Population and Economic Projections for the State of Hawaii to 2040

DBEDT 2040 Series

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This report presents the results and methodology of the 2040 Series of the DBEDT Population and Economic Projections for the State of Hawaii and its four counties. This is the eighth in a series of long-range projections dating back to the first report published in 1978. The 2040 Series uses the detailed population characteristics from the 2010 Decennial Census, 2010 estimates of economic variables, and input-output (I-O) tables based on the 2007 Economic Census as baseline data for the projection.

It should be noted that these projections are neither targets nor goals. They are DBEDT's best estimates of likely trends in important population and economic variables based on currently available information. The accuracy of these projections depends on the degree to which historical trends provide guides to the future, changing external conditions, infrastructure capacity, and other supply constraints which have not been incorporated into the model.

Section 1 of this report summarizes the population and economic projections for the state and counties. Section 2 describes the methodology and assumptions that were used to produce the projections. The appendix tables contain detailed projections.

I. Summary of Projections

1. Population

The resident population of Hawaii, which includes active-duty military personnel and their dependents, is projected to increase from 1,363,621 in 2010 to 1,708,900 in 2040, an average growth rate of 0.8 percent per year over the projection period.

The level of active-duty military personnel has been increasing in recent years. Without a clear known direction of the future level of military personnel in Hawaii this projection is produced based on an assumption that the population of active-duty military personnel will decrease gradually from its 2010 level to the past ten year average.

Table 1-1 presents the projection of total resident population by county. As has been the case with previous DBEDT long-range projections, the Neighbor Island counties are projected to have higher population growth than Honolulu. The resident population of the City and County of Honolulu is projected to increase at an annual rate of 0.4 percent from 2010 to 2040, while Hawaii County is projected to grow at 1.6 percent annually, Maui County at 1.4 percent, and Kauai County at 1.1 percent.

As a result, the Neighbor Island population as the share of the state total will increase from 29.9 percent in 2010 to 36.4 percent in 2040, while the corresponding share of the City and County of Honolulu is projected to decrease from 70.1 percent to 63.6 percent.

Table 1-1. Resident Population by County: 1980-2040

Year	State Total	Hawaii County	Honolulu County	Kauai County	Maui County
1980[1]	968,500	92,900	764,600	39,400	71,600
1985[1]	1,039,698	105,900	804,294	44,357	85,147
1990[1]	1,113,491	121,572	838,534	51,676	101,709
1995[1]	1,196,854	140,492	881,399	57,068	117,895
2000[1]	1,213,519	149,244	876,629	58,568	129,078
2005[1]	1,292,729	168,237	918,181	62,863	143,448
2010[1]	1,363,621	185,406	955,775	67,226	155,214
2015[2]	1,418,300	202,700	976,200	71,400	168,000
2020[2]	1,481,200	220,900	1,003,700	75,600	181,000
2025[2]	1,543,200	239,600	1,029,400	80,000	194,200
2030[2]	1,602,300	258,500	1,052,100	84,400	207,300
2035[2]	1,657,500	277,300	1,071,200	88,700	220,200
2040[2]	1,708,900	296,300	1,086,700	93,000	232,900
Average annual growth rate (%)					
1980-1985	1.4	2.7	1.0	2.4	3.5
1985-1990	1.4	2.8	0.8	3.1	3.6
1990-1995	1.5	2.9	1.0	2.0	3.0
1995-2000	0.3	1.2	-0.1	0.5	1.8
2000-2005	1.3	2.4	0.9	1.4	2.1
2005-2010	1.1	2.0	0.8	1.4	1.6
2010-2015[3]	0.8	1.8	0.4	1.2	1.6
2015-2020	0.9	1.7	0.6	1.2	1.5
2020-2025	0.8	1.6	0.5	1.1	1.4
2025-2030	0.8	1.5	0.4	1.1	1.3
2030-2035	0.7	1.4	0.4	1.0	1.2
2035-2040	0.6	1.3	0.3	0.9	1.1

[1] July estimates by the U.S. Census Bureau
[2] DBEDT projections, figures presented here can be different from those in the appendix tables because of rounding.
[3] Assumption of a gradual decrease of the military personnel from 40,300 in 2010 to 36,800 in 2015 is reflected in the slow growth rate during this period.

