LAND USE ON GUAM

by

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The focus of discussion is a descriptive analysis of historical and contemporary land-use patterns of the American territory of Guam. Sources used are published literature, unpublished research, and personal interviews and observation. An examination of the physical characteristics of the land, combined with analysis of ownership patterns, the characteristics of development, and local attitudes regarding land use, reveal some of the practices and values of Guam society. Among these qualities are culture change as the result of changing use and ownership of land, and a development pattern which, according to Western concepts of ordered growth by planning, has been haphazard.

TO THE GRADUATE SCHOOL:

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The ways in which human beings live on this earth vary both across time and according to culture and environment. Some manage to exist in frozen regions, some have adapted to the rarified atmosphere of high altitudes. There are those who live their lives in urbanized, densely populated settings while others inhabit coral atolls of fewer than one hundred persons. Although for every place man lives there are a number of physical givens, such as climate, terrain, soil fertility, and elevation, each population develops characteristic ways of utilizing the land upon which they live. Some societies are primarily agrarian and devote the major portion of their land to farming; others are highly industrialized with much land utilized for urban and technological uses; and still others are fishing and hunting societies in which most land may be left in its natural state. There are population groupings that combine all of these societal modes as well as other ways of living. Each mode then, or each combination of modes, is reflected in the manner in which land is put to use. Thus, land-use patterns can describe some of the qualities of a society.

In the following pages a descriptive analysis of the land-use patterns of the American territory of Guam is presented. Guam is located in the western Pacific 6000 miles from the United States and 1500 miles south of Japan. It is a tropical, relatively high island of some 212 square miles in area and is the southernmost in the chain that constitutes the Mariana Islands. The population of Guam has been

estimated at 100,000 persons as of 1976 and is an ethnically mixed one in which Pacific Islanders, Asians, and those of European descent are the most numerous.

The historical influences on the island have also been mixed. The indigenous peoples, Chamorros, may have reached Guam as early as 7000 B.C.; however, it wasn't until the early 16th century that Guam was discovered by European man. Spanish government of the island was organized beginning in 1668 and ended in 1898. During that period Spaniards, Mexicans, Filipinos, and other Micronesian peoples visited and settled on Guam.

In the 20th century, two other groups arrived on the island and contributed their influences to the shaping of today's Guam. They were the Americans and the Japanese. At the end of the Spanish-American War in 1898, Guam became a U.S. possession and, except for the period of Japanese occupation during the Second World War, was administered by the U.S. Navy Department for more than 50 years. In 1950 the U.S. Congress enacted the Organic Act of Guam which established a territorial civil government for the island and conferred American citizenship upon the people of Guam.

The present status of Guam is that of an unincorporated territory of the United States. Although the governor and legislators are popularly elected in the island's civil government, the U.S. Department of Interior has general administrative supervision over island affairs.

The next section discusses the methodologies employed in this study. Then, following general geologic and hydrologic summaries of Guam a historical overview of change in land ownership and living patterns is presented. The major portion of this paper describes current

land-use patterns in terms of ownership characteristics, construction data, tax and recordation requirements, zoning law and patterns, property values, and the impact of development. Another aspect of land use on Guam is examined in a section dealing with local attitudes concerning land. A concluding section summarizes some of the research findings.

I. METHODOLOGY

A multi-method approach has been employed in the research phase of this study. A large portion of the study is the result of a review of the published literature on Guam land use and a subsequent consolidation of these data sources in the text presented here. Unpublished research bearing upon land use has also been employed. Primary sources have been utilized in the form of material gathered by interviews with various representatives of Government of Guam departments and by analysis of opinion and attitude questionnaire items concerning land use, ownership, and regulation. In addition, some of my own observations, based upon 6 years of residence on Guam, are included.

Presentation of both tables and text is, wherever possible, on a regional basis. The five geographic regions are arbitrary in that they do not correspond to any existing districts; however, the regional breakdown affords a basis for intra-island comparisons and is not arbitrary in the sense that the regions generally reflect popular ideas concerning Guam's separate areas. They also reflect certain geographic and hydrologic similarities within each region. Figure 1 locates the five regions to be discussed throughout this paper.

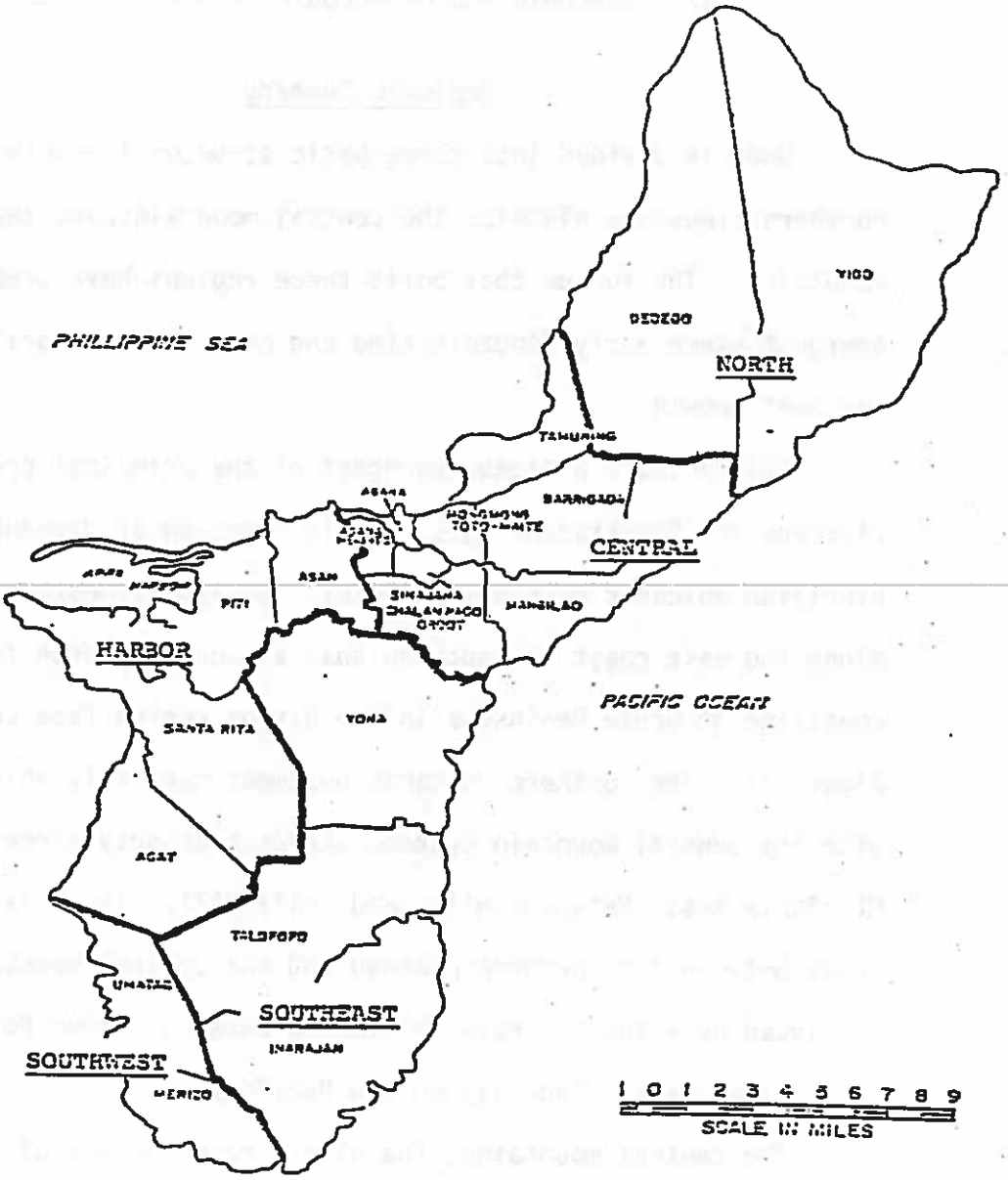

Figure 1. Guam: geographic regions.

II. GEOLOGIC AND HYDROLOGIC CHARACTERISTICS

Geologic Summary

Guam is divided into three basic structural provinces: the northern limestone plateau, the central mountains, and the southern mountains. The forces that built these regions have been generally emergent since early Cenozoic time and consisted primarily in volcanism and reef growth.

The northern plateau, youngest of the principal provinces, is of Pliocene and Pleistocene ages. It is composed of Mariana limestone overlying volcanic basement material. Mariana limestone is also found along the east coast of southern Guam and on the north facing central coastline of Orote Peninsula in the Harbor region (see Locator Map, Figure 2). The northern volcanic basement material, which is continuous with the central mountain system, surfaces at only three places: Mt. Santa Rosa, Mataguac Hill, and Palii Hill. There is a well-defined break between the northern plateau and the central mountains which is caused by a fault across the island between Adelup Point on the Philippine sea and Pago Bay on the Pacific.

The central mountains, the oldest rock systems of the island, are made up of contorted early Tertiary volcanic materials. This area consists in a sequence of water-laid tuffaceous shale, sandstone and conglomerate that is 2,000-3,000 feet thick, lava flows and blocky breccias, reworked tuff-breccia, and other conglomerate that contains

