department of Defense.

Generally: investigates the application of geothermal resources to defense needs.

Department of the Army.

Corps of Engineers.

Must approve any improvement of obstruction to be built in or on navigable waters;
Constructs flood control and navigation projects;
Has power of condemnation;
Repairs flood control works threatened or destroyed by flood;
Issues permits for the dumping of dredged material into navigable waters;
Establishes harbor lines;
Assists in the construction of works for the restoration and and protection of shores;
Must give full consideration to the recreational and fish and wildlife benefits of its water projects; and must operate its facilities to enhance these values if it can reasonably do so;
Provides technical services to state and local governments;
Holds public hearings.

Department of Housing and Urban Development.

Administers the Flood Insurance Program;

Administers the Community Development Grant Program under the Housing and Community Development Act of 1974.

Department of Interior.

Bureau of Land Management.

Leases public lands and the Outer Continental Shelf.

Bureau of Mines.

Carries on research into processes of geothermal extraction, processing, use, reuse, and disposal.

Bureau of Outdoor Recreation.

Develops a nationwide outdoor recreation plan;

Assists states in developing outdoor recreation plans;

Reviews Environmental Impact Statements on federally assisted public works projects.

Bureau of Reclamation.

Undertakes research and develops plans for the regulation, conservation, and utilization of water and related land resources;

Locates, constructs, operates, and maintains works for the storage, diversion, and development of waters for the reclamation of arid and semiarid lands in the western states;

Builds dams and reservoirs, canals, and distribution systems;

Builds power plants and transmission lines;

Has condemnation power through the Secretary of the Interior;

Sells electric power and energy generated at most of its projects;

Reviews Environmental Impact Statements for proposed federal water resource projects;

Provides loans to the irrigation districts within its projects to rehabilitate and improve the irrigation facilities;

Provides grants for construction of water resource programs.

National Park Service.

Concerned with the impact of any potentially harmful industry or project upon national parks and refuges.

U.S. Fish and Wildlife Service.

Enforces game and fish laws;
Manages and protects wildlife refuges;
Conducts research on fish and wildlife;
Protects certain marine mammals;
Makes studies to determine the probable effect of federal and other water use projects on the fish and wildlife resources of the area affected;
Reviews Environmental Impact Statements.

U.S. Geological Survey.

Enforces departmental regulations applicable to oil, gas, and other mining leases, permits, licenses, development contracts, and gas storage contracts;
Supervises the operations of private industry on mining and oil and gas leases on public domain, acquired, Indian, Outer Continental Shelf, and certain Naval Petroleum Reserve lands to prevent waste and to limit environmental damage and pollution;
Collect royalties;
Performs surveys, investigations, and research covering topography, geology, and the mineral and water resources of the United States;
May condemn land for Geological Survey use through the department;
Administers an exploration program for the discovery of domestic minerals by private industry with federal assistance.

Office of Water Resources Research.

Sponsors research in priority areas.

Department of Transportation.

U.S. Coast Guard.

Detects, prevents, and controls pollution on and adjacent to the

navigable waters of the United States;
Licences deepwater ports.

Department of the Treasury.

Internal Revenue Service.

Taxes income from investment in energy production, ownership;
Provides for tax incentives for energy investment as directed by congress and the president;
Decides issues regarding taxation, incentives through administrative hearings.

Energy Research and Development Administration.

Encourages and conducts research and development programs respecting all energy sources;
Collects and distributes data concerning the manufacture or development of energy and its efficient extraction, conversion, transmission, and use;
Encourages and conducts research into energy conservation;
Has power of condemnation to provide facilities necessary for its operation;
Provides loans and makes contracts for the conduct of research with public or private institutions or persons;
Subsidizes the construction and operation of reactors and other facilities for educational activities;
Coordinates research and development programs for all energy resources.

Environmental Protection Agency.

Regulates disposal of dredged material in navigable waters in U.S. and offshore;
Promulgates guidelines for solid waste recovery, collection, separation, and disposal systems;
Regulates noise pollution;
Conducts research on causes, effects, and prevention of air and water pollution;
Approves or disapproves state air plans and institutes its own plan

if a state fails to act;
Sets standards of performance for new stationary sources of air pollution;
Sets emission standards for hazardous air pollutants;
Approves or disapproves water quality standards if the state fails to act;
Issues permits for effluent discharges;
Publishes a list of toxic pollutants and effluent limitations for these substances;
Sets limitations for thermal discharges;
Has inspection powers;
Reviews Environmental Impact Statements in its areas of expertise.

Federal Energy Administration.

Makes plans related to the production, conservation, use, control, distribution, rationing, and allocation of all forms of energy;
Collects data on energy sources and use;
Has enforcement powers;
Coordinates federal energy programs and policies with those of the states.

