
CHAPTER 4: Kaua'i County Assets

4.0 Introduction to Kaua'i County Assets

The assets identified in this section were selected, mapped, and included in the document based on the features that Kauai County identified as important and essential assets to the county. The emphasis for identification of assets is on those things that ensure sustainable development and livelihoods for Kaua'i. People of Kaua'i categorized these assets in several key areas: 1) Emergency Services Infrastructure, 2) Vulnerable Populations, 3) Critical Infrastructure, 4) Transportation and Ports of Entry, 5) Telecommunications, 6) Land and Solid Waste Protection, 7) Economically Important Assets, 8) Socially, Culturally, and Economically Important Assets, and 9) Other Government Facilities.

The assets in each of these areas have been incorporated in the county's Geographic Information System (GIS) based on information provided at public county meetings, two steering and technical committee meetings, interviews with members of the Disaster Management Committee, four meetings with community members in the geographic districts, interviews with first response personnel in civil defense, fire, and police departments, and interviews with non-governmental organizations and community leaders.

4.1 General Characterizations and Demographics

The natural features of the Island of Kaua'i are as important to protect as the people who live in the island. In this section, information about the characteristics of the island are discussed, including geography, population demographics, employment, economy, and land use.

4.1.1 Geography

In the center of the island of Kaua'i is Kawaikini Peak, rising 5,170 feet and Mount Wai'ale'ale, rising 5,080 feet. Mount Wai'ale'ale is the rainiest spot on earth, averaging 460 inches of rain a year, and contributes to this island's nickname---the Garden Island. Many streams flow from these mountains to the sea through canyons in the volcanic rock. Waimea canyon has colorful rock walls that are 2,857 feet high. Rugged cliffs along the northwestern coast make it impossible to build a road around the whole island. Ni'ihau, nicknamed "The Forbidden Island," is a private island owned by the Robinson family of Kaua'i. The island is semi-arid with a dry climate, although several lakes provide fresh water.

Kaua'i is situated northwest of O'ahu, separated by the Kaua'i Channel. Known as the Garden Isle, Kaua'i is the northernmost and geologically oldest of the major Hawaiian Islands. Kaua'i County includes Ni'ihau Island (73 square miles) and the tiny uninhabited islets of Ka'ula and Lehua. These islands are volcanic in origin, although there are currently no active volcanoes in

this county. The circular island of Kaua'i rises three miles from the ocean floor and is roughly 550 square miles.

The highest mountain, Kawaikini Peak, rises to 5,243 feet (1,598 m) above sea level, closely followed by Mt. Wai'ale'ale 5,080 feet (1,548 m) as the second tallest peak. The northeastern slopes of Wai'ale'ale, one of the wettest spots on earth, receive an annual average rainfall of 450 inches (1,143 cm). This high annual rainfall has eroded deep valleys in Kauai's central mountain mass and formed spectacular canyons. Waimea Canyon, the "Grand Canyon of the Pacific" is almost 10 miles (about 16 km) long and more than 0.5 miles (0.8 km) deep.

The steep slopes and topography, combined with a number of natural occurrences, can increase the effects of a natural hazard. High precipitation in steep terrain can cause flooding. High winds increase as it moves up slopes. Weathering and erosion can cause rockslides and landslides, typically along the coastal road. Since most of the development has occurred along the coastline, the area where it is possible to settle, the settlements can impede some natural processes (flow of water, beach movement), and coastal hazards may cause more severe and costly impacts to the population (flooding, coastal erosion).

4.1.2 Population

Kaua'i County has a population of 63,689 (Hawaii State Databook, 2008). Eighty-nine percent is urban (State of Hawaii Data Book 2008). Comparing this population to the 1970 census population of 29,800, this represents more than 200 percent increase in over 38 years. During this period, Kaua'i grew at a faster annual rate than the state as a whole. Between 1990 and 2008, Kaua'i County's resident population increased 19.6 percent (see Table 3-1). The geographic area population statistics were not available at the time of publication, so the figures reflect the latest census levels in the tables below. These localized population statistics should be updated with the implementation of the 2010 census and the ten-year update of the Kaua'i County General Plan.

Table 4-1: Population by Geographic Area

Area	2008	Change from 1990 to 2008	
	Resident Population	Number	Percent
Kauai County	63,689	12,512	19.6
	2000		
Hanalei	6,348	1,717	37.1
Kealia-Moloaa	3,123	945	43.4
Wailua-Kapaa Homesteads	7,750	1,128	17.0
Kapaa	7,652	825	12.1
Puhi-Hanamaulu	6,860	1,476	27.4
Lihue	5,162	-117	-2.2
Koloa-Poipu	5,404	504	10.3
Eleele-Kalaheo	7,441	973	15.0
Kaumakani-Hanapepe	3,438	525	18.0
Kekaha-Waimea	5,125	-620	-10.8
Niihau	160	-70	-30.4

(Source: State of Hawaii Data Book, 2008; 2000 Census)

Kaua'i's infrastructure and service needs are determined not only by the number of residents, but also by the number of visitors who spend time on the island. Between 1970 and 2008, the population of visitors and residents increased substantially, from about 9 percent to over 31 percent. On average, there are an additional 19,855 people on Kaua'i who are not residents. In 2008, visitors comprised about 31 percent of Kaua'i's population (State of Hawaii Data Book 2008). Growth scenarios reviewed during the General Plan Update and projections developed by the Planning Department estimate a range of 24,000 to 28,000 visitors per day in 2020, although the economic crisis has resulted in fluctuations in visitor populations, and this will alter the estimates over the long run. The Planning Department uses the higher estimate for public facility planning to ensure access for everyone.

Population projections developed for the Kaua'i General Plan Update estimate 2020 population as follows: resident population between 65,260 – 74,320; average daily visitors from 24,000 – 28,000; and, total population between 89,260 – 102,320 (Kauai General Plan, November 2000, 1-19). The amounts have fluctuated with recent changes in the economy as people have moved to other states and visitors have declined; the projections, however, have not yet been revised to 2009, because there is a wide degree of unpredictability related to the visitor industry. The County General Plan Update will happen in 2010.

There are approximately 21,700 households in Kaua'i, with the largest number of these in the Waimea to Barking Sands area on the west side of the island. Of these, approximately half are renter-occupied households. There is a lower percentage of female-headed households with children than on other islands---only about 1,340 households or 6% of households (See Chapter 5 Appendix 4, Table 5-4.4).

In terms of ethnicity and ancestry, the majority of residents on Kauai are characterized as "Asian alone or in combination with one or more other races." Slightly fewer are "White alone or combined with one or more races" and about half of the number of Asians categorize themselves as "Native Hawaiian and other Pacific Islander alone or in combination with other races" (about 17,000) (See Chapter 5 Appendix 4, Table 5-4.3).

4.1.3 Economy

Of the total State economy, Kaua'i represents only 4% of the labor income and 4% of the total personal income. Kaua'i's per capita personal income, \$26,791, remains higher than the per capita of Hawai'i County, although well below the State average, \$31,518 (State of Hawai'i Data Book 2008).

Kaua'i's economy is less diversified than O'ahu, and the primary sector remains tourism. With the global economic crisis, Kaua'i has seen a decline in tourism, with visitor arrivals declining 16% by 2009. The unemployment rate rose by 7% from 2008 to 2009. Time share properties, where bookings are made well in advance, have continued to sustain the tourism industry. Kauai also benefits from the location of the Pacific Missile Range Facility (PMRF) that offers

higher salary jobs for about 875 people that work there. PMRF has received some federal stimulus funding and is not subject to the same economic vacillations as the tourism sector.

The following table from the State of Hawai'i Data Book (2008) shows the decline of visitors in the State of Hawai'i, with a significant decrease

Table 4-2. Average Daily Visitor Census, by County and Island: 2007 and 2008

State of Hawai'i Data Book Table 7.06						
AVERAGE DAILY VISITOR CENSUS, BY COUNTY AND ISLAND: 2007 AND 2008						
[Covers visitors staying overnight or longer anywhere in the state, and any overnight or non-overnight interisland trips reported by these visitors. Domestic includes passengers from all flights originating from the mainland United States. International includes passengers from all flights originating from U.S. territories and other countries]						
County or island	2007			2008		
	Total	Domestic	Inter-national	Total	Domestic	Inter-national
State total	189,412	150,960	38,452	172,487	135,239	37,248
Oahu	88,092	59,332	28,760	81,751	54,014	27,737
Hawaii County	27,891	24,542	3,350	24,842	21,411	3,432
Kauai County	22,207	21,071	1,135	19,855	18,889	966
Maui County	51,222	46,015	5,207	46,038	40,925	5,113
Maui	49,355	44,328	5,028	44,433	39,493	4,940
Molokai	982	878	104	831	724	107
Lanai	885	810	76	774	708	66

Source: Hawaii State Department of Business, Economic Development and Tourism, Tourism Research Branch, *Annual Visitor Research Report* (annual) and records. See also <<http://www.hawaii.gov/dbedt>>.

According to a review of the economy of Kaua'i in August 2009 (Schaeffers 2009), the percent change for 2009 from the actual number in 2008, except for unemployment rate, is as follows:

Category	Percent
Job growth*	-4%
Unemployment rate*	10%
Single-family home sales **	-30%
Condominium sales **	-40%
Single-family home median **	-27%
Condominium median **	-47%
Visitor arrivals **	-16%
Visitor spending **	-16%

* Year-end forecast ** Through June 2009 Source: First Hawaiian Bank

4.1.4 Employment

Historically, employment trends for Kaua'i County reflect the national recession of the early 1980s, the weak State economy during the 1990s, the damaging effects of two hurricanes, and the impacts of the weakened global economy since 2007 that have resulted in declines in tourism. Despite these economic setbacks, Kaua'i wage and salary job increased at an annual rate of approximately 3.0 percent between 1970s and 1998. In 1998, Kaua'i had about 24,900 wage and salary jobs (Kauai General Plan, November 2000, 1-15, 16). The economy relies heavily on the visitor industry.