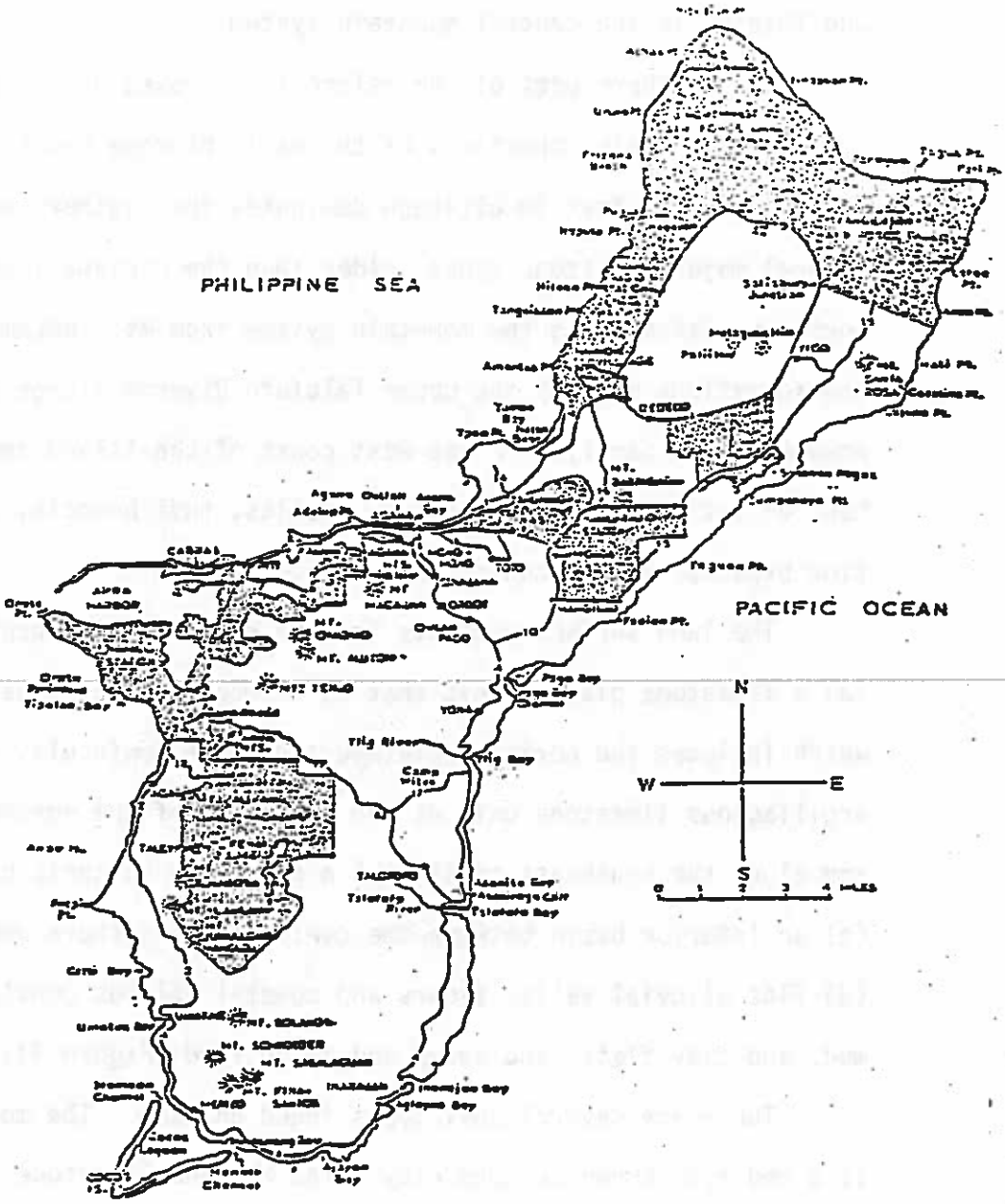

Figure 2. General locator map of Guam. [From (2), 24A.]

fragments of reef-associated limestone. There is extensive faulting and folding in the central mountain system.

The southern part of the island is composed of higher and less contorted volcanic formations of the early Miocene Epoch. A ridge averaging 1,200 feet in altitude dominates the southern area and several major limestone types, older than the Mariana limestone of the northern plateau, cap the mountain system from Mt. LamLam to Mt. Alifan. The formations make up the upper Talofofo River drainage basin. The mountains run parallel to the west coast of the island and are mixed beds of tuffaceous shales, pillow basalts, tuff breccia, andesites, flow breccia, and volcanic conglomerate.

The land surface consists in four physiographic provinces: (a) a limestone plateau unit that is formed on pure limestone and which includes the northern plateau and Orote Peninsula, and an argillaceous limestone unit at the south end of the northern plateau and along the southeast coast; (b) a dissected volcanic upland unit; (c) an interior basin between the central and southern mountains; and (d) flat alluvial valley floors and coastal uplands consisting in sand, mud, and clay flats, and swamp and marsh land (Figure 3).

There are several soil types found on Guam. The most ubiquitous is a red type known as Guam clay. The Mariana limestone of the northern plateau is covered with a relatively thin layer of this clay. There are other clayey soils on the northeastern and eastern slopes of the southern mountains and heavy clay alluvial soils are found in

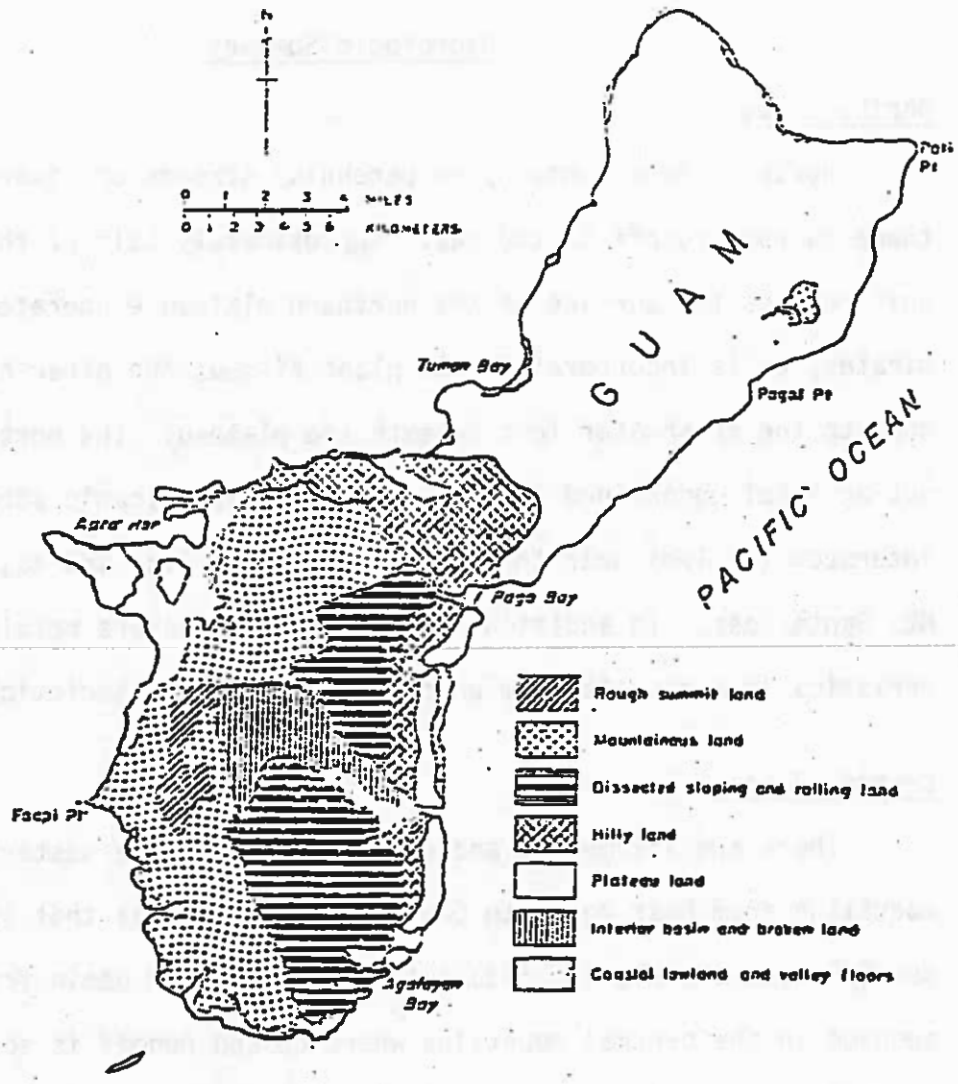

Figure 3. Physiographic divisions of Guam. [From (2), 14A.]

river valleys. Because of the leaching of minerals, Guam's soils are not of high fertility (1, 2).

Hydrologic Summary

Northern Region

Northern Guam contains no perennial streams or rivers nor is there surface runoff to the sea. Approximately half of the rainfall that reaches the surface of the northern plateau evaporates, transpirates, or is incorporated into plant tissue; the other half percolates down to the freshwater lens beneath the plateau. The northern lens is not an ideal unconfined lens in that basement volcanic structures intersect the lens near the Adelup-Pago fault line and adjacent to Mt. Santa Rosa. In addition, other geologic factors result in characteristics that deviate from unconfined lens characteristics.

Central Region

There are six medium and small streams on the western central coastline from East Agana to Cabras Island, an area that is mixed residential, commercial, and industrial. All of them begin from springs or seepage in the central mountains where upland runoff is so low at times that flow is totally absorbed along the streambeds and surface flow ceases. The Chaot River feeds the Agana Marsh and the other five, the Fonte, Asan, Matque, Taguag, and Masso rivers, empty onto the coastal reef. The villages in this region are Agana, Piti, and Asan.

Harbor Region

On the west side of the central mountains, several small streams flow from steep ravines through marshes and swamplands. Further south, 10 streams from the Namo River south to Facpi Point arise in the

western foothills. Their sources are perched water, diked water, or seepage from volcanic sources, and they pass through alluvial lowlands. All of these systems are small and limited in quantity and have greatly diminished flows during drought periods. On the other hand, several of these creeks and rivers pass through inhabited areas and the Namo River, particularly, has been known to cause flooding in the Harbor region village of Agat.

Southwest Region

From Facpi Point to Cocos Lagoon there are 10 streams or stream systems. The flow sources are mainly dike-complexes and seepage but small deposits of limestone and agglomerate volcanic material contribute to flow. Fena Reservoir, located inland on military property in this region, is fed mainly by rainfall that has reached the volcanic basement structures and then flowed out through their perimeters from pools. Merizo and Umatac, the only villages in this area, are both located in narrow coastal strips. Also in this region is a growing number of farms which utilize the stream systems for irrigation purposes.

Southeast Region

The eastern coast and the caps of the southern mountains consist in limestone formations which have percolation properties similar to those of the northern plateau; however, a large proportion of the rainfall runs into ravines and channels and the remainder is stored in a high water table to be released through seepage. These seeps and small streams establish the base flow of the rivers. The major rivers and river systems in the Southeast are the Inarajan, Pauliluc, Talofofo, and Ylig river

systems, and the Pago River. Only three villages are located in this region: Inarajan, Talofofo, and Yona (Note 1).

In summary, the southern half of Guam, which includes the Harbor, Southeast, and Southwest regions as well as parts of the Central region, is highly dissected by streams and rivers. In addition to surface flow, southern freshwater resources include perched groundwaters and the groundwaters associated with limestone areas. The lowland areas of the larger southern rivers are alluvial and drainage is moderate to poor. Some of this land is utilized for agricultural purposes but there are also reed marshes or swamps and scattered patches of nipa palm and mangrove.

The northern half of the island is strikingly different from the southern half, both visually and hydrographically. It is bound almost completely by vertical cliffs which rise within approximately 100 meters from the shoreline, perennial water flow is absent, and the only water source for northern Guam is a delicately balanced basal water lens.