The size and composition of the population are affected by the interaction of three variables: births, deaths, and net migration. This projection is based on the assumption that the fertility rate will remain constant at the 2007-2009 level, while the survival rate is assumed to steadily improve over the projection period. The methodology used to calculate the future value of survival rates is discussed in the next section.

Table 1-2. De Facto Population by County: 1980-2040

Year	State Total	Hawaii County	Honolulu County	Kauai County	Maui County
1980[1]	1,054,218	99,181	822,408	46,341	86,288
1985[1]	1,136,160	112,343	853,605	55,086	115,125
1990[1]	1,257,319	137,103	913,268	68,558	138,390
1995[1]	1,298,096	152,482	921,626	68,844	155,144
2000[1]	1,336,005	166,429	926,192	74,734	168,650
2005[1]	1,412,500	188,612	959,340	79,561	184,987
2010[1]	1,469,236	202,552	988,316	83,352	195,015
2015[2]	1,539,100	221,200	1,016,800	89,500	211,600
2020[2]	1,604,100	239,700	1,043,900	94,500	226,000
2025[2]	1,669,800	259,000	1,070,100	99,800	240,900
2030[2]	1,732,300	278,400	1,093,200	105,000	255,700
2035[2]	1,791,400	297,800	1,113,100	110,200	270,400
2040[2]	1,846,500	317,300	1,129,300	115,200	284,700
Average annual growth rate (%)					
1980-1985	1.5	2.5	0.7	3.5	5.9
1985-1990	2.0	4.1	1.4	4.5	3.7
1990-1995	0.6	2.1	0.2	0.1	2.3
1995-2000	0.6	1.8	0.1	1.7	1.7
2000-2005	1.1	2.5	0.7	1.3	1.9
2005-2010	0.8	1.4	0.6	0.9	1.1
2010-2015	0.9	1.8	0.6	1.4	1.6
2015-2020	0.8	1.6	0.5	1.1	1.3
2020-2025	0.8	1.6	0.5	1.1	1.3
2025-2030	0.7	1.5	0.4	1.0	1.2
2030-2035	0.7	1.4	0.4	1.0	1.1
2035-2040	0.6	1.3	0.3	0.9	1.0

[1] DBEDT estimates
[2] DBEDT projections

Due to population aging and faster increase in deaths in comparison to births, the natural population increase (i.e., total births minus total deaths) will decrease over time even with improving survivorship (Table 1-3). This implies that the state will need more net-migration than experienced in the past to support the same level of population growth.

Our assumptions for future migration were developed based on historical time series information on population change and natural population growth, and the Census Bureau's estimates of historical international migration. International migration, which has shown a relatively stable level in the past, was assumed to follow a trend similar to what Hawaii experienced in the past 10 years. Unlike international migration, net domestic migration has shown a great volatility in

the past. Our assumption for future net domestic migration was developed by combining county staffs' observations on ongoing trends and their prospects for the future trend to the estimated past trend. Overall, the net domestic migration was projected to be a little lower than experienced in the past. Together with declining natural population growth, it resulted in moderate population growth in the future.

Table 1-3. Components of Change in Other Civilian Population (Annual average for the period)