Projections developed for the General Plan Update assume that: 1) agricultural employment will grow at an annual rate of 3.6 to 5.3 percent; 2) high technology will grow at an annual rate of 3.3 to 4.0 percent; and, 3) visitor growth will grow at an annual rate of 1.5 to 2.2 percent.

4.1.5 Land Use

The State Land Use Commission has classified 14,558 acres in Kaua'i as urban, 198,769 acres as conservation, 139,320 acres as agricultural and 1,253 acres as rural (State of Hawai'i Data Book, 2008).

Table 4-3. Estimated Land Acreage.

State of Hawai'i Data Book Table 6.04-- ESTIMATED ACREAGE OF LAND USE DISTRICTS, BY ISLAND: DECEMBER 31, 2006					
[Total acreage, including inland water, as classified by the Hawaii State Land Use Commission under the provisions of Chapter 205, Hawaii Revised Statutes, as amended. All data are approximate]					
Island	Total area 1/	Classification by State Land Use Commission 2/			
		Urban	Conservation	Agricultural	Rural
State total	4,112,388	197,663	1,973,631	1,930,224	10,870
Hawaii 3/	2,573,400	53,722	1,304,347	1,214,040	1,291
Maui	465,800	22,823	194,836	244,088	4,053
Kahoolawe	28,800	-	28,800	-	-
Lanai	90,500	3,257	38,197	46,639	2,407
Molokai	165,800	2,539	49,768	111,627	1,866
Oahu 3/	386,188	100,764	156,614	128,810	-
Kauai	353,900	14,558	198,769	139,320	1,253
Niihau	45,700	-	-	45,700	-
Kaula and Lehua	400	-	400	-	-
Other islands 4/	1,900	-	1,900	-	-

1/ These totals differ somewhat from the official figures based on measurements by the Geography Division of the U.S. Bureau of the Census, cited in Section 5.
2/ For definitions, see Hawaii Revised Statutes, Section 205-2.
3/ May be revised, pending updates of County records.
4/ The Northwestern Hawaiian Islands, from Nihoa to Kure Atoll, excluding Midway.
Source: Hawaii State Department of Business, Economic Development & Tourism, Land Use Commission, records.

In the 1980s, approximately 54,900 acres of prime agricultural lands were determined as Agricultural Lands of Importance to the State of Hawai'i (ALISH), with an estimated 50,000 acres still available for cultivation. About 30,000 acres of very good to fair agricultural land remain open for cultivation. In 1998, there were twelve aquaculture farms using about 160 acres of land. Irrigation systems serving agricultural lands have decayed and have been poorly maintained. Ownership of the ditches and water sources remains contentious. With the decline in sugar production, the plantations are selling lands; however, the poor irrigation systems will make it difficult for future cultivation and for diversified agriculture plans. Most of the diversified agriculture is coffee production, with additional production of flowers, papaya, and poi. In 2009, Gay & Robinson estates leased land to Dow AgroSciences for propagation of seed corn. The seed production has recently gained more economically than the conversion of sugar cane lands for use in ethanol production.

Of conservation lands, some of the most precious state parks---Ha'ena State Park, Koke'e State Park, Na Pali Coast State Park, Polihale State Park, Wailua River State Park, Waimea Canyon State Park, and Kilauea Point National Wildlife Refuge---lie in these areas. About 80 percent of the users of these parks come from visitors to Kaua'i. Residents regard their natural resources as important and have developed policies within the Kaua'i General Plan to protect and preserve the quality of these resources.

Although Kaua'i County encompasses four islands (two uninhabited), the island of Ni'ihau is unique. It is privately owned and managed by Gay & Robinson, Inc. and county officials and politics have little, if any, authority on the island. The population figures for this island are gathered by Gay & Robinson, Inc. and the population is controlled by not allowing visitors. The family company makes all land use decisions and is not bound by oversight from Kaua'i County agencies. The land has not been developed and the population is not expected to increase.

Table 4-4. Real Property Tax Valuation.

State of Hawai'i Data Book Table 9.39-- REAL PROPERTY TAX VALUATION FOR THE STATE, BY COUNTY, 2009				
[In thousands of dollars. For fiscal year ending June 30. Gross valuations exclude nontaxable (government) properties]				
2009, by county	Honolulu	Maui	Hawaii	Kauai
Assessor's gross valuation 1/ 2/	190,699,156	51,670,185	34,434,334	21,104,658
Land	(3/)	29,057,819	16,928,602	12,648,775
Improvement	(3/)	22,612,366	17,505,732	8,455,883
Exemptions 1/	23,481,605	8,554,170	4,758,281	1,725,332
Assessor's net taxable valuation	167,217,551	43,116,015	29,676,053	19,379,326
Half of valuation on appeal	879,604	536,916	170,418	87,722
Number of appeals	2,873	1,436	1,448	203
Valuation for tax rate purposes	166,337,947	42,579,099	29,505,635	19,291,604
Land	(3/)	25,377,173	15,913,327	11,994,580
Improvement	(3/)	17,201,926	13,592,308	7,297,024

Amount to be raised by taxation	804,120	221,782	226,606	103,513
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1/ Beginning in 1993, data exclude nontaxable properties.
2/ Assessed value for 2006 as of January 31, 2005 for Honolulu, June 14, 2005 for Maui, April 16, 2005 for Hawaii, and April 26, 2005 for Kauai. Assessed value for 2007 as of January 31, 2006 for Honolulu, June 29, 2006 for Maui, April 18, 2006 for Hawaii, and June 30, 2006 for Kauai. Assessed value for 2008 as of January 29, 2007 for Honolulu, April 19, 2007 for Maui, June 5, 2007 for Hawaii, and May 1, 2007 for Kauai. Assessed value for 2009 as of January 29, 2008 for Honolulu, April 14, 2008 for Maui, April 21, 2008 for Hawaii, and May 1, 2008 for Kauai.
3/ As of the 2004 - 2005 report, Statewide detail no longer available separately as the City and County of Honolulu consolidated 'Land' and 'Improvement' into the single category 'Property'.
Source: City and County of Honolulu, Department of Budget & Fiscal Services, Real Property Assessment Division, *Real Property Tax Valuations, Tax Rates, & Exemptions, 2008-2009 Tax Year, State of Hawaii*(August 2008) and
<<https://www.realpropertyhonolulu.com/portal/rpadcms/Reports?parent=REPORTS>> accessed November 26, 2008 and earlier reports, and reports as the Department of Finance.
Source: <http://hawaii.gov/dbedt/info/economic/databook/2008-individual/09/>

Within the General Plan, Kaua'i residents have documented the importance of maintaining the rural character of the island. Several characteristics that are important include: keeping towns and communities compact with a distinct identity rather than sprawling; maintaining open lands; keeping building heights low and relatively small scale; and, maintaining natural vegetation along roads. By highlighting the importance of protecting local assets, Kaua'i values the health and sustainability of its communities.

4.2 Emergency Services Infrastructure

Emergency Services Infrastructure refers to critical facilities required during a disaster and first response units to any type of disaster. The location of the emergency services infrastructure has been recorded in the GIS database. These include: the emergency operations center; police stations; fire stations; hospitals, clinics, and dispensaries; civil defense sirens; and, community shelters. (Please see Figures A6, B6, C6 in Chapter 3 Appendix 3, page A3-29, 37, 45, and corresponding Tables that follow; Chapter 3 Appendix 3, pages A3-87 – 93 and A3-137 – 142.)

4.2.1 Emergency Operations Center

The new Emergency Operations Center opened in Lihu'e in 2002. The center houses Kaua'i Civil Defense Agency, the Kaua'i Police Department, and the Prosecuting Attorney's office with facilities for operating a first response center and shelter for personnel during disasters. Built with some funding from the Hazard Mitigation Grant Program, the facility was designed to the highest standards. It has the capability of maintaining communications access. The facility has been operational for seven years and provided quick and appropriate response for several disasters. The co-location of police and attorneys with emergency managers has enabled improved coordination in response to disasters.

4.2.2 Police and Fire Stations

The Kaua'i County Police Department has three stations, with the main station and administrative headquarters in Lihue, at the new emergency operations center facility. The smaller stations in Waimea and Hanalei are co-located with fire stations.

There are currently seven fire stations on the island of Kaua'i, with the main station and administrative headquarters located in Līhu'e. The other fire stations are located in communities throughout the county to provide emergency services---in Waimea, Hanapēpē, Kalāheo, Kōloa, Kapa'a, and Hanalei. The mission of the Kaua'i Fire Department is to protect life, preserve property and enhance the environment of the County of Kaua'i from all hazards. Station units provide 24-hour protection. There are seven engine companies and one rescue/hazardous materials company. The fire fighting force consists of 122 uniformed personnel and four civilians, organized into three bureaus---Administration and Operations, Training and Research, and Prevention (Government of Kauai 2009, Kaua'i Fire Department, <http://www.kauai.gov/Government/Departments/FireDepartment/tabid/107/Default.aspx>; Department of Defense, Civil Defense Division. December 1998. State of Hawai'i Drought and Wildland Fire Mitigation Plan). In addition

4.2.3 Shelters

In 1997, Hawai'i State Civil Defense and Kaua'i Civil Defense Agency surveyed shelter spaces in Kaua'i. The final list identified approved sites by hazard. It also included a list of retrofits and hardening activities that were needed in order to designate sites as suitable for sheltering during disasters. The study concluded that there were 20,744 ready shelter spaces for 55,300 residents---lacking 34,556 spaces. The population has since risen to 63,689 (State of Hawai'i Data Book, 2008 Census). No additional formal study has been undertaken. However, several sites have been developed with areas specifically designed to serve as shelters. The visitor population, estimated 15,000 to 20,000 per day, also does not have secured shelter spaces, unless hotels have provided safe locations. Available shelter spaces also do not correlate well with the population around the island, and is somewhat uneven in distribution.

The Department of Defense Army National Guard armories have become shelters in the past, even though they are not adequate for this service. During an emergency, however, the army has been reluctant to turn people away who become stranded. The facilities require some shutters and hardening to meet requirements for hurricanes. These facilities also need hardening because they store the supplies used in post-disaster recovery operations. Currently, available funding for shelters cannot be used to harden the facilities because the armories are under federal jurisdiction.