III. HISTORICAL OVERVIEW

In precontact times the Chamorro population of Guam lived in small scattered settlements along the rivers and coastal areas. This afforded access to fresh water, fishing, and soils for growing rice, taro and other tubers, breadfruit, and bananas. For 160 years after Guam's first contact with Western culture in 1519, this traditional pattern persisted. In 1680, however, the Spanish authorities forced the Chamorros to leave their rural villages and garden lands and concentrate in six villages in the southern half of the island. Over the next century there was a gradual movement to Agana in Central region. By 1870, 84 percent of the population resided in Agana (3). But the economy remained a subsistence one and each man was primarily a farmer. Most of the land area remained in private ownership, particularly the best lands. The Spanish crown lands by then constituted about one-fourth of the island and were mainly inferior grade lands located on the northern plateau and grazing land in the southern interior. In 1895 Spanish authorities rescinded all possessory land titles, an act that was to have far-reaching effect in creating confusion as to land ownership.

When Guam became an American possession in 1898, the Spanish crown lands became the property of the U.S. Government and were under the control of the Navy Department. By World War II the proportion of land under federal and naval control had grown to nearly two-thirds and the amount of land still held by Guamanians had diminished to approximately

70 square miles, or one-third. Most of the privately owned lands were in parcels smaller than 50 hectares (4).

During the period of U.S. administration before the Second World War, the naval government encouraged the Guamanians to resettle their agricultural lands. One result was that most families owned two homes, a town residence and a simpler dwelling on the farm, or ranch as it is customarily called. Those with farms divided their time between their urban and rural homes, some of them commuting long distances to ranch lands on a daily basis and other residing on the ranch during the week and commuting to town for the weekend (3). It has been estimated that by World War II some 15,000-17,000 acres were under cultivation, 1,500 head of cattle were pastured on the southern grasslands, and 2,450 families derived their living chiefly from agriculture; leased public domain lands amounted to about 6,000 hectares (4).

Village population shifts also took place in the prewar period. Most of the population lived around Apra Harbor and in Agana by the end of 1941. The remainder lived in the southern half of the island although some were scattered in the rural northern plateau; at that time there were no villages in the northern part of Guam.

Pre-occupation bombardment by U.S. Armed Forces in 1944 destroyed nearly all of Agana and the Harbor region villages of Piti, Asan, Agat, and Sumay. (Sumay, located on Orote Peninsula, is no longer a civilian community.) Although agriculture continued to be the most significant land use in the immediate postwar period, it was severely disrupted when considerable amounts of good agricultural land were taken for military use. Table 1 indicates the estimated amount of land held by the military, the Government of Guam, and by private owners as of 1950.

Table 1

Estimated Land Holdings by Owner, Guam 1950

(In Acres and Percent)

Landowner	Acres	Percent
Military		
Permanent holdings		
Private land acquired or to be acquired	24,278	
Government land owned prior to WWII	17,485	34%
Land reclaimed by dredging	1,578	
Temporary holdings		
Private land under leasehold	4,352	
Government land	1,435	
Government of Guam lands		
Sites for schools, police stations, roads, etc.	815	21%
Public lands	29,603	
Private lands		
Urban	2,600	45%
Rural	61,854	
Total	144,000[a]	100%

SOURCE: Adapted from (4).

[a]This total is equivalent to 225 square miles; Guam's area is generally held to be 212 square miles, or 135,680 acres. It is not known where the error of 8,320 acres is in these estimates, but it appears that the amount of private lands may have been over-estimated and the amount held by the military under-estimated.

Bombardment of the island also resulted in a denuding of the landscape and this in turn led to a serious depletion of the physical land resources through erosion. Farming was thus doubly handicapped. By 1949, it was estimated that there were some 1,700 acres under cultivation by nearly 600 full-time and 700 part-time farmers (4). Rice and copra were no longer exported and agricultural production dropped to a level that was inadequate to meet even the local demand.

By 1950, the transformation from an economy based upon agriculture to a wage-based economy was complete. Jobs were plentiful, wages were attractive, and there was a general reluctance to return to agriculture as the sole source of livelihood. Yet despite this change in the mode of living there was, according to R. F. Coote (4), a deterrent to land development caused by what he saw as a singular attachment Guamanians had for their land and a reluctance to sell even at attractive prices. More will be said about this attitude in the chapter dealing with attitudes toward land.

Before continuing to present-day land-use patterns, some comments are necessary concerning former land recordation procedures. It will be seen that some of the problems that existed a quarter century ago serve to complicate land issues today.

Prior to World War II, the only instruments recorded were deeds. These were abstracted and only the abstract was recorded. All recordation was done in longhand. Marginal notations were made if there were any encumbrances and the only index was according to grantee (4). During the war a few deeds and nearly all maps disappeared; however, all but one of the handwritten abstract record books survived. Thus,

with the exception of Book One of Merizo, any recordation that had been made since the Spanish Mortgage Law of 1898 survived (Note 2).

By 1950, all instruments presented were recorded in exact typed copy. In addition to deeds these included assignments, releases, mortages, and various other instruments. In the case of surveyed land, indices were according to property designations broken down by municipalities; unsurveyed land was indexed by place name. Land surveys and legal descriptions were according to the metes and bounds system and, in general, land was measured in terms of hectares, ares, centares. There was an overall deficiency of adequate surveys and maps and the former Spanish crown lands then under public domain had still not been registered.

IV. CURRENT LAND-USE PATTERNS

Until the early 1960's Guam remained an essentially rural island. Most roadways were still unpaved, land values remained constant and low, and there was little commercial activity. Although the local legislative body had passed the island's first zoning bill in 1952, it was not conceived in terms of long-range planning effect nor was there to be any significant development upon which zoning legislation would have an impact for more than a decade. Then two events in the early 60's created the conditions for startling changes in Guam's development. In 1962, Typhoon Karen churned across the island damaging if not destroying nearly every structure on the island. Millions of dollars in rehabilitation funds soon began pouring into Guam as the process of renewal got under way. The other event was the lifting of the requirement that a security clearance was needed in order to enter Guam. This meant, among other things, that Guam was no longer isolated from tourism and foreign investment which, since then, have been the two most powerful new influences on Guam's development. Other influences such as the U.S. military presence, cultural attitudes, legal systems, and human practices continued in their impact and, combined with these newer influences, shaped the Guam of today. These are the subjects of consideration in the remainder of this paper.

Land Ownership

When local government was created by the Organic Act of 1950, thousands of acres previously administered by naval forces became public

domain lands of the Government of Guam. These lands are concentrated in the Northern region and along the coast in the Southwestern region. There are also scattered parcels in the central part of Guam (see Ownership Map, Figure 4). Private lands are most extensive in the Southeast and Central regions, but there are numerous parcels in the Dededo-Yigo area in the Northern region. In the last decade the proportion of private land has grown through the purchase of excess government lands, land grants, and litigation (2). Military and major federal land holdings include Naval Station, Polaris Point, and Navy Magazine in the Harbor region; Radio Barrigada and Naval Air Station in the Central region; Andersen Air Force Base and Marbo Annex in the Northern region; and Fena Reservoir area in the Southwestern region. The majority of federal lands were acquired during the period of naval administration from private owners by purchase, condemnation, and cession.

Strange as it may seem, the exact figures for ownership among the three land-owning categories is a matter of conjecture. Estimates vary by source, sometimes considerably, in the number of acres ascribed to each entity. There are several known reasons for these discrepancies. Land records are obsolete, inaccurate, and incomplete. Outdated base maps compound the problem (5, 6).

Moreover, 17 percent of the public domain lands have neither been surveyed nor registered as of April 1976, and half of the public domain lands that have been surveyed as of the same date have not been registered (Note 2). Table 2 shows two Government of Guam (GovGuam) estimates made 16 months apart, a Navy estimate, and what is commonly believed to be the proportions. As can be seen, there is no agreement even as to the total number of acres for the island.

The Ownership Map, Figure 4, is directly from A Study and Review of Laws Pertaining to Alien Investment on Guam, Stanford Research institute (6), where it is presented as "Exhibit A, Guam Land Ownership Pattern."

Table 2

Guam Land Ownership Proportions According to Source

(In Acres and Percent)

Source	Private		Government of Guam		U.S. Federal	
	Acres	Percent	Acres	Percent	Acres	Percent
GovGuam[a]	61,603	45%	27,000	20%	48,357	35%
GovGuam[b]	67,700	49.9	25,000	18.4	43,000	31.7
Navy[a]	51,600	36	42,000	30	48,400	34
Common assumption	. . .	33	. . .	33	. . .	33

[a]SOURCE: Adapted from (5).

[b]SOURCE: Adapted from (6).

In Table 3 and Figure 5, private land ownership proportions are presented according to ethnic group to illustrate how much land is still held by Guamanians and how much has passed into the hands of others since the security clearance requirement was rescinded. At least 23.5 percent of privately owned land is held by alien groups and the off-island U.S. group controls another 2.9 percent; thus, a fourth of the private lands have been alienated from the Guamanian.

Actually, however, the amount of land owned by non-Guamanians is even higher because Stanford Research Institute, which compiled the statistics, included in its definition of Guamanian not only persons who were born on Guam but also other U.S. citizens who had resided on

Table 3

Guam Private Land Ownership Proportions, 1974

(By Region and Nationality in Hectares and Percent)

Region	Off-island U.S.		Alien		Guamanian	
	Ha.	Percent	Ha.	Percent	Ha.	Percent
Harbor						
Agat	6	1%	294	29%	700	70%
Asan	0	0	204	26	596	74
Piti	0	0	99	20	400	80
Central						
Agana	1	1%	6	6%	93	93%
Barrigada	122	6	198	10	1,680	84
Sinajana	35	2	75	4	1,890	94
Southwest						
Merizo	19	4%	71	14%	410	82%
Umatac	18	9	25	13	157	78
Southeast						
Inarajan	38	1.5%	1,442	47.5%	1,520	51%
Talofofo	18	1	903	30	2,080	69
Yona	94	2	889	17	4,057	81
Northern						
Dededo	203	14%	357	25%	940	61%
Machanao	0	0	136	68	64	32
Total	616	2.9%	5,016	23.5%	15,668	73.6%

SOURCE: Adapted from (5).

The Ownership Map, Figure 5, is directly from a Study and Review of Laws Pertaining to Alien Investment on Guam, Stanford Research Institute (5), where it is presented as "Exhibit A, Guam Land Ownership Pattern (Concluded)."