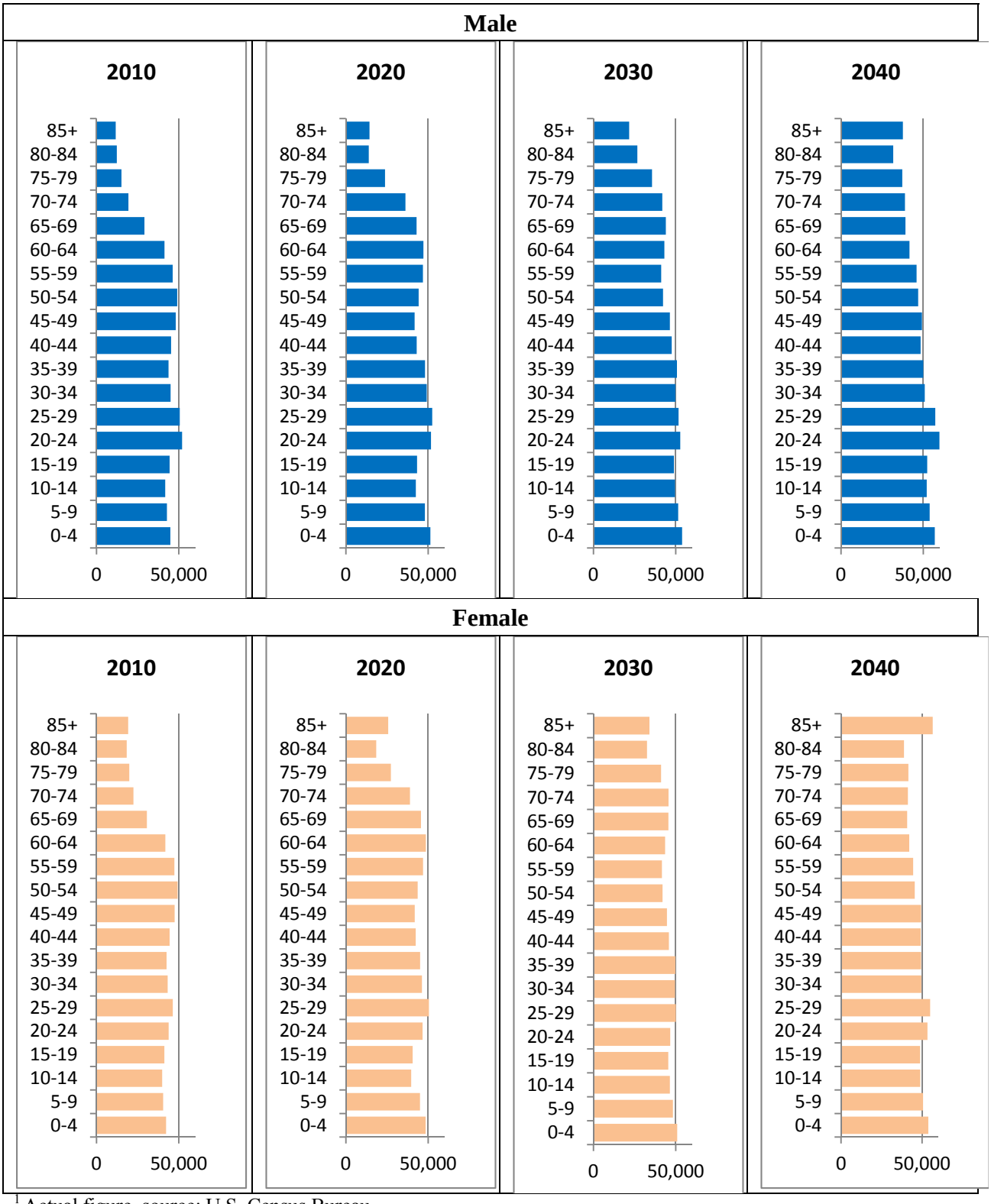
Period	Population change	Number of births[3]	Number of deaths	Net migration
1980-1985[1]	13,400	14,700	5,200	3,900
1985-1990[1]	16,500	15,000	6,100	7,600
1990-1995[1]	20,200	16,000	7,000	11,200
1995-2000[1]	4,600	14,700	8,000	-2,100
2000-2005[1]	13,400	14,800	8,500	7,100
2005-2010[1]	13,100	15,900	9,200	6,400
2010-2015[2]	12,700	16,420	10,300	6,600
2015-2020[2]	12,600	17,200	11,200	6,600
2020-2025[2]	12,400	17,800	12,000	6,600
2025-2030[2]	11,800	18,200	13,000	6,600
2030-2035[2]	11,000	18,700	14,300	6,600
2035-2040[2]	10,300	19,400	15,800	6,600

[1] DBEDT calculation based on the population data by U.S. Census Bureau
[2] DBEDT projections
[3] Decrease of births during 1995-2005 reflects a decrease of the female population at child bearing ages. The population between 25 and 44 years old decreased by 11 percent from 1992 to 2003 while the total population increased by 8 percent for the same period.