Kaua'i County was the first place in Hawai'i to develop a partnership with the Kaua'i Humane Society. The new facility was built to high wind specifications and will provide shelter to pets. Space in the basement has also been developed to increase the number of shelter spaces in the county.

Photo 4-1. The Kauai Humane Society offers shelter for pets.

Table 4-5. Official Shelters for Kaua'i

Shelter Site	Number of Occupants Permissible	Disaster Type
Ele'ele School	652	Tsunami Flooding Hurricane
Kalāheo School	964	Tsunami Flooding Hurricane
Kapa'a Elementary School	1,209	Tsunami Flooding Hurricane
Kapa'a High School	3,569	Tsunami Flooding Hurricane
Kaua'i Community College	1,059	
Kaua'i High & Intermediate School		Tsunami Flooding Hurricane
Kaumakani Neighborhood Board Center	341	
Kekaha School	894	Tsunami Flooding Hurricane
King Kaumuali'i Elementary School	2,245	Tsunami Flooding Hurricane
Kōloa School	884	Tsunami Flooding Hurricane
Waimea Canyon School	2,288	Flooding Hurricane
Waimea High School	3,142	Tsunami Flooding Hurricane
Wilcox Elementary School	268	Tsunami Flooding Hurricane
Kaua'i Veteran's Hospital	209	
Mahelona Memorial hospital	14	
Veteran's Center	144	
Kaua'i County Humane Society		Tsunami Flooding Hurricane

Source: Hawaii State Civil Defense and Kauai County Civil Defense Agency. 1997. Shelter Survey.

4.3 People and Communities

Even though the Līhu'e and Kapa'a areas of Kaua'i are considered more as urban land, population density is not greatest in these locations. Kaua'i still retains a rural character and the lack of high-rise buildings and urban sprawl help to protect the population from disasters. As Table 4-1 indicates, the population is spread almost evenly around the island. Vulnerability does not result from high density in hazard areas, but rather from isolation of communities in disasters that prevent access to evacuation routes and medical services. Although much

improved since 2003, there are places where telecommunications dead zones exist and people cannot access proper assistance during crises.

In many areas, the only developed land lies near the coastline. Floods or other disasters could cut off the people who live in these areas. Landslides have also caused road closures. Bridge failures may prevent movement along the coastal road by emergency vehicles and impede access to residents who need assistance.

In the GIS database, the following have been included: day care facilities, nursing homes, social service agencies, and a dialysis center



Photo 4-2. Hanalei Bridge.

4.3.1 People in Poverty

Research has demonstrated that disasters exacerbate and stress social conditions, such that the poor are most impacted (Wisner et al 2004). The percentage of the Kaua'i population in poverty, according to the following table, is consistent with other counties; however, the real numbers are low. Even with recent growth and development, the rural characteristics of Kaua'i may provide some cushion from impacts, where communities may still support extended families and neighbors.

Studies have demonstrated that female-headed households with children often represent the largest population of those under the poverty line. For Hawai'i, previous studies based on the last census have shown that 37% of those below the poverty line are women with children who are considered heads of households. The census data further revealed that there are 1,340 female headed households, but this number is not correlated with the poverty indicators. The data will be updated with the implementation of the 2010 census.

About 18% of the resident population in Kaua'i is older than 65 years, but the data has not been correlated with recent poverty statistics, and will be updated in the 2010 census. As discussed in section 4.3.2 for the elderly, the Agency on Elderly Affairs provides services for the elderly population in need.

Table 4-6. Estimated Household Income and Poverty.

State of Hawai'i Data Book, Table 13.19— ESTIMATED MEDIAN HOUSEHOLD INCOME AND POVERTY STATUS, BY COUNTY: 2006 and 2007	
[Beginning with the estimates for 2005, data from the American Community Survey (ACS) were used in the estimation procedure; all prior years used data from the Annual Social and Economic Supplements (ASEC) of the Current Population Survey (CPS). Comparisons between 2005-and-beyond Small Area Income and Poverty Estimates (SAIPE) estimates (based on ACS data) and SAIPE estimates for previous years (based on CPS ASEC data) are not advised because there is a break in the time-series due to the switch from one source to the other. Comparisons of pre-2005 state-level estimates are possible; and 2005-and-beyond estimates will be comparable. For detailed discussion, see source]	

Item	Median household income	90% confidence interval 1/	Persons in poverty 2/	90% confidence interval 1/		90% confidence interval 1/	Persons under 18 in poverty	90% confidence interval 1/	
	Dollars		Number	Percent	Number		Percent		
2006									
State total	60,554	59,522 to 61,586	117,811	112,601 to 123,021	9.4	9.0 to 9.8	34,462	31,744 to 37,181	11.8
County:									
Hawaii	51,454	48,532 to 54,376	23,202	20,249 to 26,155	13.8	12.0 to 15.5	6,917	5,666 to 8,168	17.7
Honolulu	62,534	60,631 to 64,436	74,969	66,578 to 83,360	8.5	7.6 to 9.5	21,626	18,015 to 25,237	10.5
Kalawao 3/	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Kauai	50,764	46,752 to 54,775	5,888	4,797 to 6,980	9.4	7.7 to 11.2	1,845	1,450 to 2,241	12.6
Maui 3/	57,468	54,777 to 60,159	13,752	11,442 to 16,062	9.8	8.2 to 11.5	4,074	3,234 to 4,914	12.5
2007									
State total	62,613	61,100 to 64,125	106,232	101,569 to 110,894	8.5	8.1 to 8.8	30,618	27,922 to 33,315	10.8
County:									
Hawaii	55,779	52,961 to 58,597	22,394	19,300 to 25,489	13.1	11.3 to 14.9	6,935	5,531 to 8,338	18.1
Honolulu	64,849	63,140 to 66,558	68,696	62,397 to 74,995	7.8	7.1 to 8.5	18,842	15,642 to 22,041	9.5
Kalawao 3/	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Kauai	55,786	51,838 to 59,734	5,632	4,528 to 6,736	9.0	7.3 to 10.8	1,758	1,335 to 2,181	12.5
Maui 3/	60,435	56,755 to 64,116	9,509	7,950 to 11,068	6.8	5.6 to 7.9	3,084	2,341 to 3,826	9.8

1/ Based on Mainland poverty thresholds. Official Hawaii thresholds are about 15 percent higher. See Table 13.25.

2/ A confidence interval is a range of values that describes the uncertainty surrounding an estimate and are one way to represent how "good" an estimate is; the larger a 90% confidence interval for a particular estimate, the more caution is required when using the estimate

3/ Kalawao is a Census-designated county but is included in Maui County for other consideration.

Source: U.S. Census Bureau, Housing and Household Economic Statistics Division, Small Area Estimates Branch <http://www.census.gov/hhes/www/saie/index.html>, accessed December 10, 2008

4.3.2 Elderly Population

Kaua'i has a significant and increasing number of elderly residents. In 2000, the elderly population (age 60 and older) rose to 17.9 percent from 15.7 percent in 1980 (2000 Census). The elderly resident population has increased faster than total population growth in the county. Nearly 13 percent of the elderly population is categorized as low-income (Kauai General Plan 2000,

8-5). Districts with a significant elderly population---about one in five over 60 years---include Līhu'e, Kōloa-Poipu-Kalaheo, and the West Side (Kauai General Plan 2000, 8-5).

Growth in the elderly population in Kaua'i is expected to increase over the next several decades. This indicates a need to plan for rising demand for geriatric services, including long-term and home care, alternative living accommodations, and access to health care, social services, and public transportation. With significant members of the elderly community classified as low-income and likely spending more for increased services, housing also becomes difficult to afford (Kauai General Plan 2000, 8-5).

The elderly population poses some difficulties to emergency management, especially in situation of a disaster. Access to medical facilities may be impeded during a natural hazard. Evacuation from areas of the island, such as Po'ipū and Kōloa may be difficult since there are few access roads, and the elderly populations living in these areas may need additional assistance. Emergency response plans must consider special needs and requirements for the elderly population.

To ensure that the elderly population is protected, the County of Kaua'i Agency on Elderly Affairs participates in the Disaster Mitigation Committee. County of Kaua'i Agency on Elderly Affairs, with the Mayor as Chief Executive, is the local Area Agency on Aging. Its purpose is to plan, support, and advocate for programs to promote the well-being of Kauai's older adults and to address and respond to the priority needs of all seniors. Priority is given to seniors 60+ years old who are in the greatest financial and social need. Seniors and their families have the opportunity to make a contribution towards the services they receive, thus helping to maintain and expand services within each program. These services are provided with funding by County, State and Federal governments. Services include: Information and Referral, Case Management, Senior Transportation, Adult Day Care, Homemaker Services, Personal Care, Respite, Elderly Nutrition Services, Volunteer Program, Friendly Visiting Program, Telephone Reassurance, Senior Companion Program, Home Service Registry, Legal Assistance Services and Caregiver Counseling. They have developed information and procedures to help the elderly populations of Kaua'i prepare for disaster. The copy of the booklet distributed to the senior population appears as a best practice in Chapter 6 Appendix.

4.3.3 Communities

The geography of the Island of Kaua'i lends itself to the divisions from the mountains to the sea, or ahupua'a. The rural character of the island combined with the divisions in ahupua'a has resulted in planning that takes place within communities. Examples of this type of organization is the Hanalei Watershed Hui, which has been able to work together to address community environmental issues and needs. Although the communities are not focused on hazard mitigation, many of their environmental activities become flood mitigation projects. In addition, the ability of these communities to work together in many activities, often with non-governmental organizations has helped to improve health, education, livelihoods, and well-being in communities that makes them more likely to recover quickly from disaster impacts.

4.3.4 Public Housing and Building Stock

Housing has changed over the last century as people moved away from plantation houses to agricultural homesteads and house-lots. As the highway around the island developed, new areas became available for development. Former plantations converted to residential subdivisions. In addition, the transient and visitor population changed, increasing markets for condominiums and timeshare rental units. During the 1990s, an influx of mainland buyers again increased resort development and demand in high-end residential real estate.