Guam for at least five years(5). Some in the latter group own a great deal of land that was purchased long ago. Foreign land control, including U.S. off-island, is relatively high in Inarajan and Talofofo in the Southeast region and in the cadastral villages of Dededo and Machanao in the Northern region. It is also high, though less so than in the above areas, in the Harbor region cadastral village of Agat.

Typically, U.S. off-islanders have acquired land for such business purposes as manufacturing, construction, trade, and various services. As for alien buyers and lessees, the Japanese have been interested in high value coastal land with potential for developing tourism and, occasionally, housing projects; the Taiwan and Hong Kong Chinese generally obtain land for speculative purposes or, it is popularly believed, for a place of refuge should home government conditions make them wish to flee; the Korean land interests have been mainly for the purpose of residential and other construction (5).

Thus, the present pattern of land ownership is a highly mixed one in terms of ethnic group, and it is a confused one in terms of the broad categories of ownership. Alien investment is substantial. This pattern is the result of historical happenstance rather than planning. The Government of Guam has in the last ten years instituted various planning processes but such efforts have generally had little organizing impact. A Bureau of Planning was established in local government in 1975 but it is too early to gauge its effectiveness. A significant impediment in government planning and policies is the military: it is difficult to assess the impact of federal land on the island's social, economic, and physical systems because of military secrecy concerning present and future projects. Moreover, military property in some cases

divides established communities, cuts convenient lines of travel from one area to another and, in general, limits expansion potential (7). Nevertheless, it is generally believed that military land requirements are unlikely to decrease.

Land Valuation

There is considerable range in land costs on Guam and, aside from the figures afforded by the Stanford Research Institute (SRI) study, information is mainly in the form of generalization (5). Table 4 shows regional land prices by cadastral village at a time when Guam was just passing its peak of economic growth. The wide range of price is because of varying factors such as lot size, zoning classification, and location. These figures are to be considered generally applicable for today; however, the actual price paid today would be lower than that paid for the same parcel before the beginning of 1974. In other words, it is now a "buyer's market."

In 1974, the SRI study declined to make any generalizations about land values except to state that Japanese interests were, in the main, acquiring high value properties on or near the coast (5). Coastal property continues to remain relatively expensive, especially so the nearer it is to the central part of the island. Land on Tumon Bay, Guam's resort center where the major hotels are located, sold for $9.00 per square meter in the late 60's; now a minimum and attractive price for such land is $100.00 per square meter (8). Table 5 shows square meter prices advertised for land in four of the five geographic regions; no land was advertised in the Southwestern region during the survey period. Some of the land advertised was not described in terms of

Table 4

Land Prices on Guam

(Dollars per Square Meter)

Region	Price range 1971-74[a]	Typical prices July-Oct. 1973
	Harbor	
Agat	$ 1.00 - 35.00	$ 2.00 - 12.00
Asan	2.80 - 23.00	1.00 - 4.00
Piti	3.50 - 45.00	1.00 - 47.00
	Central	
Agana	$21.75 - 447.50	$61.00 - 405.00
Barrigada	1.10 - 88.00	3.00 - 52.00
Sinajana	1.67 - 140.00	1.00 - 191.00
	Southwest	
Merizo	$ .78 - 80.00	$ 4.00 - 48.00
Umatac	1.50 - 10.00	10.00
	Southeast	
Inarajan	$ .68 - 19.40	$ 1.00 - 21.00
Talofofo	.30 - 60.00	1.00 - 4.00
Yona	1.00 - 75.00	1.00 - 4.00
	North	
Dededo	$ 3.00 - 214.00	$ 4.00 - 75.00
Machanao	2.50 - 5.20	4.00 - 6.00

SOURCE: Adapted from (5).

[a]Prices as paid by non-Guamanians.

Table 5

Advertised Land Prices, Guam

March 20-April 9, 1976

Region	$ per sq. m.	Date Advertised
	Harbor	
Agat (with view)	$ 6.18	April 8
Agat (access road, power, water)	7.00	March 26
	Central	
Tamuning (Marine Drive frontage)	$36.00	March 30
Tumon (with view)	42.50	March 31
Barrigada	3.70	March 20
	Southeast	
Inarajan (beach and road frontage)	$14.00	April 7
	North	
Machanao	$ 4.57	March 29
Yigo	3.67	April 9
Yigo	2.70	March 30

SOURCE: All prices are from the classified ads section of the Pacific Daily News for each property and date listed.

whether or not there was road access or utilities; therefore, it can be assumed, unless otherwise stated, that these are included for the Tamuning and Tumon properties only.

The cost of land has spiraled upward ever since 1962; before then, land values were steady. One result of the increasing cost of land is that many local families simply can no longer afford to purchase their own homes. They cannot buy land and pay building costs as well. Another result is that a local tradition of providing a newly-married couple with a piece of land and sometimes a house as well is fading from practice. If newlyweds wish to and can afford it, they may rent an apartment; if not, and neither set of parents has been able to provide land or a house, young couples move in with parents. The subject of building costs will be discussed in the following section.

Construction Costs, Building Permits, and Development

In 1967, there were an estimated 10,000 buildings of all descriptions on the island. Estimates since then tend to vary but by 1973 there were at least 16,000 buildings and perhaps more. The appraised value of these buildings was $51.6 million in 1967 and $236.3 million for 1973. Housing constituted the greatest share of this growth (9). Implicit in these figures is the fact that the construction industry became Guam's leading growth industry. Gross receipts of contractors amounted to $126.2 million in 1974. Contractors' peak year for value of new building permits was also 1974 when the figure was $116.7 million; however, increases from previous years are partially attributable to effects of inflation (10).

The apartment and residential market share has fluctuated markedly over the last eight years. In 1968 their share was 85 percent; in 1972 it was 54 percent; for the first three quarters of 1975 it was 79 percent. Commercial construction increased from a 9 percent share in 1968 to 43 percent in 1972; in 1973 the commercial share was about one-third and the apartment and residential share two-thirds (11).

Table 6 indicates the number of all kinds of building permits issued by village for the first three quarters of 1975. In this period the commercial share for new and additional building permits dropped to 8 percent. The Northern region showed the most activity with 43.3 percent of the permits issued for that area; the others, in order, were the Central region with 37.4 percent, the Southeast with 10.2 percent, the Harbor with 8.1 percent, and the Southwest with barely 1 percent. Total construction cost for these 1,105 building permits was $26.1 million (Note 3).

The appearance of multi-story structures has become increasingly common on Guam and there is now a surplus of apartment and office space. Similarly, new condominiums stand empty or only partially filled and housing developments are having the same problem.[1] The economic boom of the early 70's has become a time of austerity. Spiraling land costs

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[1]Typhoon Pamela, which occurred in May 1976 after the research portion of this study was completed, has had a considerable effect upon Guam housing. More than 5,000 dwelling units were considered unrestorable after the storm's devastation. One result has been that some types of housing have become scarce, particularly rentals of all kinds. This situation can be expected to continue for a long time (12).

Table 6

Building Permits Issued, January-September, 1975

(All Classes and by Region)

Region	Permit class											
	Residential		Apartments		Commercial		Industrial		Religious (& non-profit)		GovGuam (& welfare)	
	New	Add	New	Add	New	Add	New	Add	New	Add	New	Add
Harbor (subtotal)	46	35	0	0	4	2	0	0	0	0	0	3
Agat	28	20	. . .	. . .	4	2	. . .	. . .	. . .	. . .	. . .	2
Asan	6	6	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Piti	2	5	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	1
Santa Rita	10	4	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Central (subtotal)	167	157	0	4	9	52	0	0	1	4	7	12
Agana	4	5	. . .	. . .	2	13	. . .	. . .	. . .	0	1	6
Agana Heights	10	7	. . .	. . .	. . .	2	. . .	. . .	. . .	1	. . .	. . .
Barrigada	25	55	. . .	. . .	. . .	1	. . .	. . .	. . .	. . .	. . .	. . .
Chalan Pago-Ordot	15	8	. . .	. . .	. . .	1	. . .	. . .	. . .	. . .	. . .	. . .
Mangilao	32	9	. . .	. . .	. . .	. . .	. . .	. . .	1	. . .	3	4
Sinajana	53	28	. . .	1	2	1	. . .	. . .	. . .	1	. . .	1
Tamuning	13	29	. . .	3	3	31	. . .	. . .	. . .	2	3	. . .
Mongmong-Toto-Maite	15	16	. . .	. . .	2	3	. . .	. . .	. . .	. . .	. . .	1

Table 6 -- Concluded

Region	Permit class											
	Residential		Apartments		Commercial		Industrial		Religious (& non-profit)		GovGuam (& welfare)	
	New	Add	New	Add	New	Add	New	Add	New	Add	New	Add
Southwest (subtotal)	9	2	0	0	0	0	0	0	0	0	0	0
Merizo	8	1	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Umatac	1	1	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Southeast (subtotal)	79	25	0	0	2	1	0	0	0	2	4	0
Inarajan	12	4	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	1	. . .
Talofofo	9	5	. . .	. . .	. . .	. . .	. . .	. . .	. . .	2	2	. . .
Yona	58	16	. . .	. . .	2	1	. . .	. . .	. . .	. . .	1	. . .
North (subtotal)	188	163	0	0	11	11	1	0	1	1	101	1
Dededo	71	132	. . .	. . .	8	10	1	. . .	1	1	1	1
Yigo	117	31	. . .	. . .	3	1	. . .	. . .	. . .	. . .	100	. . .
Total	489	382	0	4	26	66	1	0	2	7	112	16

SOURCE: (Note 3).

inflated building costs which were in turn pushed up by the need to import material and labor. Estimates for building cost per square foot range between a low of $20.00 and a conservative high of $30.00 (8). Still, housing developments have proliferated, particularly in the Northern region where construction of infrastructure and buildings, is less costly; in the South, costs increase because of its uneven topography and, if interior valley regions are opened to non-agricultural development, access will have to be provided first (13).

Environmental Limitations on Land Use

The amount of building that is occurring on the northern plateau is cause for concern. Nearly all of the civilian water supply is extracted from the northern basal water lens and although its dynamics are not fully understood it is known that continued use of this water source depends upon adequate recharge and proper withdrawal. There is steady consumption of land in the recharge area for streets, parking lots, and buildings and there is an additional threat to water quality in the form of pollutants introduced by urban runoff. Some of the growth in the North occurred before sewage treatment facilities were available and this resulted in the construction of package aeration treatment plants with ground discharge. Although the major proportion of public domain lands are in the North they are insufficient in area to guarantee protection of the water lens; moreover, GovGuam has leased tracts of public lands as subdivisions, it is not financially able to purchase additional recharge area lands, and there is no land transfer program for the purpose of protecting the lens (2).