Federal Power Commission.

Regulates electric and gas utilities engaged in interstate commerce;
Issues licenses for construction, operation, and maintenance of project works necessary or convenient for the development of navigation and power on streams congress has jurisdiction over;
Participates with other agencies in coordinating development of national land and water resources.

Securities and Exchange Commission.

Registers and regulates sales of securities;
Maintains competitive conditions among securities issuers;
Refers proceedings to Department of Justice.

STATE INSTITUTIONS

Texas Air Control Board.

Plans for the proper control of air resources;
Establishes levels of quality;
Promulgates and enforces rules and regulations;
Inspects and monitors air resources quality;
Causes legal proceedings to be instituted through the Attorney General's Office.

Antiquities Commission.

Designates State Archeological Landmarks;
Enforces the Antiquities Code of Texas.

Attorney General.

Gives legal advice to state agencies upon request in the form of opinions;
Represents state in civil and some criminal proceedings.

Texas Commission on Interstate Cooperation.

Promotes cooperation among Texas and other state governments;
Recommends adoption of compacts, uniform and reciprocal statutes and administrative rules.

Texas Coastal and Marine Council.

Assists in the planning, coordination, and assessment of marine-related affairs.

Comptroller of Public Accounts.

Oil, Gas, and Utilities Division.

Administers state taxes on oil, gas, sulfur, cement, telegraph companies, electric light, power, or water companies, others presumably including producers and users of geothermal energy.
Maintains field offices throughout the state.

Texas Historical Commission.

Administers the National Historical Preservation Act of 1966(16 U.S.C.A.

470 et seq.)

Interagency Council on Natural Resources and the Environment.

Composed of representatives from the General Land Office, the Governor's Office, Air Control Board, Department of Agriculture, Department of Parks and Wildlife, Department of Highways and Public Transportation, Texas Railroad Commission, Texas Soil and Water Conservation Board, Texas Water Development Board, Texas Water Quality Board, Texas A&M University, Texas Water Rights Commission, UT Bureau of Economic Geology, Historical Commission;

Coordinates natural resources development in Texas, including activities of member agencies regarding the Coastal Zone Management Program.

Office of the Governor.

Division of Planning Coordination.

Reviews proposed projects and grant applications of State agencies regional commissions;

Conducts economic impact analyses.

Governor's Energy Advisory Council.

Charged with creation of a state energy policy;

Will coordinate this policy with other state agencies.

Greater South Texas Cultural Basin Commission.

Promotes economic and social progress in forty counties of South Texas.

Railroad Commission of Texas.

Promulgates rules and regulations concerning the development of geothermal energy on private lands;

Regulates drilling, production, and maintenance of wells on state lands;

Charged with conserving the resource, physically and economically;

Protects correlative rights;

Sets production rates;

Prevents or abates water pollution;

Enforces its orders through shutoff process.

State Department of Health.

Designates shellfish producing areas as polluted and unacceptable for industry;
Certifies water and wastewater treatment operators;
Monitors coastal waters;
Reviews and approves water and wastewater treatment systems;
Supports work of the Air Control Board by monitoring air quality throughout the state.

Department of Highways and Public Transportation.

Coordinates matters involving the Intracoastal Canal;
Participates in A-95 Review procedures.

Department of Parks and Wildlife.

Maintains a comprehensive plan for outdoor recreation;
Develops and maintains comprehensive plans for fish and wildlife;
Exercises police power over fish and game, commercial fishing and pollution, ground water withdrawals;
Issues sand, shell, gravel, and marl permits;
Maintains extensive field structure.

General Land Office.

Issues licenses, leases, permits for use of state lands, including those belonging to the School Land Board, and the Board for Lease of University Lands. The Commissioner of the General Land Office is also a member of the several commissions handling land held by other institutions;
Collects rents and royalties;
Reviews Environmental Impact Statements involving activities on state lands including activities by navigation districts;
Leads state efforts to develop a Coastal Zone Management Program for the state.

Gulf States Marine Commission.

Develops a multistate program for the protection of gulf fisheries.

Member states include: Florida, Alabama, Mississippi, Louisiana, and Texas.

Texas Industrial Commission.

Locates and attempts to attract new industries;
Promotes expansion of existing industries;
May make loans to Industrial Development Agencies.

State Soil and Water Conservation Board.

Administers the state's responsibilities under the Federal Watershed Protection and Flood Prevention Act (16 U.S.C.A. 165a-4);
Assists and coordinates the activities of Soil and Water Conservation Districts;
Mandated to secure the cooperation and assistance of the U.S. and any of its agencies and of agencies of Texas in the work of the districts.