Following Hurricane Iniki, the housing market suffered from a downturn in the visitor industry. Housing stock generally changed and improved following Iniki, with fewer single-wall construction facilities.

Table 4-7. Housing Values, 2008.

State of Hawai'i Data Book Table 21.03-- ACCEPTED VALUE PER HOUSING UNIT, BY COUNTY: 2008 [Not comparable to <i>Data Books</i> prior to 2006. In dollars. Excludes building permits for additions, alterations and repair. "Accepted value" is the cost of construction for which building permits are issued]					
Type of structure	State total	City and County of Honolulu	Hawaii County	Kauai County	Maui County
One-family	350,763	380,386	350,014	387,079	298,815
Two-family	(NA)	332,874	220,000	(NA)	209,841
Multi-family	215,633	91,921	97,780	699,487	851,466
NA Not available.					
Source: Compiled from county building departments by the Hawaii State Department of Business, Economic Development & Tourism; U.S. Census Bureau, Building Permits < http://censtats.census.gov/bldg/bldgprmt.shtml > accessed June 29, 2009.					

The cost of housing, including owner-occupied and rental units, continues to be one of the biggest economic obstacles facing most Kaua'i residents. Of the total number of owner-occupied housing in 2008, only 5.7% of the houses are located in Kaua'i (State of Hawai'i Data Book 2008). In 1997, Kaua'i had the third highest median household income of Hawaii's four counties. The median household income of \$34,890 was about 14 percent lower than the statewide median figure. A common indicator of housing cost burden is the monthly shelter-to-income ratio. The optimum shelter-to-income ratio should not exceed 30 percent. A greater proportion of rental households, about 50 percent of them, have shelter-to-income ratios exceeding 30 percent and have difficulty transitioning to homeownership since they cannot save enough for a down payment (Kaua'i General Plan 2000, 8-3). The housing characteristics have not been reassessed since the last census. As shown below, Kauai County has the least amount of housing, and also the fewest residents. Approximately 60% of the housing units are owner-occupied (State of Hawai'i Data Book 2008). The following table shows the residential characteristics of the State, with information for Kaua'i County highlighted. This will be updated in the 2010 census.

Table 4-8. Estimated Land Acreage.

State of Hawaii Data Book Table 21.16-- SELECTED HOUSING CHARACTERISTICS, BY COUNTY: 2000 [Data include some condominium units used or intended for use by transients]					
Subject	State total	City and County of Honolulu	Hawaii County	Kauai County	Maui County 1/
All housing units	460,542	315,988	62,674	25,331	56,549
Occupied housing units	403,240	286,450	52,985	20,183	43,622
Owner-occupied housing units	227,888	156,290	34,175	12,384	25,039
Renter-occupied housing units	175,352	130,160	18,810	7,799	18,583
Average household size	2.92	2.95	2.75	2.87	2.91
Owner-occupied housing units	3.07	3.13	2.79	3.01	3.13
Renter-occupied housing units	2.71	2.74	2.69	2.63	2.61
Vacant housing units	57,302	29,538	9,689	5,148	12,927
For rent	15,699	12,203	1,556	504	1,436
For sale only	3,720	2,572	678	152	318
Rented or sold, not occupied	2,683	1,690	463	108	422
For seasonal, recreational, or occasional use	25,584	6,856	5,101	3,850	9,777
For migrant workers	57	17	21	14	5
Other vacant	9,559	6,200	1,870	520	969
Homeowner vacancy rate (percent)	1.6	1.6	1.9	1.2	1.3
Rental vacancy rate (percent)	8.2	8.6	7.6	6.1	7.2
Owner-occupied:					
Family households	178,918	124,021	25,634	9,765	19,498
Married-couple family	143,564	99,455	20,531	7,921	15,657
Other family	35,354	24,566	5,103	1,844	3,841
Nonfamily households	48,970	32,269	8,541	2,619	5,541
Renter-occupied:					
Family households	108,150	81,651	11,269	4,807	10,423
Married-couple family	72,513	56,740	6,297	2,960	6,516
Other family	35,637	24,911	4,972	1,847	3,907
Nonfamily household	67,202	48,509	7,541	2,992	8,160
1/ Maui County includes Kalawao County. Kalawao County had 172 housing units.					
Source: U.S. Census Bureau, Census 2000 Summary File 1 Hawaii (July 25, 2001).					

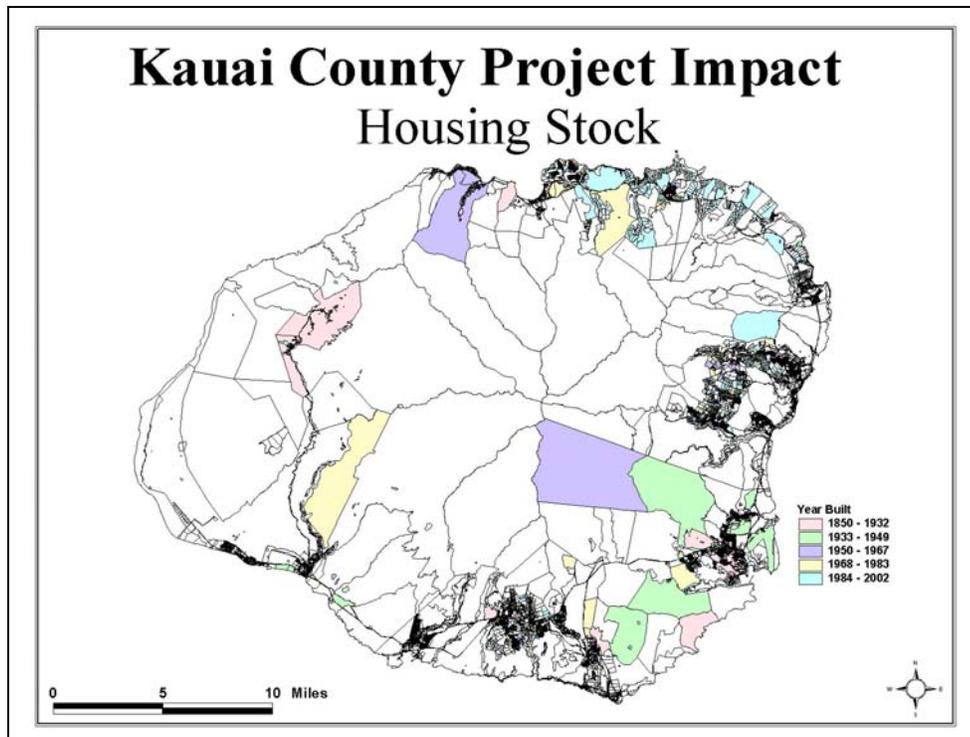
The analysis of housing affordability indicates that about half the homeowners and renters are economically vulnerable to impacts of any crisis. Inability to work for even short periods of time could prevent people from paying mortgages or rent, and could cause a severe sheltering crisis for Kaua'i County, in addition to any damage sustained to houses and buildings during a disaster.

Inventories of housing stock and roof types have been included in the Real Property Tax database. Because of the lack of staff to survey and verify this data, some of it has become outdated; however, this data is included in figures below. Since many houses were damaged during Hurricane Iniki, they were rebuilt to stronger building standards. Most of the poorest houses with the lowest quality materials collapsed in 1992.

One of the measures for housing vulnerability used in other studies has been the age of the structure, with the assumption that the older the facility, the weaker it may be due to aging. This assumption does not necessarily apply to Kaua'i. Many of the weakest houses did collapse. Although the maintenance levels since Hurricane Iniki will have a large impact on the ability of the newer houses to withstand disasters, the assumption is that those things that withstood the previous hurricanes are built pretty well.

The following chart, Figure 3-5, shows the number of homes built over time in Kaua'i. The chart depicts a dramatic increase in home-building following Hurricane Iniki following the disaster as many people were forced to reconstruct their homes. By using the reconstruction efforts as an opportunity to improve the quality and safety of the housing, building permits were granted with stronger standards and codes, and stricter setbacks were applied to rimlot houses in risky areas. Figure 3-6 shows the age of the developments geographically, with the assumption that the oldest areas may be at most risk.

Figure 4-1. Kaua'i County Housing Stock by Year of Construction.



The chart to the left, Figure 3-8, shows the types of construction, with single-wall construction being the most used type of housing construction on Kauai. Double wall construction is only in the thousands, while masonry is not used as much. In verifying this data in the local communities, meeting participants claimed that double wall construction is far greater than appears in the assessed records. This is one of the types of data that will need improvement in the future.