The aging of the population is one of the most prominent features of Hawaii's population trend. The share of the population 65 years of age and over increased from 8.0 percent in 1980 to 14.5 percent in 2010. This trend will continue in the future, increasing this share of the total population to 23.6 percent in 2040 (Table 1-4). Figure 1-1 compares the age structure of the population of the State of Hawaii from 2010 to 2040 by gender. As seen in the figures, the aging of Hawaii's population is more evident for the female population.

Projections of population for the state and four counties by selected characteristics and by five-year age groups are presented in Appendix Tables A-2 through A-21.

Figure 1-1. Age Distribution for the Resident Population of Hawaii: 2010 to 2040



[1] Actual figure, source: U.S. Census Bureau
[2] DBEDT projections

Table 1-4. Share of Total Resident Population by Age Group: 1980-2040

Age group	1980[1]	1990[1]	2000[1]	2010[1]	2020[2]	2030[2]	2040[2]
0-14	23.3%	21.4%	20.2%	18.5%	18.5%	18.8%	18.5%
15-24	19.8%	14.8%	13.6%	13.3%	12.3%	12.1%	12.6%
25-34	18.7%	18.1%	14.1%	13.6%	13.4%	12.6%	12.5%
35-44	11.6%	16.2%	15.8%	12.9%	12.0%	12.1%	11.5%
45-54	9.7%	9.8%	14.2%	14.2%	11.6%	10.9%	11.1%
55-64	8.9%	8.5%	8.9%	13.0%	12.8%	10.6%	10.2%
65+	8.0%	11.2%	13.3%	14.5%	19.4%	23.0%	23.6%

[1] DBEDT calculation based on the population data by U.S. Census Bureau
[2] DBEDT projections

2. Gross Domestic Product and Personal Income

Projections of gross domestic product (GDP) and personal income are summarized in Tables 1-5 and 1-6. With decelerating population growth, the projection predicts moderate economic growth as a whole.

The real gross domestic product of Hawaii is forecast to grow at 1.7 percent per year over the projection period. The growth of GDP depends on demand from outside the region as well as local consumption and investment. Demand from outside the region is assumed exogenously as it is determined by factors that are difficult to incorporate in the model.

Table 1-5. Projections of Real GDP

Real GDP (State total, in million 2005 dollars)						
2010[1]	2015[2]	2020[2]	2025[2]	2030[2]	2035[2]	2040[2]
59,329	65,400	71,500	77,700	84,100	90,600	97,200
Average Annual Growth Rate						
2010-2015	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040	
2.0%	1.8%	1.7%	1.6%	1.5%	1.4%	

[1] Actual figure, source: U.S. Bureau of Economic Analysis (BEA),
[2] DBEDT projections

This projection takes into accounts the large government construction plans that have already been approved and scheduled for the projection period. Besides these, the projection anticipates an overall slowdown in the long-term growth of investment, leading to a forecast of a moderate GDP growth.

Another factor that contributes to the moderate level of GDP growth is an anticipation of slow tourism growth. Although tourism expenditures grew at a double digit rate during the recovery period from the recent recession, it is expected to grow at an average of 1.0 percent annually in real terms for the period of 2011-2040. Table A-69 in the Appendix provides more detailed tourism projections by county.

Hawaii's total personal income is forecast to grow at an annual rate of 1.7 percent in real terms over the projection period.

With a growing population, per capita personal income will grow at a lower rate than that of total personal income. In particular, the Neighbor Islands are expected to experience relatively low growth of per capita personal income as a result of higher rates of population growth.