Texas Public Utilities Commission.

Will regulate affairs of most public utilities in Texas beginning September 1, 1976.

Texas Water Development Board.

Maintains a comprehensive state water plan for all water resources available to the state;
Maintains programs for desalination of brines;
Conducts studies regarding the economic value of water used for municipal, industrial, irrigation and recreational purposes;
Samples water resources of the state;
Maintains liaison with U.S. Bureau of Reclamation and Corps of Engineers.

Texas Water Quality Board.

Maintains principal authority in the state on matters relating to water quality;
Establishes water quality criteria for state waters;
Regulates the operation of wastewater treatment facilities;
Administers most of the requirements of the National Pollution Dis-

charge Elimination System through agreement with the Environmental Protection Agency;
Monitors and enforces state effluent discharge permits;
Maintains a field structure.

Texas Water Rights Commission.

Grants or rejects applications to take or divert public surface waters;
Creates and regulates certain types of water districts, including underground water districts;
Maintains field structure.

The University of Texas at Austin.

Center for Energy Studies.

Serves as the university's clearinghouse of energy information;
Coordinates numerous research efforts related to energy through a cooperative multidisciplinary organization.

Bureau of Economic Geology.

Participates in research coordinated by Center for Energy Studies;
A quasi-state agency serving as the state's geological survey.

Marine Science Institute.

Maintains extensive field facilities located in Gulf cities of Galveston and Port Aransas;
Maintains programs in Marine Environmental Quality, Physiology and Ecology of Marine Organisms, Geological and Physical Coastal Processes, Nearshore Living Resources, Planetary Seismology, Submarine Geology, Submarine Geophysics.

Texas A&M University.

Principally through Sea Grant College: Identifies and assesses needs in marine resources;
Carries out research and other projects responsive to those needs;
Trains personnel in marine related fields;
Fosters public awareness.

LOCAL INSTITUTIONS

Councils of Government.

Multicounty jurisdiction;
Composed of or responsible to locally elected officials;
Adopt plans in concert with other institutions in areas of housing, health, public works, economic development, waste disposal systems, manpower, transportation, others;
Review certain federally funded projects through OMB Cir. A-95 procedures.

Counties.

Governed by four elected commissioners, representing different geographical areas, presided over by a county judge, elected at large;
Levy and collect taxes up to $.85 per $100 valuation.
Combined city-county health departments may file pollution suits;
May construct and operate wastewater collection and treatment systems, other water quality management functions;
May control land usage in potential flood areas through zoning, flood plain management programs;
Can pass and enforce ordinances for Gulf beaches.

Municipalities.

Pass ordinances;
Issue bonds;
Make and enforce building codes and subdivision regulations;
Grant and regulate franchises;
Annex and acquire land;
Construct water supply and waste disposal systems.

General Law Cities. (5000 or less)

Annex territory contiguous to the city and one-half mile or less in width following majority approval of the territory's inhabitants;
May tax up to 1.5% of its taxable property annually.

General Law Cities. (5000 or more)

Annex territory within one mile of the city following majority approval of the territory's inhabitants;
May tax up to 1.5% of its taxable property annually.

Home-Rule Cities.

Annex adjacent land without consent;
May tax up to 2.5% of its taxable property annually;
May make and enforce building and subdivision regulations within five miles of its boundaries through Extra-Territorial Jurisdiction.

Special Governments.

Established by authorization of certain state agencies, by special legislation by the legislature, by petition to and approval by a county commissioners' court, and authorization by the city to be served by the proposed district. All methods require a confirmation election by landowners within proposed district boundaries.

Most special governments may issue bonds, fix and collect charges for services, levy ad valorem taxes, own and construct facilities, levy maintenance taxes, approve certain land use restrictions.

APPENDIX E

TYPES OF SPECIAL DISTRICTS CREATED IN TEXAS

TYPES OF SPECIAL DISTRICTS CREATED IN TEXAS

TYPE	PURPOSE
Water	
Water Control and Improvement	Supply and Irrigation
Water Improvement	Irrigation
Drainage	Control
Levee Improvement	Flood Control
Navigation	Navigation and Port
Fresh Water Supply	Urban Supply
Municipal Water	Urban Supply
Water Supply	Supply and Development
River Authority	Multipurpose
Watershed Authority	Conservation and Supply
Underground Water	Conservation
Conservation and Reclamation	Multipurpose
Water Power Control	Supply and Power
Sanitation	Wastewater Treatment and Disposal
Improvement	Supply and Control
Flood Control	Control
Soil Conservation	Soil Conservation
Hospital	Medical Care
Housing Authorities	Public Housing
Urban Renewal Authorities	Municipal Redevelopment
Rural Fire Prevention	Fire Fighting
Noxious Weed Control	Weed Control
Airport	Airports