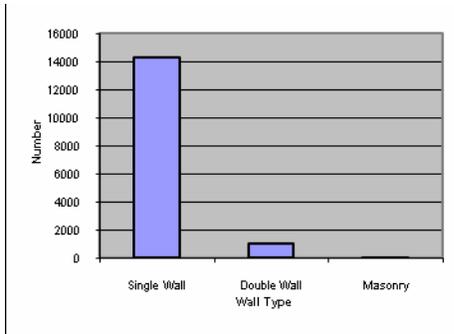
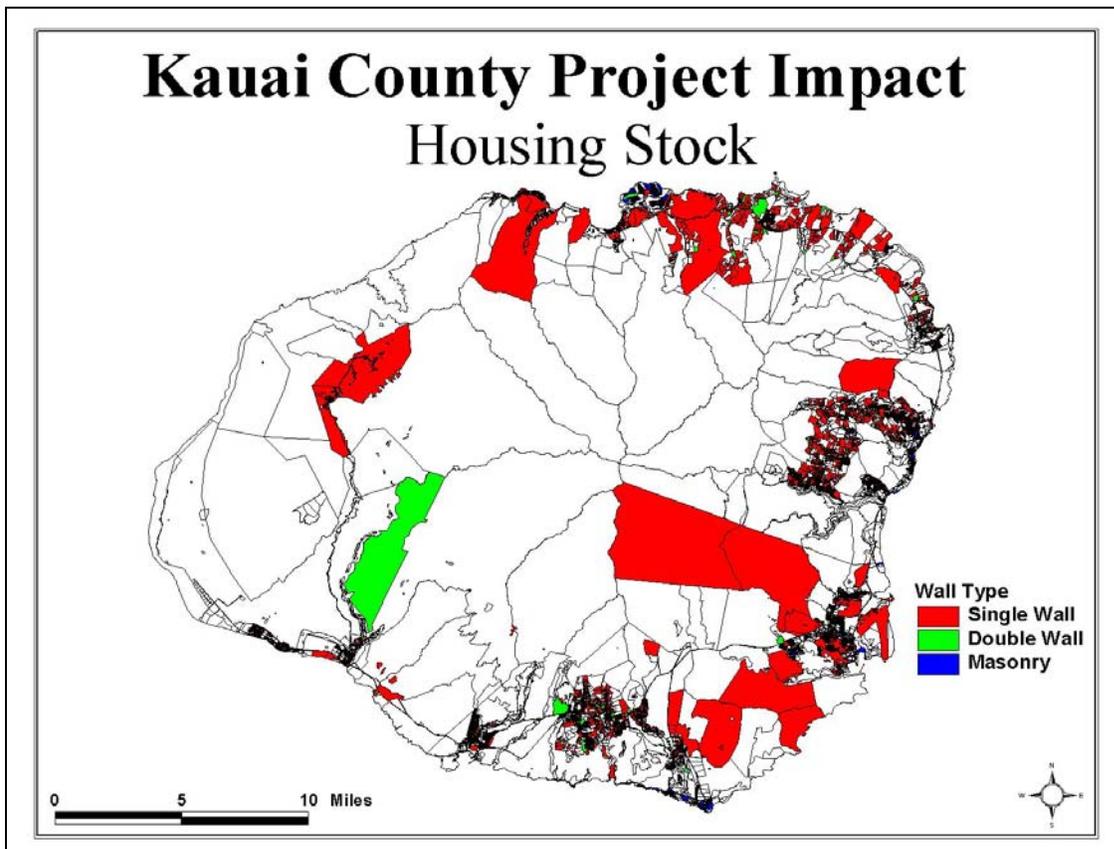


Figure 4-2. Kaua'i County Types of Construction (above).
 Figure 4-3. Kaua'i County Housing Stock by Type of Construction (below).



Kaua'i County has been at the forefront of planning in the state for improved building standards for housing. In addition to strengthening buildings, Kaua'i has promoted safe room construction in new homes. The ordinance for safe room construction appears in the Chapter Six appendix. The County Planning Department recommended additional setbacks for rim lot development, because houses located on ridges and cliffs experienced an upsweep of wind.

4.3.5 Visitors

The County of Kaua'i provides basic services to the visitor industry, such as water supply, roads, fire and police protection, and operation of public parks. With the additional average 19,855 visitors to Kaua'i per day, the County must also provide protection during natural hazards (State of Hawai'i Data Book 2008). Not only do visitors present a problem for sheltering, they do not typically have water and food reserves, and will tax very limited resources available for the county following a disaster. Further problems come from people who need to leave and cannot get off the island. Interisland travel becomes limited, people miss flights, and it may be days before they can get out of Kaua'i. This experience during Hurricane Iniki damaged the tourism industry and resulted in fewer visitors to Kauai for years following the hurricane. With the high economic dependency on tourism, it is important for Kauai's economy to value and plan for visitors in the case of disaster, not only to protect this population but to also protect the local economy.

Visitors may not have additional cash resources to cover their extended stays and financial institutions may not have reserves for the population. Depending on the impact of the disaster to Oahu, it may be difficult for Kaua'i to receive cash and goods since financial and shipping services rely on transfers through Honolulu. There may not be enough goods to purchase on-island. The visitor population is vulnerable to disasters, and exacerbates resources available to the county. Therefore, any hazard mitigation plan should make plans to protect and provide resources to the visitor population, while maintaining the same level of protection and safety for residents.

4.4 Critical Infrastructure

Critical infrastructure covers a wide range of activities and lifelines that support the daily activities of Kaua'i County and are essential in any emergency situation. These lifelines include water infrastructure, energy, transportation and ports of entry, telecommunications, and solid waste.

4.4.1 Water

The Kaua'i County Water Department has mapped and maintains the maps of their resources using geographic information systems. Some of the data is available on their website, although much of the specific information needs to remain secure as part of homeland security. Personal customer information has not been included and privacy has been maintained. The GIS system includes the following: county water storage tanks; water distribution lines for the public system; wells; private water systems; reservoirs for wildfire fighting; irrigation and ditch systems; wastewater systems; dams and reservoirs; and, storm drainage systems.

4.4.2 Water Supply

The Kaua'i County Department of Water (DOW) is a semi-autonomous agency for the management, control, and operation of the island's municipal water system. DOW supplies water to thirteen geographic service areas, each of which is served by a single system or linked subsystems. Service areas include: 1) West Side – Hanapēpē to Ele'ele and Waimea to Kekaha; 2) Kalāheo to Po'ipū-Kōloa – Kalāheo, Kōloa- Po'ipū, and Lawai-Omao; 3) Līhu'e – Puhi-Līhu'e

to Hanamā'ulu; 4) Kawaihau – Anahola, Moloa'a, and Kapa'a-Wailua; and, 5) North Shore – 'Anini, Hanalei, Kīlauea-Waipake-Kalihiwai, and Wainiha-Hā'ena. In addition, there are several private potable water systems, including Princeville. DOW contracts with Princeville to supply 'Anini with water (Kauai General Plan 2000, 7-10,11).

DOW maintains 52 separate groundwater sources comprised of wells, shafts, and tunnels. Storage tank capacity contains approximately 18.5 million gallons. DOW has 16 booster pump stations. Average daily demand for municipal water is approximately 10.6 million gallons per day, with maximum demand reaching 15.9 million gallons per day. In general, the municipal water system has adequate source and storage capacity to support existing demands; however, additional growth would require expansion to the water system (Kauai General Plan 2000, 7-10,11).

The Kaua'i Department of Water and members of the Water Board have completed a 20 year plan known as "Water Plan 2020." This is a comprehensive, long range planning effort, to ensure that the county continues to provide safe, affordable and sufficient drinking water in the 21st century for the Kaua'i community. The plan reviews existing facilities, and service standards and provides an outline for new and replacement facilities, a capital improvement program for the next 5-7 years, a financial plan, and a rate study.

Kaua'i's Department of Water operates 13 separate, unconnected water systems spread out along our island from Kekāha to Hā'ena. Pumping water from 48 underground wells and tunnels and storing it in 43 tanks, DOW delivers water to nearly 18,000 accounts through 400 miles of pipeline. Many of the water systems date back to the plantation era, and some pipelines are 80-100 years old.

Water Plan 2020 is focused on potable water, used for drinking and fire protection. It addresses the sources, infrastructure, and funding needed to deliver potable water. The plan will not cover issues involving water for agriculture, stream standards, and watershed management. These issues are the focus of other state and local planning and regulatory processes.

Water supply in Līhu'e is constrained by a lack of new groundwater sources because of the geology of the area, and therefore, new development is also constrained in this area. Throughout the North Shore, water supply is also limited. Long-range plans have been developed to monitor and expand the water system over the next 20 years. Even though Kauai is known for receiving a great deal of precipitation, it must still monitor its water resources, which may be burdened during periods of drought associated with climate variability and change. Areas on Kaua'i are subject to wildland fires, as previously discussed, and will require additional water resources to combat fires, especially during dry periods. (These issues have been addressed in the county drought mitigation plans.)

4.4.3 Wastewater Treatment

Wastewater treatment varies across the island. The county provides service to some communities and some private systems supply needs to some communities. Other areas rely on Individual Wastewater Systems (IWS), such as cesspools and septic tanks. Wastewater

disposal is adequate and does not pose significant health or environmental threats. There are several projects that improve drainage to ensure that storm water does not adversely impact drainage systems. The plan for improving the system in Wailua were finalized in September 2008. The County is implementing the plans as funds become available.

Kaua'i County Department of Public Works Division of Wastewater Management operates four wastewater systems serving Waimea, Hanapēpē to Ele'ele, Līhu'e to Hanamā'ulu, and the Kūhio Highway corridor. Currently, there are no facility plans to expand treatment plants. Information had been recorded in paper surveys and reports for a number of years, and digital information was limited. Some of the information was digitized for the plans, but federal requirements will require digital data storage for reporting in the future.

The greatest vulnerability to wastewater treatment systems during storms could be overtaxed systems and leaks or breaks in pipes that would threaten environmental and public health. Some of these pipes follow bridges, which may be vulnerable to collapse during floods, storms, and seismic events. The Division of Wastewater Management participated in the development of the geographic information system and plans to improve digital records in the future. This will make it easier to identify weaknesses in the system and areas for response.

4.4.4 Energy

Kaua'i Island Utilities Cooperative (KIUC) serves approximately 29,300 customers, providing four levels of service: residential, commercial, large power, and street lighting. Major load centers are Kapa'a-Wailua, Līhu'e, and Kōloa-Po'ipū. The total firm electrical generating capacity on Kaua'i is 110 megawatts. KIUC generates its own power from a 96-megawatt, diesel-fired power plant located at Port Allen and purchases 14 megawatts of firm capacity from Līhu'e Plantation. The utility also purchases non-firm power from Island Coffee and Gay & Robinson sugar mill. This nominal amount is acquired under "surplus power" contracts with the companies and cannot be relied upon to meet peak demand. These non-firm sources generate a total of approximately 4.1 megawatts of power. About 20 percent of KIUC's power output is generated from renewable resources, including bagasse, a sugar-cane by-product, and hydropower.