The government has similar land need problems in the South. In order to develop southern water resources through the impoundment of river waters, additional land must be acquired from private owners. Land in the South is being subdivided for speculative purposes and an increasing number of persons are moving to flood-plain areas where land is less expensive (2).

It is ironic that the northern plateau, whose water lens is so fragile, is most suitable for development: all areas are easily accessible and, as noted above, it is cheaper to build there. Its most outstanding characteristic, however, is its flatness. There are only two villages on the entire northern half of the island with less than 80 percent of their land falling in the zero to 15 percent slope category: Chalan Pago-Ordot and Agana Heights (Table 7). Both of these villages are just on or south of the Adelup Point-Pago Bay fault line where the central mountains begin and in a sense could therefore be considered as part of the southern half instead. Fifty-seven percent of the island has a zero to 15 percent slope range; 47 percent of that comprises the two Northern region villages of Dededo and Yigo for which 43 percent of the 1975 building permits were issued, more permits than for any other area. One-fourth of the zero to 15 percent slope lands are in the Central region; thus, nearly three-fourths of the land with the least slope constitutes the northern part of Guam. On the other hand, 71 percent of the combined Southeast-Southwest region has a slope greater than 15 percent. Several villages have very limited amounts of land with less than a 16 percent slope, thus imposing a natural limitation on the extent of urban growth. These include Agana Heights (12 percent), Piti (3 percent), and Umatac (2 percent) (7).

Table 7

Guam Land Suitability According to Slope Degree

(By Region in Acres and Percent)

Region	Degree of slope					
	0 - 15%		16 - 35%		35%+	
	Acres	% of total	Acres	% of total	Acres	% of total
Harbor (total)	8,868	11.5	7,033	26.9	10,107	31.2
Agat	1,326	19	2,139	30	3,677	51
Asan	1,515	39	919	23	1,508	38
Piti	127	3	1,998	44	2,457	53
Santa Rita	5,900	57	1,977	19	2,465	24
Central (total)	19,335	25.1	2,334	8.9	2,088	6.5
Agana	698	94	20	3	24	3
Agana Heights	89	12	353	48	300	40
Barrigada	5,567	95	235	4	60	1
Chalan Pago-Ordot	1,506	38	1,160	29	1,276	33
Mangilao	6,025	93	229	3	248	4
Mongmong-Toto-Maite	1,137	82	106	14	40	4
Sinajana	518	80	169	23	55	7
Tamuning	3,795	96	62	2	85	2
Southwest (total)	993	1.3	2,253	8.6	4,638	14.4
Merizo	910	23	965	24	2,067	53
Umatac	83	2	1,288	33	2,571	65
Southeast (total)	11,400	15.1	11,339	43.4	13,150	40.6
Inarajan	5,400	44	3,907	32	2,955	24
Talofofo	4,126	38	3,004	27	3,852	35
Yona	2,131	17	4,428	34	6,343	49
Northern (total)	36,242	47.0	3,187	12.2	2,375	7.3
Dededo	18,115	94	571	3	616	3
Yigo	18,127	80	2,616	12	1,759	8
Grand total	77,095	56.8	26,146	19.3	32,358	23.9

SOURCE: Adapted from (7).

Guam's present urban development utilizes approximately 20 percent of the usable portion of the island. Slopes exceeding 30 percent and military holdings are excluded for consideration for urban development (14). In addition to slope factor, another critical determinant of land use is the zoning law and the way in which it is applied. This will be considered in the following section.

Zoning and Land Use

The island's first zoning law, enacted in 1952, has been amended several times in the ensuing years. The law essentially provides that land be classified according to use. These classifications are as follows: single residential, R-1; multiple dwelling, R-2; planned-unit development, PUD; commercial, C; limited industry, M-1; heavy industry, M-2; agricultural and open-conservation, A and Open. Zones are defined according to the uses permitted therein and there are provisions in the law concerning height, side yard and setback limits. There are also provisions to regulate nonconforming uses and shoreline development, and the law provides procedures for variances and zoning changes.

In practice, the enforcement of the zoning law and building code regulations has been deficient. Lack of sufficient manpower and of formal enforcement procedures is part of the problem. Of greater significance has been the practice of zoning on a case-by-case variance basis. A case in point occurred when, despite the governor's veto, the Twelfth Guam Legislature enacted bills to rezone for commercial use a section of Marine Drive in Tamuning. Similar actions affected land adjacent to Route 4 which crosses the island between Adelup Point and Pago Bay and then continues south on the windward side of the island.

The basis of these zoning problems is that Guam lacks an up-to-date master plan for development. There is no clearly defined land-use plan and development program or policy. In terms of what Western ideas are concerning ordered land use, development on Guam would be termed random and chaotic. Convenience requirements and the economics of the cultural system have been the primary determinants of development patterns rather than the implementation of a Western process to control growth in a sequence that reflected concern for the island's total environment.

Ten years ago, even the most urban communities of Agana and Tamuning were zoned, respectively, 70 percent and 62 percent agricultural. There was no multiple dwelling (R-2) zoning in Tamuning. In the intervening years the population grew, a tourism industry was born, and unprecedented economic prosperity was enjoyed by the residents of the island. As previously indicated, the construction industry grew prodigiously for a time, with an impressive increase in the number of structures a result. How did convenience and economics determine Guam's growth?

The answer to this question lies in the nature of the development ethic of the time. Without a program to guide an efficient utilization of land, a traditional and haphazard process remained in effect. Some landowners developed their holdings in a piecemeal fashion; incompatible land uses were located contiguously; non-conforming uses occurred despite the zoning regulations; supportive services were not always included as necessary adjuncts in residential subdivision development; property availability and land prices seemed to be the dominating factor in determining where the residential subdivisions

were located; and, finally, public facilities such as highways and sewer lines fostered a linear and extended growth pattern (2, 7).

Disorganized and inefficient land use characterizes the appearance of the landscape of today. The compact, densely settled villages of former times have now spread across the land except where the topography or the lack of utilities prohibit such growth, as in Umatac and Inarajan. There is no differentiation among areas by functional, economic, or social requirements. The urban locations lack structuring of land uses and are generally inefficient because of strip development, as on Marine Drive (Route 1), or illogical zoning mixes. Residential developments are still being proposed for environmentally sensitive areas and infrastructure needs are still being considered after rather than before development occurs. There is also the danger that recreation and park areas may not be developed in sufficient amounts or that such existing areas may not be protected from other encroaching land uses. Compounding the problem of orderly development is the existence of many irregularly shaped lots and mini-lots. In the same vein, many lots have become physically isolated because of overlapping and conflicting title and subdivision actions.

Recent development on Guam has thus proceeded on the basis of not merely inadequate planning but an absence of coordinated planning. This of course acts as a constraint upon future development. Until the Bureau of Planning or some other body devises a complete development plan, the major tool for regulating the course of growth is the zoning law.

Table 8 shows the village and regional zoning classification in acres and percents; it also indicates the percentage each use occupies

of the total urban use acreage by village and region and the percentage of military lands by village, region, and island. Rounding off procedures have resulted in approximate computations and explain why total island acreage in this table differs from that of other tables.

According to these figures, military land comprises 33.7 percent of the total island acreage and 9.2 percent is devoted to urban use. The remaining 57.1 percent is zoned for agriculture, conservation and open space. More than half of the Harbor and Northern regions is military land.

Urban Land-Use Characteristics

Approximately 65 percent of the total urban-use acreage is low density R-1, while 19 percent is zoned for multiple-dwelling R-2 use. In effect, this is a 77.4 percent low density, 22.6 percent high density split. Residential development has tended to follow highways and planned or existing utilities. Thus, growth potential in the South is limited as long as infrastructure development such as sewage treatment plants and water supply remain inadequate. On the other hand, considerable residential development has taken place in Yigo and Dededo in the North, and there are increasing numbers of apartment units in Agat (Harbor), and Mangilao and Tamuning (Central). Both Yona and Sinajana (Central) have experienced considerable facelifting in the last five years through urban renewal and low rent housing projects. The Central district village of Chalan Pago-Ordot, despite its nearness to the Agana-Tamuning business district and its high number of R-1 zoned acres, is relatively undeveloped. Because it is composed of two separate places, it lacks a village core; moreover, slope factors and lack of access have limited development in certain areas.

Table 8

Guam Zoning Classification

(By Region in Acres and Percent)

Region	Zoning Classification									
	One-fam. dwellg.	% total urban	Mult. dwellg.	% total urban	Pl.-unit devel.	% total urban	Comm'l.	% total urban	Ltd. ind'l.	% total urban
Harbor (total)	795.3	67.0	130.9	11.0	47.0	4.0	67.7	5.7	142.6	12.0
Agat	230.8	67.1	79.4	23.1	. . .	. . .	33.8	9.8	. . .	. . .
Asan	235.2	71.1	50.0	15.1	. . .	. . .	26.5	8.0	19.1	5.8
Piti	97.0	88.4	1.5	1.4	. . .	. . .	7.4	6.8	. . .	. . .
Santa Rita	232.3	57.7	. . .	. . .	47.0	11.7	. . .	. . .	123.5	30.6
Central (total)	4,504.2	54.7	2,158.3	26.2	18.7	.2	487.9	6.0	830.1	10.1
Agana	51.5	15.6	81.1	24.6	. . .	. . .	163.2	49.5	33.8	10.3
Agana Heights	304.1	84.2	50.0	14.0	. . .	. . .	6.6	1.8	. . .	. . .
Barrigada	845.3	88.4	82.3	8.6	. . .	. . .	26.5	2.8	2.2	0.2
Chalan Pago-Ordot	1,156.9	95.4	5.9	0.5	16.2	1.3	33.8	2.8	. . .	. . .
Mangilao	1,037.9	69.0	201.4	13.4	. . .	. . .	35.1	2.3	. . .	. . .
Mongmong-Toto-Maite	243.9	31.9	404.3	53.0	. . .	. . .	49.3	6.5	66.0	8.6
Sinajana	172.0	74.4	39.7	17.2	. . .	. . .	13.2	5.7	6.3	2.7
Tamuning	695.3	24.2	1,293.6	45.0	2.5	0.1	160.2	5.6	721.8	25.1
Southwest (total)	423.4	87.6	38.8	8.0	. . .	. . .	21.1	4.4	. . .	. . .
Merizo	396.9	89.4	29.2	6.6	. . .	. . .	17.6	4.0	. . .	. . .
Umatac	26.5	66.9	9.6	24.3	. . .	. . .	3.5	8.8	. . .	. . .
Southeast (total)	694.9	95.4	6.6	.9	. . .	. . .	26.8	3.7	. . .	. . .
Inarajan	154.4	93.3	6.6	4.0	. . .	. . .	4.4	2.7	. . .	. . .
Talofofo	268.5	93.7	. . .	. . .	. . .	. . .	18.0	6.3	. . .	. . .
Yona	272.0	98.4	. . .	. . .	. . .	. . .	4.4	1.6	. . .	. . .
Northern (total)	1,727.2	90.3	17.6	.9	67.4	3.4	103.6	5.4	. . .	. . .
Dededo	1,312.7	93.2	17.6	1.2	. . .	. . .	78.6	5.6	. . .	. . .
Yigo	414.5	82.2	. . .	. . .	64.4	12.8	25.0	5.0	. . .	. . .
Grand total	8,145.0	64.8	2,352.2	18.8	130.1	1.0	707.1	5.7	972.7	7.8