In addition to the above, there are several combination districts created by the Texas Legislature. Examples of these include a subsidence district in the Houston area, and the Gulf Coast Waste Disposal Authority, also in the Houston area. (Thrombley, 1959, adapted by Williamson)

APPENDIX F

SPECIAL DISTRICTS IN THE CASE STUDY AREA

SPECIAL DISTRICTS IN THE CASE STUDY AREA

TYPE	NUMBER
River Authority	1
Drainage District	2
Soil and Water Conservation District	1
Navigation District	3
Municipal Water District	1
Conservation and Reclamation District	1
Water Supply District	1
Fresh Water Supply District	1
Water Control and Improvement District	3
Airport District	1
Total	15

In addition to the above nonschool special districts, there are eighteen school districts and one MHMR district.

APPENDIX G

PROFESSIONAL AND TRADE ORGANIZATIONS

PROFESSIONAL AND TRADE ORGANIZATIONS

Advertising Federation of Corpus Christi.
Altrusa Club
American Association of Cost Engineers, South Texas Section
American Businesss Women's Association, Sparkling City Charter Chapter
American Chemical Society, South Texas Section
American Institute of Chemical Engineers, Coastal Bend Section
American Society of Civil Engineers
American Society of Safety Engineers
Associated General Contractors of America, Inc., South Texas Chapter
Auxiliary to the Nueces Chapter of Professional Engineers
Board of Trade-Port of Corpus Christi
Business and Professional Women's Club of Corpus Christi
Central Business District Association
City Council of Beta Sigma Phi
City Federation of Women's Clubs
Coastal Bend Agri-Business Council
Coastal Bend Archeological Society
Coastal Bend Chapter, National Secretaries Association
Coastal Bend Genealogical Society
Coastal Bend Personnel Association
Coastal Bend Retail Lumber Dealers Association
Coastal Bend Society of Texas Osteopathic Medical Association
Coastal Bend Veterinary Medical Association
Coastal Bend Warehouse and Transfer Association
Coastal Educational Secretaries Association
Consumer Credit Association of Corpus Christi
Corpus Christi Apartment Association
Corpus Christi Association of Independent Insurance Agents
Corpus Christi Association of Life Underwriters
Corpus Christi Association of Petroleum Landmen
Corpus Christi Board of Realtors
Corpus Christi Business and Estate Council
Corpus Christi Chamber of Commerce

Corpus Christi Chapter of American Society of Chartered Life Underwriters
Corpus Christi Chamber of Commerce Women's Committee
Corpus Christi Chapter, American Institute of Architects
Corpus Christi Chapter of National Association of Women in Construction
Corpus Christi Chapter, Texas Society of Certified Public Accountants
Corpus Christi Claims Association
Corpus Christi Council of Hospital Auxiliaries
Corpus Christi District Retail Grocers Association
Corpus Christi Firefighters Association, Local #936
Corpus Christi Franchised New Car Dealers Association
Corpus Christi Geological Society
Corpus Christi Hotel-Motel Association
Corpus Christi Independent Garagemen's Association
Corpus Christi Ministerial Alliance
Corpus Christi Press Club
Corpus Christi Principals Association
Corpus Christi Rental Property Association
Corpus Christi Restaurant Association
Corpus Christi Sales And Marketing Executives Association
Corpus Christi Traffic Association
Desk and Derrick Club of Corpus Christi
Downtown Business and Professional Women's Club
Gulf Coast Chapter, American Institute of Banking
Gulf Coast Florists Association
Gulf Coast Life Member Club--Telephone Pioneers of American
Gulf Coast Purchasing Management Association
Insurance Women of Corpus Christi
Licensed Vocation Nurses Association, Division #7
Little Theatre Corpus Christi
National Association of Corrosion Engineers
National Defense Transportation Association
Negro Business and Professional Women's Club of Corpus Christi
Nueces Chapter of Texas Society of Professional Engineers
Nueces County Bar Association
Nueces County Medical Society

Nueces County Pharmaceutical Association
Nueces Valley District Dental Society
PBX Club of Corpus Christi
Pilot Club of Corpus Christi
Sierra Club of Corpus Christi
Society of Professional Well Log Analysts
Society of Real Estate Appraisers
South Texas Division of the Texas Hospital Association
South Texas Marine Dealers Association
Southwest Texas Section, Society of Petroleum Engineers of AIME
Texas Chiropractic Association, District 12
Texas Hairdressers and Cosmetologists Association
The Byliners of Corpus Christi
Zonta Club of Corpus Christi