The County has the ability to guide the location, siting and design of electrical generation and transmission facilities through a combination of land use policies, zoning regulations, and design guidelines. Current service, divided into the main regions of the island, is as follows:

- **West Side** – The main transmission line for the West Side extends from Port Allen to Mana along Kaunualii Highway, including double circuits between Port Allen and Kekaha. Switchyards are located at Port Allen and Kekaha, with substations in Mana and Kaumakani.
- **Kalaheo to Poipu-Koloa** – Four transmission circuits serve this region---one extending east from Port Allen and another extending south from Kaunualii Highway. There is a switchyard in Koloa and a substation in Lawai.
- **Lihue** – Four transmission circuits serve this area. Although Lihue Plantation provides power to the system, the primary source of electricity is the Port Allen Generating Station.
- **Kawaihau** – This region is served via a tap off of the mauka transmission line that connects the Wainiha Hydroelectric Plant with Port Allen. This tap provides power via the Kapaa

Switchyard to Kapaa Town and other developed coastal areas, as well as to residential communities in Kapaa and Wailua homestead areas. Kapaa Switchyard is also linked to the Lydgate Substation and the Lihue Switchyard.

- **North Shore** – This area is served by electrical power provided by the transmission lines along the Power Line Trail supplemented by power from the Wainiha Hydroelectric Plant.

KIUC participated in the planning process and understand the importance of mitigating the impact of natural hazards on Kauai's energy system. Following Hurricane Iniki in 1992, there was an island-wide electrical blackout and telecommunications and commercial water services were almost entirely curtailed. Sewage treatment plants were forced to discontinue operations thus threatening pollution of surrounding waters. The loss of electricity closed gas stations and refrigerated food spoiled in homes, stores, and warehouses. Credit cards could not be verified and cash was not available from automatic teller machines (US Department of Energy and Office of Emergency Management for the State of Hawaii, 1996, Hawaiian Islands Hazard Mitigation Report, 1).

During the recovery from Iniki, KIUC undertook a program to upgrade the transmission system by installing steel poles and adding many storm guys and push braces. Because Kaua'i Electric was part of Citizens Utilities Company (CUC), they were able to acquire funds expeditiously to make repairs. The Citizens Utilities had three programs to improve resiliency of its transmission lines and distribution systems. Kauai Electric had to obtain easements for the additional guying and put quite an effort into the installations. Kaua'i Electric already planned to install steel poles prior to Iniki, and the effort continued during disaster recovery in order to harden the overall system. KE and CUC spent approximately \$20 million to replace wood poles with steel, and about \$300,000 per year to install guy wires on wood poles not being replaced (US Department of Energy and Office of Emergency Management for the State of Hawaii, 1996, Hawaiian Islands Hazard Mitigation Report, 27-28).

KIUC no longer installs class 3 poles. Since Hurricane Iniki, KIUC has only installed class 2 and class 1 poles. Presently, KIUC will only install class 1 poles. The Public Utility Commission (PUC) is looking at adopting the National Energy Securities Code (NESEC) and eliminating General Order No. 6 (GO6) rules for overhead electric line construction and structural loading requirements. Once this happens, the wind loading would increase substantially. Thus, KIUC would need to install bigger poles or even use steel poles.

The use of an ocean outfall by the Citizens Utilities on Kaua'i for power plant cooling systems has been found to reduce vulnerability of the power plant to hurricane and gale force winds (US Department of Energy and Office of Emergency Management for the State of Hawaii, 1996, Hawaiian Islands Hazard Mitigation Report, 34-35). Since Homeland Security has become important in planning for the security of utilities, it is important to that KIUC is installing an automatic gate in Ele'ele, a Security System at the Lihue Building and is working on cyber security systems for the network. KIUC is also discussing ways to increase

SCADA/EMS cyber security.

Quite a bit of the utility data has not been classified for inclusion in the geographic information system. Some of the transmission lines and pole locations are not included. The following positions and information have been recorded in the GIS database and included in attached maps: power plants; booster stations; fuel storage and supply; propane tanks, and above ground fuel pipelines.

4.5 Transportation and Ports of Entry

Transportation data is important for emergency operations during any type of disaster and for providing relief and recovery. Failure of these lifelines could be a great impediment to dealing with the impacts of a hazard. The information recorded in the GIS database and in attached maps includes: roads and bridges; airports, landing strips and helicopter pads; ports; vehicle and heavy equipment base yards, and car rental agencies.

4.5.1 Airports

The State Department of Transportation, Airports Division, operates two facilities on Kaua'i---the Lihue Airport and the Port Allen Airport. The Lihue Airport serves as the primary gateway for arriving and departing passengers. Overseas passenger service, interisland commuter service, and cargo service use Lihue Airport. It encompasses 834 acres of land. The State of Hawai'i owns and operates the airport as part of the statewide airport system (Kauai General Plan 2000, 4-33; State of Hawai'i Data Book 2008).



Photo 4-3. Lihue Airport.

Based on visitor projections and forecast aviation demand projections, the State's 2020 Master Plan proposed improvements to extend the Runway 17-35 from 6,500 feet to 8,500 feet, although these projections may have declined and the State's budget constraints may not allow the extension to happen. Additional security requirements at airports, decreased travel overseas because of war, terrorism, and SARS, H1N1, pandemic flu, or other health epidemics, fewer daily interisland flights, and localized airline changes that make interisland travel less commuter-friendly may alter the original projections.

Port Allen Airport has a single runway, general aviation airport with minimal facilities. The State of Hawaii owns the facility. It has been used minimally since the Lihue Airport replaced it. This airport provides emergency helicopter operations, helicopter tour flights, and general aviation

needs. This airport does not have the physical buildings or facilities to adequately accommodate the needs of the helicopter operators.

4.5.2 Harbors

Nāwiliwili Harbor serves as the primary commercial harbor for Kaua'i. Facilities include three piers for handling overseas and interisland general and containerized cargo. Charter boat fishing, recreational boating and passenger cruise ships use the harbor. In the Department of Transportation's 2010 Master Plan, expansion of the harbor has been planned based on increased projections in visitors, growth of the county, and increased operations of cruise ships. Following September 11, 2001, cruise ship operations declined, and it is not clear whether the need to increase port services is critical at this juncture. However, previous projections showed the highest rate of return in investments at Nāwiliwili Harbor among all the proposed harbor improvements statewide.



Photo 4-4. Nāwiliwili Harbor.

Maintaining operations at Nāwiliwili Harbor is critical during emergencies, as Kaua'i experienced during Hurricane Iniki. All of the major relief supplies and equipment would need to be transported through this harbor by Young Brothers cargo transporters. Agreements have been made among the Matson Corporation, State Civil Defense, the Honolulu Electric Company (HECO), and Young Brothers to maintain port operations during emergencies in Honolulu, where most of the imports to Hawai'i, including fuel and equipment, arrive, and to make sure

that SCD can control the manifest for deliveries of relief assistance and necessities to the neighbor islands.

The second commercial harbor at Port Allen Harbor has a single pier. Current operations from this harbor include: commercial fisheries, US Naval vessels supporting the Pacific Missile Range Facility, petroleum shipments, general cargo, and small recreational tour operators. The harbor does not currently provide adequate facilities for tour operators displaced from Hanalei River. Capital improvements are needed to support expected future growth.

The State Department of Land and Natural Resources Division of Boating and Ocean Recreation (DOBOR) owns four small boat harbors on Kaua'i---Nāwiliwili, Port Allen, Kīkīaola and Kukui'ula. The Wailua Marina is privately owned. DOBOR manages boat-launching ramps. Local fishers and residents use most of these small boat harbors. Charter boats and tour operators have migrated to Nāwiliwili and Port Allen because of conflicts about types of harbor use, and have not been allowed to operate out of small boat harbors in communities.

4.5.3 Roadways and Bridges

The regional roadway system on Kaua'i consists of two-lane roads connecting major developed areas on the island. The quality of the highways varies from a narrow, winding highway north of Hanalei to excellent arterial highways. A short four-lane segment of undivided highway exists in Līhu'e town, and a three-lane section goes from Hanamā'ulu to Waipo'uli.

The existing roadways serving various regions are described below:

- **West Side** – Kaumualii Highway, a two-lane State arterial road, is the primary highway connecting the West Side to Kalaheo, Lihue, and points eastward. Kaumualii Highway extends west from Eleele/Port Allen to Mana. Kokee Road is the main route providing access mauka to Waimea Canyon and Kokee State Park.
- **Kalaheo to Poipu-Koloa** – Kaumualii Highway is the primary highway connecting the Kalaheo-Poipu-Koloa Planning District to Lihue on the east and to Port Allen/Eleele on the west. Other major roads are county-owned. They include Maluhia Road, Poipu Road, the Poipu Bypass, and Koloa Road.
- **Lihue** – This region is the hub which connects the two belt highways, Kaumualii Highway (serving west Kauai) and Kuhio Highway (serving east Kauai). Kapule Highway has been constructed to bypass Lihue Town, connecting the airport, harbor, and industrial areas with Wailua-Kapaa and other points on the east side.
- **Kawaihau** – Kuhio Highway is the primary roadway serving the Kawaihau Planning District. It is a three-lane State arterial highway between its junction with Kapule Highway and Kamoā Road in Waipouli. Two lanes are northbound, and one lane is southbound. Using contra-flow traffic measures, the land usage is reversed during the morning peak ours in order to accommodate Lihue-bound commuters. Between Kamoā Road and Waikaea Canal at the edge of Kapaa Town, the third lane is used for left turns in both directions. In Kapaa Town, Kuhio Highway becomes two lanes with on-street parking through the town center. From the north edge of Kapaa Town to Moloaa, Kuhio Highway is a two-lane arterial highway.

In 1995, a temporary Kapa'a by-pass route was opened to traffic during daylight hours. The route runs mauka of Kūhio Highway, utilizing private cane haul roads. It has provided some relief for Kūhio Highway traffic through Waipouli and most of Kapaa Town.

Major two-lane collector roads include Kuamo'o Road (State) and Olohena Road (County), which provide access to the Wailua Homesteads area from Kuhio Highway in Wailua and Kapaa. Kawaihau Road is a county-owned two-lane collector road connecting Kapaa Homesteads with Kuhio Highway.