Table 8, Concluded

Region	Zoning Classification								
	Heavy ind.	% total urban	Total urban uses Acres	% of total	A and Open Acres	% total acres	Military Acres	% total acres	Total acres
Harbor (total)	3.7	.3	1,187.2	4.6	10,178.3	39.1	14,642.5	56.3	26,008
Agat	. . .	. . .	344.0	4.8	3,229.0	45.2	3,569.0	50.0	7,142
Asan	. . .	. . .	330.8	8.4	2,563.2	65.0	1,048.0	26.6	3,942
Piti	3.7	3.4	109.6	2.4	2,418.9	52.8	2,053.5	44.8	4,582
Santa Rita	. . .	. . .	402.8	3.9	1,967.2	19.0	7,972.0	77.1	10,342
Central (total)	229.3	2.8	8,228.5	34.5	9,299.8	39.0	6,327.9	26.5	23,856
Agana	. . .	. . .	329.6	44.4	411.6	55.5	0.9	0.1	742
Agana Heights	. . .	. . .	358.0	48.3	176.0	23.7	208.0	28.0	742
Barrigada	. . .	. . .	956.3	16.3	1,068.4	18.2	3,837.3	65.5	5,862
Chalan Pago-Ordot	. . .	. . .	1,212.8	30.8	2,729.2	69.2	. . .	. . .	3,942
Mangilao	229.3	15.3	1,503.7	23.2	3,485.2	53.6	1,513.1	23.2	6,502
Mongmong-Toto-Maite	. . .	. . .	763.5	55.3	424.7	30.7	193.9	14.0	1,382
Sinajana	. . .	. . .	231.2	31.2	490.1	66.0	20.7	2.8	742
Tamuning	. . .	. . .	2,873.4	72.9	514.6	13.2	554.0	1.4	3,942
Southwest (total)	. . .	. . .	483.3	6.1	7,368.3	93.5	32.4	.4	7,884
Merizo	. . .	. . .	443.7	11.3	3,478.4	88.2	19.9	0.5	3,942
Umatac	. . .	. . .	39.6	1.0	3,889.9	98.7	12.5	0.3	3,942
Southeast (total)	. . .	. . .	728.3	2.0	34,079.2	94.3	1,348.5	3.7	36,146
Inarajan	. . .	. . .	165.4	1.3	12,096.6	98.7	. . .	. . .	12,262
Talofofo	. . .	. . .	286.5	2.6	9,404.2	85.6	1,291.3	11.8	10,982
Yona	. . .	. . .	276.4	2.1	12,578.4	97.5	57.2	0.4	12,902
Northern (total)	. . .	. . .	1,912.8	4.6	16,516.5	39.5	23,372.7	55.9	41,804
Dededo	. . .	. . .	1,408.9	7.3	7,972.6	41.3	9,920.5	51.4	19,302
Yigo	. . .	. . .	503.9	2.2	8,543.9	38.0	13,452.2	59.8	22,502
Grand total	233.0	1.9	12,540.1	9.2	77,442.1	57.1	45,724.0	33.7	135,706.2

SOURCE: Adapted from (7).

A number of villages are characterized by an inconsistent mix of residential and other uses. In the case of Mangilao (Central), newer residential uses conflict with pre-established industrial uses associated with coral production without a buffer zone between them. The general development is scattered with a concentration of R-1 and R-2 uses located near the University of Guam. The construction of the Department of Public Health and Social Services central facility in this area where there were already three high schools and the University of Guam created additional use mix and severe traffic flow problems.

Agana and Tamuning are also characterized by considerable mixing of land use. Topography is responsible for the development pattern in some areas: the bluffs which extend along the coast have restricted growth on one side while the shoreline restricts it on the other side, therefore, development has been induced along Route 1 (Marine Drive) in a long commercial strip. There are no common-use clusters along this route and there are no provisions for pedestrian movement on both sides of the road. Both villages have residential mixed with commercial and industrial uses as a result of inadequate enforcement of zoning laws and a lack of planning (7). A prime section of coastal land in south Agana is zoned M-1; several cemetries exist on oceanfront land along Marine Drive in Agana and southward to Piti; at the edge of one of the island's best housing areas in Tamuning there are two hospitals (one just nearing completion) which, as population levels and land-use densities increase, will become even less accessible than they are in mid-1976. Agana, the capital and once the business center of the island, has been plagued with land ownership problems in the postwar period. Now Tamuning has become the preferred location for business

activities (13). In addition to condominiums, apartments, and some prestige-type single-family residential development, Tamuning has industrial parks, shopping centers, wholesaling, retailing, warehousing, theatres, hospitals and clinics, factories, resort development, and a plethora of restaurants and stores.

Industrial zoning comprises a total of 1,160.7 acres, or 1.3 percent of the civilian lands of the island. Most of this land is in Tamuning: 721.8 acres. Industrial zoning is also concentrated in Santa Rita (associated with Apra Harbor). It is expected that industrial development will be limited in the future to the Apra Harbor area because of the proximity to Guam's Commercial Port on Cabras Island, existing infrastructure, and its topography (6). It is also considered ideal from an air pollution standpoint. Although the Cabras Island area is generally agreed to have the most potential for industrial development, its expansion potential is extremely limited because land in the immediate vicinity is owned by the military. Three industrial parks are administered by the Guam Economic Development Authority: Cabras Island site, 33 acres; Calvo Memorial Park in Tamuning, 26 acres; and Harmon industrial area, also in Tamuning, 16 acres (11).

Commercial zoning is primarily in small clusters within each village but there are major land areas zoned for commercial use in Agana and Tamuning: 163 and 160 acres respectively. Commercial zoning in Dededo is of secondary proportion at 78.6 acres.

Agricultural Land Uses

Agriculture and conservation and open space zoning account for 57 percent of Guam's land area. Nearly half, 44 percent, is in the

Southeast region and the other proportions are as follows: North, 21 percent; Harbor, 13 percent; Central, 12 percent; and Southwest, 10 percent. In current zoning terminology, agricultural zoning signifies rural areas rather than land that is necessarily suitable for agricultural use.

In 1975, Guam's governor declared a "green revolution" in an effort to foster a greater degree of island self-sufficiency. Although the 1970's have seen more land devoted to agriculture than at any time since the 50's, the island must still import an estimated 90 percent of its food. Most of the farms are small and individually owned and interest in farming is low when compared with the desirability of other occupations. Nevertheless, government efforts appear to be making some inroads on the low status position of farming. The present dollar volume of farming is thought to be approximately 2 million per year and there are about 800 acres of southern Guam in full-time and part-time farming (2).

There are a number of problems that must be solved before the land potentially available for farming can be utilized successfully. Foremost among them are water problems. The reasons agricultural development is limited on the northern plateau are because the soil is thin and of poor quality and there is little knowledge of the impact of pesticides and fertilizers upon the underlying water lens. The South does not have an adequate water distribution system; moreover, much of the area needed for water development through river water impoundment is not owned by the government. The five municipalities comprising the Southeastern and Southwestern regions have an estimated 5,000 acres of arable land on river bottoms, coastal uplands, and

argillaceous limestone which could eventually be converted to dual domestic-agricultural use by constructing several dam-reservoir systems. Such development has been recommended for the Talofofo, Ugam, Inarajan, Umatac, and LaSaFua rivers (15, 16).

Open-Space Land Uses

Public ownership of open space is limited on Guam and the prospect for increased public ownership in this category seems to be growing more remote. Land is simply becoming too expensive for the government to acquire; moreover, existing public lands are subject to many private claims which, although they may be difficult to prove or disprove, are sufficient to prevent government registration of the lands. Also, within private developments there is a lack of requirements regarding use of open space; there are only guidelines (14).

Guam's natural resource potential for outdoor recreation is considered outstanding but there are few facilities and there are no federal parks on the island despite the potential for such parks in World War II sites and archaeological remains of the early Chamorro period. Rapid urbanization is likely to encroach further upon lands generally considered to be more suitable for recreation use. Waterfront development and legal property descriptions sometimes extend to the water's edge or, in the latter case, into federal waters. Public access to beaches is not always guaranteed either because private owners have erected fences or because the beaches are on military property. Other areas are not enjoyed by the public because of physical inaccessibility.

Table 9 presents data concerning existing private, GovGuam, and military outdoor recreation facilities. The only known change in these figures for the foreseeable future will be in the number of boating slips. Modernization and expansion of the existing marina at Agana is expected to satisfy boat slip needs for at least the next 20 years.

Other Land Uses and Problems

Highways

Most of the existing road routes were established shortly after World War II to accommodate the needs of the time. The routes are now inadequate and the general condition of most of them is poor although widening, repaving, and other work is now being done on all four of the island's most heavily travelled roads: Route 1 in Tamuning, Route 4 between Pago Bay and Sinajana, Route 8 between Agana and Maite, and Route 10 between Barrigada and its junction with Route 4 at Pago Bay (see Figure 2).

The traffic-handling capability of the island's road system is extremely overburdened and inadequate: there is about one car for every two persons; there are in many instances no alternative routes between one village and another; there has been no effort to utilize the potential of the circulation network to influence future land-use patterns; and distribution of goods from the Commercial Port to all sectors occurs initially along a single highway, Marine Drive. The demand upon Marine Drive between Agana and Tamuning is a daily average of 45,000 vehicles, which is about two-thirds of the total number of vehicles on the island (6, 8, 18). Thus, as development has occurred, severe traffic congestion has been a by-product.

Table 9

Existing Outdoor Recreation Facilities

Facility	Owner		
	GovGuam	Private	Military
Beaches (urban)	55 acres	6 acres	19 acres
Beaches (remote)	34 acres	57 acres	32 acres
Total beach footage	11,900 feet	2,700 feet	4,650 feet
Picnic units	110 acres	62 acres	56 acres
Camping	0	80 acres	0
Surfing	18 acres	0	0
Water skiing	60 acres	0	2,500 acres
Skin diving	2,000 acres	0	2,500 acres
Competitive sports	149 acres	3 acres	385 acres
Hunting	25,000 acres	28,000 acres	4,900 acres
Boating slips, no.	8	3	12
Trail miles	30 miles	22 miles	45 miles
Fishing miles	13 miles	33 miles	15 miles
Shelling miles	13 miles	33 miles	15 miles
Swimming pools, no.	1	. . .[a]	8
Golf holes, no.	0	36	27
Totlots/playground, no.	31	1	15

SOURCE: Adapted from (14) and (17).

[a]Data not available.

There are 256.21 miles of road on the island of which only 17.6 are classified as major highways and slightly less than 16 miles are 4 lanes wide or more (Table 10). The bulk of the system is the 2 lane road: 229.71 miles. In addition, there are some 20 miles of minor highway rights of way on private land (6).

Solid Waste

Solid waste disposal is presently carried out at four landfill sites: two operated by the Navy at Naval Air Station (Central) and Naval Station (Harbor), one at Andersen Air Force Base (North), and one civilian landfill at Ordot (Central). All of the sites are actively polluting the water because they are located in limestone plateau area, in swamp area, or, in the case of the civilian operation, leachate seeps into a branch of the Lonfit River. If the Ordot landfill were operated properly, it would not pose a serious pollution problem; however, the other three sites have such serious pollution effects on the water that they should be closed. All of the sites have short life expectancies, with the Ordot site having the longest at 5-7 years (2).

The northern plateau is considered an inappropriate location for landfill operations because of the possibility of pollutants contaminating the groundwater supplies. The southern part of Guam, with its volcanic-origin soils, may be considered more suitable but its distance from population concentrations would inevitably entail higher collection costs (2).

Power

While Guam's population increased 23.5 percent between 1970 and 1973, power consumption went up 67 percent (2). To supply the demand

Table 10

Classification of Guam's Road System, 1974

Class	Type of Road					
	Trunk	Major	Minor	Collector	Local	Total
2 lanes	16.26 mi.	16.7 mi.	55.7 mi.	19.30 mi.	120.85 mi.[a]	229.71 mi.
3 lanes	10.62	. . .	. . .	. . .	. . .	10.62
4 lanes	10.28	. . .	. . .	4.75	. . .	15.03
Over 4	.85	. . .	. . .	. . .	. . .	.85
Total	38.01	17.6	55.7	24.05	120.85	256.21

SOURCE: From (6).

[a]Local paved = 103.08 miles; local unpaved = 17.77 miles.

for increases in usage involves an increasing amount of land devoted to power-related uses. Enlargements of existing plants were carried out and new plants were constructed, all of which are located along the western coastline between Agat and Tanguisson Point. In this period, between 550 and 600 acres were committed to power-related uses, with the largest facilities located in the Commercial Port vicinity. In addition to the land required for major power generation, there is an increasing amount of land that must be used for substations, diesel plants, transmission lines, fuel storage facilities, and pipelines.

Erosion

Land erosion is a problem that is not new to Guam but, with construction and development, it has accelerated and now occurs in areas where, historically, it might have been only minimal. Some practices which result in erosion have been carried on for centuries, such as burning to clear land for planting or for the purpose of flushing deer and other game. It was mentioned earlier that wartime bombing caused serious erosion problems. In an effort to allay continued erosion after the war, the island was seeded with tangan-tangan (Leucaena) and, later, forestry programs were instituted. The problem persists through the very nature of Guam's clay soils, steep slopes, and heavy rains. It is considerably augmented by the continuation of burning activities, by the clearing and grading of land by mechanical means for construction and farming, and even by a motocross located at Route 17 in the southern part of the island.

Of added significance is the fact that clearing and grading permits are not regulated as to the time of year such activities are

proposed. At least 72.5 percent of the lands cleared and graded in 1973 were done during the months when the impact of the work would have been the most severe--between the rainy season months of June and November. For the following year the pattern was the same (2).

Land erosion has a serious impact on areas where rivers enter the bays and lagoons and dissect reefs. In some cases, extreme siltation in these areas has resulted in the widespread destruction of corals and other marine life and the transformation of such areas into turbid, unproductive reef areas.

V. TAXATION AND RECORDATION

Every three years all property on Guam is assessed to determine its fair market value. A unit price per square foot for all types of buildings is established and the age of the structures is considered; however, assessment is mainly by actual use. The tax rate is then imposed on 35 percent of fair market value. Guam's tax rate is dual, one percent on buildings and half of one percent is applicable to land assessments only. An exemption of $15,000 is allowed for home ownership (20; Note 4). In terms of the total taxes collected, the land tax on Guam is lower than for any of the 50 states or Washington, D. C.

It is generally believed that there is a substantial gap between fair market value and assessed value for all properties. It is also generally considered that there is no realistic base for property tax valuation because of the tremendous land-use variation. There is no updated and accurate ownership map, and descriptive legal recordations often conflict with one another. Boundary locations are indefinite and land registration claims in the Superior Court of Guam are frequent: by April 1976 the number of such cases for the year already totaled 11.

Instruments that are recorded with the Department of Land Management include leases, mortgages, assignments, deeds, releases, warranties, gifts and exchanges, affidavits, and other contracts. The original and two copies are recorded; however, land recordation procedures are complicated and unsystematic. Developed lots are assigned a tract number in the urban book but there are no tract numbers for

rural property; they have to be looked up by lot number, if they have one. There is an old numerical system by municipality which is still used: land registrations are numbered just as they occur. If a lot number is not known, there is an alphabetical system by the name of the owner, if known. A separate registration book is kept for condominiums. Then there is a map system to trace ownership: a combination of lot number and place name on such maps may solve the question of who owns a particular piece of land. There is no recordation of purchase price or lease terms in property transactions. Unsurveyed transferred property may not be recorded without a map. Certificates of title are not issued by the Department of Land Management unless the land involved has been both surveyed and registered (Note 2).

While the Department of Land Management is aware of the shortcomings in its recordation processes, expert advice and support in the form of funding and other resources has not been forthcoming. Of some help in planning and identifying land use and distribution characteristics is a series of ortho-photographic maps to be completed by the Bureau of Planning by August 1976. One map series will consist of four sheets on a scale of 1 x 25,000. The other will consist of 70 sheets with a 1 x 4,800 scale (Note 5).

Table 11

Regional Attitudes on Coastal Development and Access

(By Region in Percent)

Attitude	Region									
	Harbor		Central		S. West		S. East		North	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Limit residential development	57%	26%[a]	63%	23%	39%	47%	49%	36%	62%	23%
Limit tourist development	37	45	40	44	33	47	43	43	38	44
Limit business and industrial development	50	32	61	24	35	43	49	32	54	27
Allow all development	26	49	22	59	35	37	30	48	24	52
Allow no development	17	50	20	51	19	46	17	48	18	47
Guarantee public access	67	11	76	09	74	08	72	08	71	09

[a]Figures do not total 100% because of "don't know" and no response categories.

condominiums, and commercial buildings have sprung up in these areas creating a markedly different appearance from the Guam of the 1960's. Also, population concentration here is the highest with 70 percent of the total population located in these two regions. In view of such changes then, it appears that the Central and Northern respondents not only perceive these changes but also tend to feel that it is time to regulate the rate of change and to conserve what is left of the coastal areas.

The response to this statement among those in the Southwest region was considerably different: Only 39 percent were in favor of limiting residential development while 47 percent were opposed to it. The Southwest villages of Merizo and Umatac are located in narrow coastal strips and most of their residents live along either side of the round-the-island road which passes close to the sea directly through these villages. Much of the shoreline in both villages is already devoted to residential property but there are still a few undeveloped shoreline lots. It is development of these lots that is affected by a recent local law which prohibits any permanent structure to be erected within 326 feet of the mean high water mark. That residents of this area would be more likely to oppose limitations on coastline residential development can best be understood in terms of the limited amount of coastal land still available to live on in the centuries-old Umatac and Merizo tradition of living at the water's edge.

The Harbor region responses to this statement more closely approximated the islandwide raw score total than the responses of any other area: 57 percent of the Harbor area respondents were in favor of

limiting coastline residential development and 26 percent were opposed. The Southeast sector was also more strongly in favor of such limitation (49 percent yes vs. 36 percent no).

In regard to developing tourism in coastal areas, all regions indicated an ambivalent attitude. The Southwest responses, however, showed a slightly stronger tendency to oppose limitation of tourism development than did the other areas. Of those who expressed an opinion, the spread between yes and no responses in the Southwest was 14 percentage points whereas in the other areas the responses were either equal (Southeast) or no more than 8 percent apart.

Not all of the regions were very strongly in favor of limiting business and industrial development in coastal areas. Respondents in the Central region expressed stronger agreement (61 percent) than did those from any other section. About half of the respondents in each of the Harbor, Southeast, and Northern regions agreed while in the Southwest there were more no than yes responses (43 percent vs. 35 percent). Again, it appears that those in the Central and Northern regions, where there is the most development of all kinds, are indicating a feeling that it is time to exert some planning effort to regulate the rate of change. Those in the Southwest, where the impact of development is less, appear to be unready to forego some of the advantages of development which they have not yet had an opportunity to enjoy.

Each of the five regions disagreed with the statement that "...all development should be allowed." They also all disagreed that "...no development should be allowed." It is evident that the majority wishes to pursue some middle course on development of the coastline;

however, those from the Southwest were not clearly committed to either side of the issue of whether or not all development should be allowed in that there was only a two percent spread between their yes and no responses.

The reaction to the matter of guaranteeing public access to the coastline was in all sectors overwhelmingly in favor of such a guarantee. No more than 11 percent of the respondents from any area indicated that guarantee of public access was not desirable.

Another question in the Community Survey entailed making a choice between more roads or developing public transportation as a means of providing for future transportation needs on Guam. In all cases the choice was in favor of more improved roads (Table 12).