- **North Shore** – Kūhio Highway is the only arterial road connecting the North Shore with the rest of Kauai. Throughout the North Shore, Kuhio Highway is a two-lane road. The highway has been improved from Moloaa to Princeville. From Princeville to Haena, the road has narrow pavement widths, hazardous curves, and minimal shoulders. The narrow pavement and the ten one-lane bridges between Princeville and Haena give the roadway a unique character. Only the Lumahai Bridge is a modern two-lane bridge. The one-lane bridges preclude large tour buses from entering Hanalei Town, as well as precluding the entry of heavy trucks and construction equipment.
(Source: Kauai General Plan 2000, 7-2,3).

Existing traffic conditions are poor in the central part of the island. Traffic into and out of Līhu'e through Kapa'a is extremely congested during morning and late afternoon peak hours. Collector roads, such as Kuamo'o Road in Wailua, also suffer congestion during peak hours.

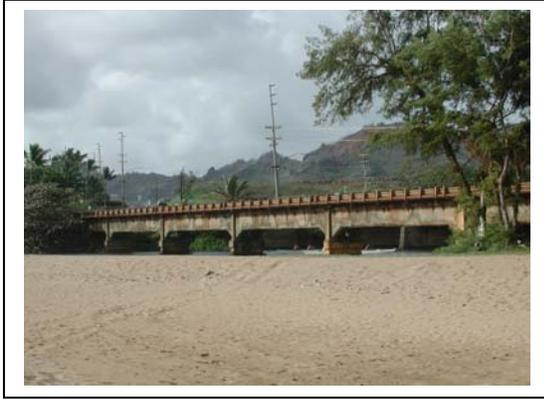


Photo 4-5. Wailua Bridge.

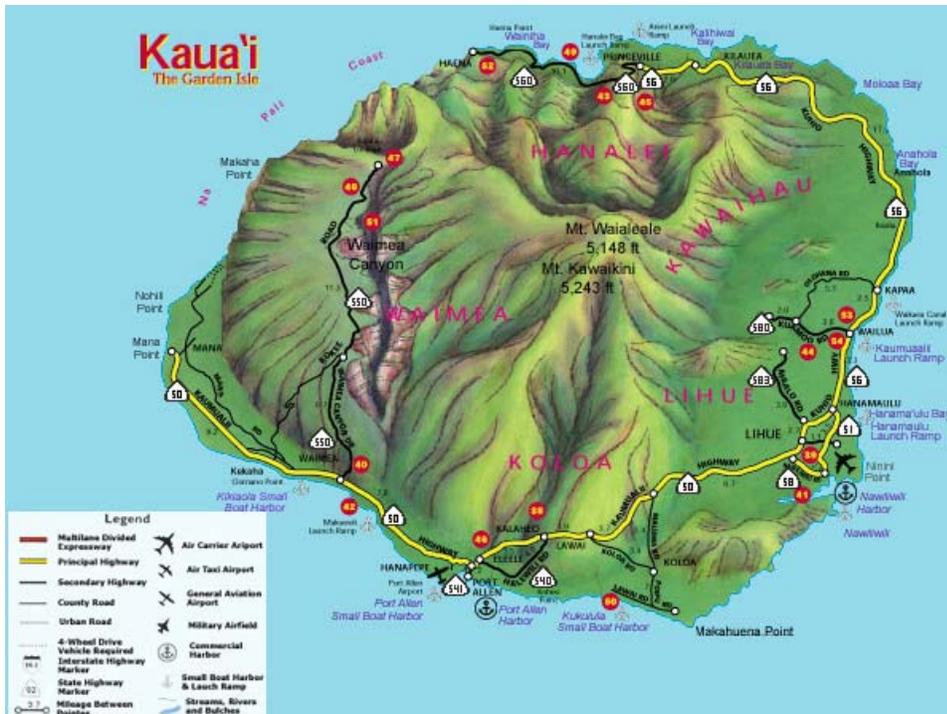
Traffic congestion makes residents and visitors extremely vulnerable to the impacts of disasters. Heavy rains will make the roads slick.

Congested and few arterial roads may make it difficult to evacuate risky areas. Large segments of the roadway run along the coastline, and many of these roadways could be engulfed in a tsunami. Cars sitting on the road trying to evacuate and the slow movement of traffic could result in high numbers of death and injury. The single lane bridges may also prevent evacuation during emergencies, and leave low-lying areas, such as

Hanalei vulnerable to tsunami.

Some planning for additional access and traffic alleviation has occurred. The Kaua'i Civil Defense Agency has worked with private landowners and other agencies to secure access to private roads for evacuation purposes. Planning for the Kapa'a Bypass Road has begun, but will require multi-agency collaboration and planning, and large amounts of funding to become a reality.

Figure 4-4. State Roadways on Kaua'i.



1. Route 50, Kaumualii Highway, Ahukini Road (Route 570) to Mana
2. Route 51, Kapule Highway, Rice Street to Kuhio Highway (Route 56)
3. Route 56, Kuhio Highway, Ahukini Highway (Route 570) to Princeville
4. Route 58, Rice Street to Kaumualii Highway (Route 50)

5. Route 540, Halewili Road off of Kaumualii Highway (Route 50)
6. Route 541, Waialo Road off of Kaumualii Highway (Route 50)
7. Route 550, Waimea Canyon Drive off of Kaumualii Highway (Route 50)
8. Route 560, Kuhio Highway, Princeville to Haena
9. Route 570, Ahukini Road Kuhio Highway (Route 56) to Kapule Highway (Route 51)
10. Route 580, Kuamoo Road off of Kuhio Highway (Route 56)
11. Route 583, Maalo Road off of Kuhio Highway (Route 56)
12. Route 50, Kaumualii Highway, Ahukini Road (Route 570) to Mana
13. Route 51, Kapule Highway, Rice Street to Kuhio Highway (Route 56)
14. Route 56, Kuhio Highway, Ahukini Highway (Route 570) to Princeville
15. Route 58, Rice Street to Kaumualii Highway (Route 50)
16. Route 540, Halewili Road off of Kaumualii Highway (Route 50)
17. Route 541, Waialo Road off of Kaumualii Highway (Route 50)
18. Route 550, Waimea Canyon Drive off of Kaumualii Highway (Route 50)
19. Route 560, Kuhio Highway, Princeville to Haena
20. Route 570, Ahukini Road Kuhio Highway (Route 56) to Kapule Highway (Route 51)
21. Route 580, Kuamoo Road off of Kuhio Highway (Route 56)
22. Route 583, Maalo Road off of Kuhio Highway (Route 56)

There are sections where traffic flow is poor. Peak hours in the morning and late afternoon result in extreme congestion, and this has resulted in the construction of bypass roads. Traffic congestion makes residents and visitors vulnerable to the impacts of disasters, because it is difficult to evacuate quickly during peak hours. Heavy rains will make the roads slick. Congestion and few arterial roads may make it difficult to evacuate risky areas. Large segments of the roadway run along the coastline, and many of these roadways could be engulfed in a tsunami. Cars sitting on the road trying to evacuate combined with the slow movement of traffic could result in high numbers of death and injury.

4.6 Telecommunications

During any type of disaster, the ability to communicate across the island, within the county, and within the state remains critical. It is important to record the locations of telecommunications equipment and lines, and to be able to maintain operability. The overall system involves public facilities, private companies, most specifically Hawaii Telcom, and various cell phone companies. Because of privacy issues, not all of the information is available for inclusion in the GIS database for the County. To the extent possible, the GIS database and maps include: telephone switching stations; satellite dishes; microwave repeaters; cellular phone antenna; telephone lines; cable television lines; and, radio stations and transmission towers.

Hawaiian Telcom

Hawaiian Telcom has approximately 30 miles of fiber optic cable underground on Kaua'i and approximately 80 miles of fiber optic cables above ground. There are 100 miles of underwater fiber optic cable that run from Ko Olina on O'ahu to the Wailua Golf Course area of Kaua'i. This is the most secure system because it lays on the bottom of the ocean floor and is not prone to damages from natural disasters (tsunami, hurricanes) or human-induced sources (ships, etc). There is approximately 5,000 sheet miles of above ground phone lines on the island.

The company has 11,300 poles on Kaua'i, of which about 9,000 are jointly shared with Kaua'i Island Utility Cooperative. The telephone pole lines are rated at about 60 to 80 mph. Except

for the Lihue to Kalaheo route, and the Lihue to Kapaa route, most fiber routes are more than 90% overhead. The Lihue to Kalaheo route is approximately 90% underground. The Lihue to Kapa'a route is 85% underground. For Kaua'i, except for the Lihue to Kalāheo route, and the Lihue to Kapa'a route, most fiber routes in Kaua'i are more than 90% overhead. The Lihue to Kalaheo route is approximately 90% underground. The Lihue to Kapa'a route is 85% underground.

The replacement costs for the system in a catastrophic disaster, using 2009 dollars, have been estimated at approximately \$16 to \$20 million. Pole replacement cost runs about \$1,500 a pole. The system maps were updated in 2006.

Hawaiian Telcom has an Emergency Operating Center in Honolulu and the company has an emergency disaster management plan. They participate in the Kauai County Utility Disaster Preparedness and Response Group. Due to company downsizing, emergency staffing, labor or manpower, equipment, and materials needed to rebuild systems would be pulled from around the state.

Kaua'i Oceanic Time Warner Cable

The Kaua'i Oceanic Cable Office provides infrastructure and resources that are critical for Kaua'i. The plant mileage totals 541.1 miles, which includes 190.5 miles of underground cable and 350.6 miles of aerial cable. The estimated value of the cable system is \$13,527,500, with the unit cost valued at \$25,000 per mile (valued in 2009 dollars).

Kaua'i Oceanic Cable Office participates in the Kauai County Utility Disaster Preparedness and Response Group. The fire stations and police station sites are connected within Oceanic's fiber optic cable (I-NET), which can be used in crisis for communications.

The Chapter 4 Appendix 1 includes the maps of the cable system that can be integrated with the county GIS to use in assessing risk and vulnerability from hazards.

4.7 Protection from Solid Waste and Hazardous Materials

Guided by federal and state laws and regulations, the county government plays the primary role in solid waste management. The county provides direct service to the public by collecting solid waste and operating facilities and programs for reuse and disposal. With the exception of hazardous materials, the county is responsible for regulating the disposal of solid waste.