Table 12

Attitudes Concerning Transportation Alternatives

Alternative	Region				
	Harbor	Central	S. West	S. East	North
More roads	57	56	74	70	60
Public transp.	43	44	26	30	40

In the two relatively remote southern regions, the number of those in favor of more roads was the greatest with nearly three-fourths of the respondents choosing that alternative. Although the questionnaire item

did not plainly reduce the choice to such terms, the people of Guam are in favor of devoting more land to the construction of roads than is presently being used.

The Behavioral Science Survey

Included among a series of 42 statements in an opinion questionnaire designed and administered under the supervision of the Behavioral Science faculty at the University of Guam were three land-related items to which respondents were asked to react by making one of six choices. The choices were strongly agree, agree, agree a little, disagree a little, disagree, and strongly disagree. For the purpose of clearer presentation, the data have been collapsed and all responses on the agree and disagree sides of the scale are presented as one figure for each. Because the sample size for the southern part of Guam was comparatively small (an average of 16 responses on these questions in the combined southern regions as opposed to an average of 70 for the Central region), the Southwest and Southeast responses are presented as one category. Moreover, this small southern sample may not necessarily be a true reflection of southern Guam attitudes on the issues involved. Percentages do not always total 100 because of a varying no response rate.

The questionnaire statements were as follows:

1. People should not sell their land.
2. Land ownership is one of the most important things in life.
3. The government should control the use and sale of land.

The responses to the first statement indicated that about two-thirds of those from each region agreed that people should not sell

their land. It has often been said that the Guamanian people place a high value on land retention. The response to this statement appears to bear out this popular notion. When a tabulation was done on the Guam-born respondents only, the results were even more striking. Seventy-two percent, or 87 of 121, agreed. It should be noted that the U.S.-born responses to this statement were markedly different from those born on Guam: the U.S.-born agreed by only 38 percent while they disagreed by a proportion of 63 percent. This is significant in pointing up a difference between the two groups in value systems.

Regional responses to "Land ownership is one of the most important things in life" are shown in Table 13. The value placed on land is again indicated by the responses to this statement. A tabulation of Guamanian and U.S. responses also points up attitudinal differences: the Guamanians agreed by 81 percent whereas the agree figure for U.S. respondents was 56 percent.

Table 13

Regional Attitudes on Land Ownership

(In Percent)

Attitude	Region			
	Harbor	Central	South	North
Agree	61%	83%	75%	89%
Disagree	37	17	19	9

The agree and disagree figures for "The government should control the use and sale of land" are shown in Table 14. Here the results are not as clear cut. Each region reacted differently from the next. While those in the highly developed Central region were in agreement with such control by the largest proportion, those to the immediate south in the still-developing Harbor region were in disagreement by the largest proportion. A tabulation of all 180 responses indicated that 50 percent agreed and 47.2 percent disagreed. A tabulation according to ethnic group showed that those from the U.S. were evenly divided and that the Guam-born respondents were in agreement by only a slightly higher proportion (55 percent). These figures, taken in their entirety, indicate that the people of Guam are, in general, ambivalent on whether the government should control land use and sale and, moreover, that there is no islandwide consensus on the issue.

Table 14

Regional Attitudes on Government Land Control

(In Percent)

Attitude	Region			
	Harbor	Central	South	North
Agree	34%	64%	50%	43%
Disagree	59	36	44	55

In another phase of the Behavioral Science Survey, a household questionnaire was administered to 302 households throughout the island. The questionnaire elicited some data on the number of parcels owned per household and lot size. In all areas the modal number of parcels owned was one. In the Harbor, Central, and Northern regions the modal lot size owned was between 500 and 1,000 square meters. Modal lot size in the Southeast and Southwest was larger, or between 3,000 and 5,000 square meters.

The Stanford Research Institute Findings

The attitudinal findings of Stanford Research Institute were based on 60 interviews with respondents who represented a wide range of age, education, employment, and background. These findings confirm conclusions drawn from the other studies and sum up reactions to some of the trends noted in this paper.

1. Ownership of land is an important aspect of Guamanian culture.

2. The escalating land prices of the 1970's have raised the cost of homes to a point beyond the means of most Guamanians.

3. While many people would like to see more development occur in southern Guam, the leaders and the younger, more educated persons tend to foresee a broader range of negative impacts from such development than do others.

4. Of high priority in the improvement of living standards are better roads, utilities, and recreation facilities. In addition, among the things most Guamanians want are a typhoon-proof concrete house and shopping centers.

5. Most Guamanians prefer the low density land development that is still characteristic of most of Guam.

6. Guamanians feel it is bad to sell land. They feel that loss of land spells loss of political and economic control.

7. In addition to the view that land is individually owned, Guamanians also consider themselves as a unit having a collective kind of ownership of their island.

VII. CONCLUSIONS

As was indicated in the introductory portion of this paper, it is believed that knowledge of the patterns of land use in a society can illuminate some aspects of that society's practices and values. In the case of the land-use characteristics of Guam, these qualities emerge in both explicit and implicit fashion.

In regard to zoning for example, it can be seen that land use on Guam is varied, that the activities and interests of the people who live on Guam are not those of a homogenous agrarian, industrial, or fishing and hunting society but rather those of a heterogenous society in which the practices, needs, and aspirations of its people have a broad range. The zoning law has developed to accommodate all the various land uses. Moreover, changes in zoning, such as a decrease in the amount of land zoned for agriculture and open space or rezoning from one use to another may reflect changes in the needs and values of a society. As Guam has increased in population, there has been a corresponding need for more land to be devoted to residential and other urban uses. This has resulted in a marked decrease in the amount of land zoned for agriculture and non-urban uses and a decline in the amount of land actually in use for food production. This in turn increases the amount of food that must be imported and is a factor in the rising cost of living.

Changes in ownership patterns have had an effect upon the local culture. The first to alienate land from the Guamanians were the

Spanish. They acquired about one-fourth of the island. By the middle of this century, two-thirds of formerly Guamanian-owned land was under federal and naval control. Now, in addition to U.S. military and Government of Guam lands, there are lands owned by aliens and U.S. off-island interests. Thus, not only is there less land available for local ownership but also land values have soared. Individuals, regardless of ethnic background, find it increasingly costly to buy a piece of land and construct a house on it. On the other hand, corporations and other pooled interests buy land, build on it, and then, depending on the structure, may rent or sell to local residents. Formerly, Guamanians acquired land by inheriting it or by purchasing it from another Guamanian. Some still construct their homes themselves, but a new feature in the local culture is buying a tract home or renting an apartment.

Whether or not Guam achieves orderly, planned growth remains to be seen. Formal land-use planning seems to be a Western concept and one that has only recently been introduced to this Pacific island. It may be that Western notions regarding planned use of land will have to undergo considerable adaptation before they can be accepted and implemented in a setting that is, in many respects, very non-Western.

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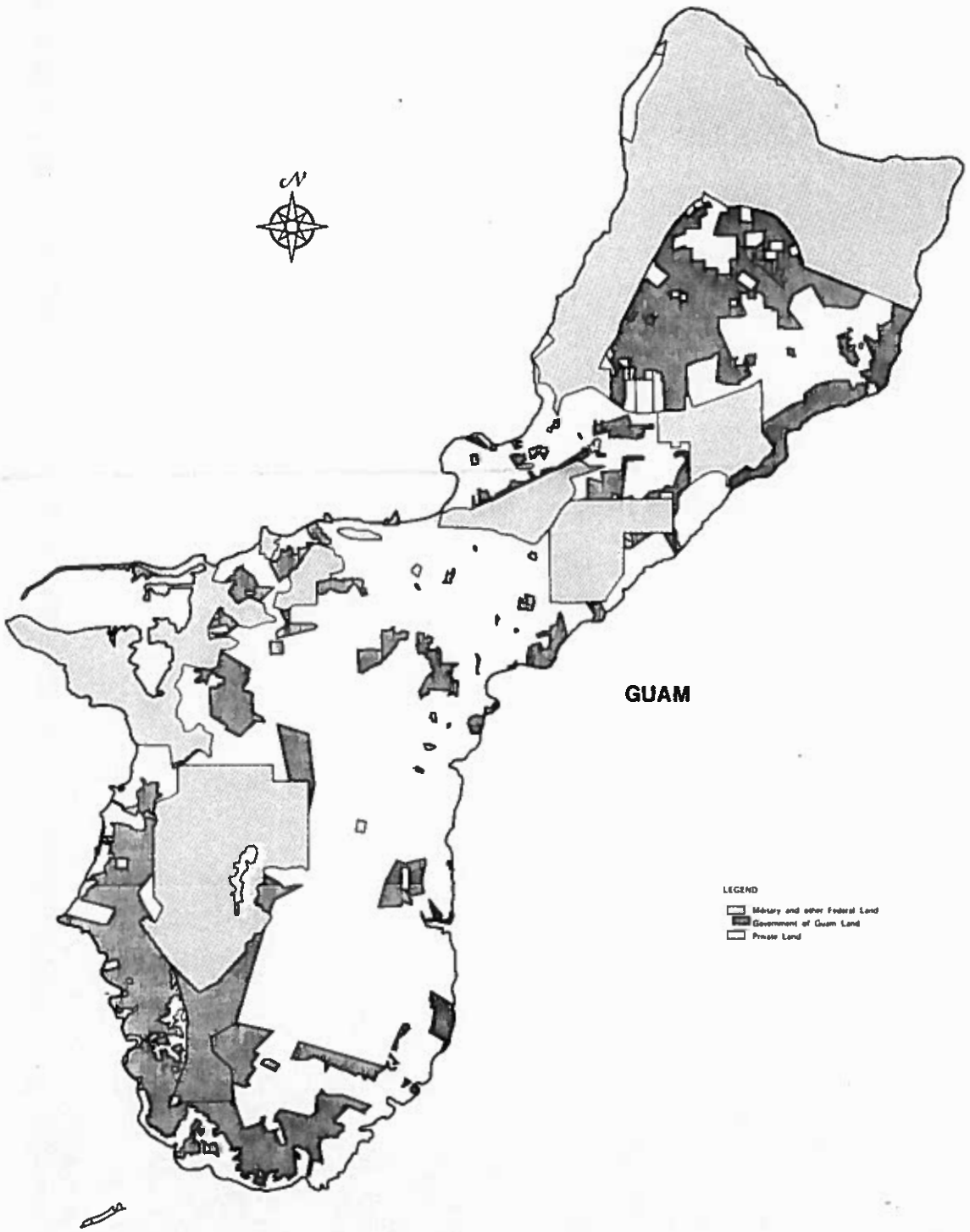

EXHIBIT A GUAM LAND OWNERSHIP PATTERN