Kaua'i County maintains an islandwide system of solid waste collection and disposal that serves its resident and visitor population. The Road Construction and Maintenance Division of the Department of Public Works administers county solid waste facilities and services. A brief description of the system follows:

- **Kekaha Landfill Phase II** – This facility began operation in 1993 and is the primary disposal site for solid waste on Kauai. In FY 1999, the Kekaha Landfill Phase II accepted approximately 67,590 tons of solid waste. This facility also serves as a drop-off point for segregated recoverable waste. During FY 1999, approximately 10.6 tons of recoverable materials (e.g., cardboard, newspaper,

glass, aluminum cans, batteries) and 1,000 gallons of used oil were recovered and/or recycled from the Kekaha Phase II operations.

- **Refuse Transfer Stations** – The County operates four refuse transfer stations that are located in Hanalei, Kapaa, Lihue, and Hanapepe. In FY 1999, a total of approximately 24,930 tons of solid waste was collected at all stations and transferred to the Kekaha Landfill Phase II. In addition, the Hanalei, Kapaa, and Hanapepe stations receive used oil through the Do-It Yourselfer (DIY) program. The Lihue station also receives scrap metal, white goods, and greenwaste. The latter is also received at the Kapaa and Hanapepe station.
- **Kekaha Debris Recycling Station** – This facility, also known as Kekaha Landfill Phase I, was used for Hurricane Iniki debris and stopped accepting solid waste in 1993. In FY 1999, approximately 404 tons of white goods and scrap metals were received at the station and subsequently shipped off-island for recycling. The Station serves as a recovery facility for segregated greenwaste. The facility accepts and shreds used automobile and truck tires that are used as alternate landfill daily cover at the Kekaha Phase II operations. **(Source:** Kauai General Plan 2000, 7-29-31).

Kaua'i County needs additional landfill capacity. Basic disposal capacity is rapidly disappearing. Hurricane Iniki exacerbated the landfill capacity by creating tons of additional debris. Emergency landfills for debris removal were placed around the island, but were closed after the crisis dissipated. A study has been completed to site new landfills. Unfortunately, it has been difficult to secure land agreements for appropriate sites.

In addition, a Disaster Debris Action Plan was completed in December 2002 that identifies future needs for debris removal based on the experience with Hurricane Iniki. The plan will be followed with environmental assessments and negotiated agreements with communities and landowners. A project to expand this study and identify suitable sites for emergency landfills has been accepted for funding under the State of Hawai'i's Pre-Disaster Mitigation planning projects with funding from the Federal Emergency Management Agency.

Hazardous Materials

Hazardous materials have been considered in the solid waste management plans, landfill site plans, and particularly in all emergency response plans. The State of Hawai'i through the Department of Health Office of Hazard Evaluation and Emergency Response (HEER) has initiated a process to update the State's Emergency Response Plan, which involves providing technical assistance and funding for each County to update the existing Hazardous Materials Emergency Response Plan. HEER is responsible for implementing the Hawai'i Environmental Response Law (HRS 128D) and the State Contingency Plan (HAR 11-451), as well as the Hawai'i Emergency Planning and Community Right-to-Know Act (HRS 128E). Kaua'i County updated its plan in 2004.

Currently, the first responders to situations involving hazardous materials on Kaua'i will be the Kaua'i County Fire Department. Should the situation require additional resources and assessments, the State Department of Health will task one of its agents to Kaua'i County to deal with the situation.

Recognizing the importance of understanding the location of potential hazardous material sites during any natural hazard, the firefighters provided information for the risk and vulnerability

assessment. Using maps at each of the county fire stations (with some of these maps incorporating use of CAMEO software that enables users to develop hazard spill and response scenarios) and Global Positioning System (GPS) technology, potential hazardous materials sites were incorporated into the geographic information system (GIS) that will be used increasingly in Kaua'i County agencies. Some of the mapped sites include: gas stations, pumping stations, landfills, oil and fuel distribution areas, tank farms, paint and auto body shops, harbors, and sewage system lines and treatment plants.

4.8 Economically Important Assets

The Small Business Administration (SBA), the Federal Emergency Management Agency (FEMA), and the Institute for Business and Home Safety (IBHS) have researched business failures following disasters. They have found that 43% of businesses that do not reopen within 48 hours do not ever reopen. Kaua'i's experience following Hurricane Iniki demonstrated the detrimental effects of disasters. Well over a decade after the disaster, the economy was still struggling. Therefore, it is important to ensure that critical facilities relating to the economy should be protected.

As mentioned previously, the economy is largely dependent on the tourism sector. This means that the facilities and networks that support the industry are critical economic assets. This includes hotels, timeshare condominiums, car rental agencies and lots, restaurants, parks, golf courses, tour operators, and activity centers. The airport, harbors, and roadways are critical infrastructure that support the tourism industry, as discussed in section 4.5.

There has been some diversification of the economy in the agricultural sector. Coffee and poi farms provide income for several local communities. In addition, the recent emphasis on seed corn production provides added economic benefit. The agricultural sector relies on water, and is sensitive to climate-related hazards. These include drought, flood, hurricanes, and wildfire, which can be exacerbated during El Niño periods.

In addition to the economy supported by the tourism industry, residents rely on financial institutions, supermarkets, and retail stores to supply necessary materials. The failure of any of these businesses negatively impacts the local population.

The GIS database and maps include: financial institutions; hotels and tourism facilities; building supplies; supermarkets; and, commercial and industrial areas.

4.9 Socially, Culturally, and Environmentally Important Assets

Although these assets usually appear at the bottom of the list of assets for a risk and vulnerability assessment, these are the things that make up the character and uniqueness of the Island of Kaua'i. To the extent that data exist and have been maintained, the GIS database and map include: churches, historic sites and buildings, archaeological sites, wetlands, unique



Photo 4-6. Hanalei.

environmental habitats and resources, trails (Na Ala Hele state trail system)/ firebreaks, hazardous materials storage, protective sand dune and coral reef systems, cemeteries and burial lands, heiau, halau, and community and cultural centers.

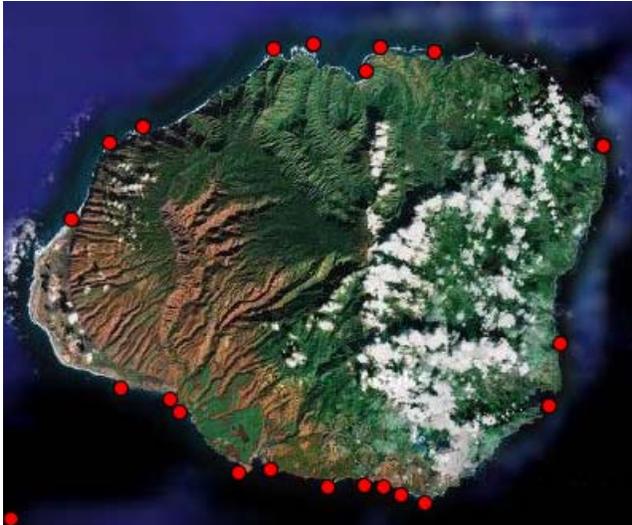
The communities provide critical assets for sustaining the important rural character of the island. As mentioned previously, the communities provide organization for managing important environmental resources using ahupua'a watershed management practices, which contributes to building resilience in

these communities..

The following map of Kaua'i show coral reef research areas. The research and work to ensure a healthy coral reef ecosystem in Hawaii contributes to building a healthy coastal environment that provides critical habitat for marine resources. In addition, the coral reefs mitigate wave impacts and protect shorelines from storm inundation.

Figure 4-6. Coral Reef Research Sites in Kaua'i.

Source: Hawai'i Coral Reef Initiative Research Program, <http://www.hawaii.edu/ssri/hcri/research/results/kauai/index.shtml>.



- Anahola Bay / Kuaehu Point
- Anini Beach
- Beach House Reef
- Haena / Kailio Point
- Hanalei
- Hoai Bay
- Ikiāloa
- Kukuiula
- Limahuli
- Marriott Hotel Reef (Lihue)
- Milolii Valley
- Nawiliwili Bay
- Nomilu Pond
- Nualolo Kai
- Oomanu Point
- Pilaa
- Poipu Beach
- Polihale Beach

- Port Allen Harbor
- Princeville

- Salt Pond Beach
- Tiger's

4.10 Built Environment

4.10.1 Building Codes

Kaua'i County has been at the forefront of planning in the state for improved building standards for housing. The Building Code Enforcement Section is responsible for the review of projects to ensure compliance and enforcement, of the all applicable building trade codes and ordinances, related to building construction. As the central coordination agency in the building permitting process, the program is responsible for the circulation and consolidation of comments from County, State, and Federal agencies, prior to permit approval. The program is also responsible for building, electrical, plumbing, and sign code enforcement inspection, as part of the permitting process. Codes have been updated to reflect the International Building Code Standards.

In collaboration with the Planning Department and other agencies in Kaua'i, the County has organized a "one-stop" process for issuing building permits. This ensures coordination among agencies and eases the process for those requesting permits.

In addition to strengthening buildings, Kaua'i has promoted safe room construction in new homes. The ordinance for safe room construction appears in the Chapter Six appendix. The County Planning Department recommended additional setbacks for rim lot development, because houses located on ridges and cliffs experienced an upsweep of wind.

4.10.2 Other Government Facilities

The government facilities are all important for maintaining operations and the economy of Kaua'i County. Most of these facilities lie in wind risk areas; however, Kaua'i County rebuilt facilities after Hurricane Iniki to much higher wind ratings than anywhere in the State of Hawai'i.

Important government facilities and services mapped in the GIS system include: state, county, and federal buildings; schools (see shelters); equipment baseyards; weather monitoring stations; the Pacific Missile Range Facility (PMRF); public housing; and, Hawaiian Homelands.

Following Hurricane Iniki, debris management became a severe problem, prompting Kaua'i County to develop a Post-Disaster Debris Management Plan. Studies have been conducted on areas that would be suitable following a disaster. Agreements with landowners have been made.

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