Figure 1-2. Average Annual Growth of Real Personal Income for the State

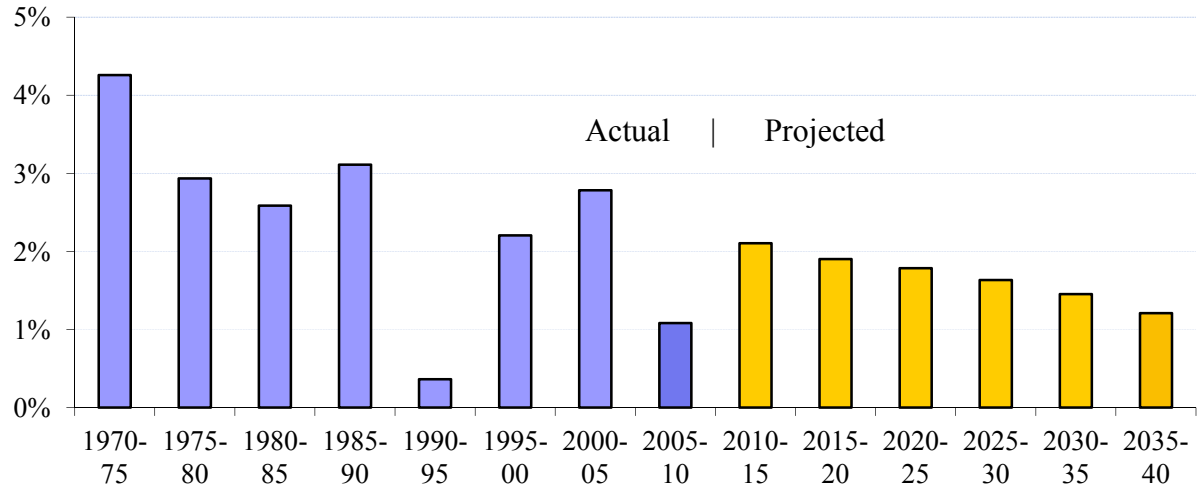


Table 1-6. Actual and Projected Personal Income (in million 2005 dollars)

	1980[1]	**1990**[1]	**2000**[1]	**2010**[2]	**2020**[3]	**2030**[3]	**2040**[3]
State Total	26,277	34,796	39,517	47,838	58,330	69,100	79,170
Hawaii County	2,224	2,827	3,702	5,040	6,700	8,450	10,120
Honolulu County	21,372	27,821	30,414	36,140	43,180	50,290	56,870
Kauai County	932	1,348	1,643	2,000	2,510	3,060	3,560
Maui County	1,749	2,799	3,757	4,670	5,950	7,300	8,620
Average Annual Growth Rate							
	1980-90	1990-00	2000-10	2010-20	2020-30	2030-40	
State total	2.8%	1.3%	1.9%	2.0%	1.7%	1.4%	
Hawaii County	2.4%	2.7%	3.1%	2.9%	2.3%	1.8%	
Honolulu County	2.7%	0.9%	1.7%	1.8%	1.5%	1.2%	
Kauai County	3.8%	2.0%	2.0%	2.3%	2.0%	1.5%	
Maui County	4.8%	3.0%	2.2%	2.5%	2.1%	1.7%	

[1] Actual figure, source: U.S. Bureau of Economic Analysis (BEA)
[2] County figures for 2010 are DBEDT estimates while state figures for 2010 are from the BEA
[3] DBEDT projections

Among the components of personal income, transfer payments are expected to grow at a faster rate than other components because of increased retirement incomes of the aging population. As a result, the share of transfer payments to total personal income is projected to increase from 15.9 percent in 2010 to 23.0 percent in 2040, while the share of labor income, the largest component of personal income, is projected to decrease from 73.1 percent in 2010 to 65.5 percent in 2040.

Detailed historical series and projections of personal income are reported in Appendix Tables A-57 through A-62.

3. Jobs and Employment

Total civilian wage and salary jobs in Hawaii are expected to increase from 623,573 in 2010 to 753,700 in 2040, an average annual growth of 0.6 percent throughout the forecast period. Total jobs (wage and salary jobs plus self-employed jobs) are projected to have a higher growth rate than that of wage and salary jobs, from 792,057 in 2010 to 1,044,900 in 2040, an average annual growth of 0.9 percent over the projection period.

The higher growth rate of projected total jobs is due to a faster growth rate projected for self-employed jobs than wage and salary jobs. For the period from 1980 to 2010, self-employed jobs have achieved 2.7 percent annual growth on average, while the average annual growth of wage and salary jobs for the period was 1.1 percent. As a result, the statewide share of self-employed jobs to total jobs increased from 14.3 percent in 1980 to 21.3 percent in 2010. This trend is expected to continue in the future, but at a more moderate rate than observed in the past.

Jobs in the other counties have increased at a much faster rate than in Honolulu in the past. This trend is expected to continue over the projection period, increasing the Neighbor Island's share of statewide total jobs from 28.9 percent in 2009 to 33.9 percent in 2040.

Figure 1-3. Average Annual Growth of Total Civilian Jobs for the State

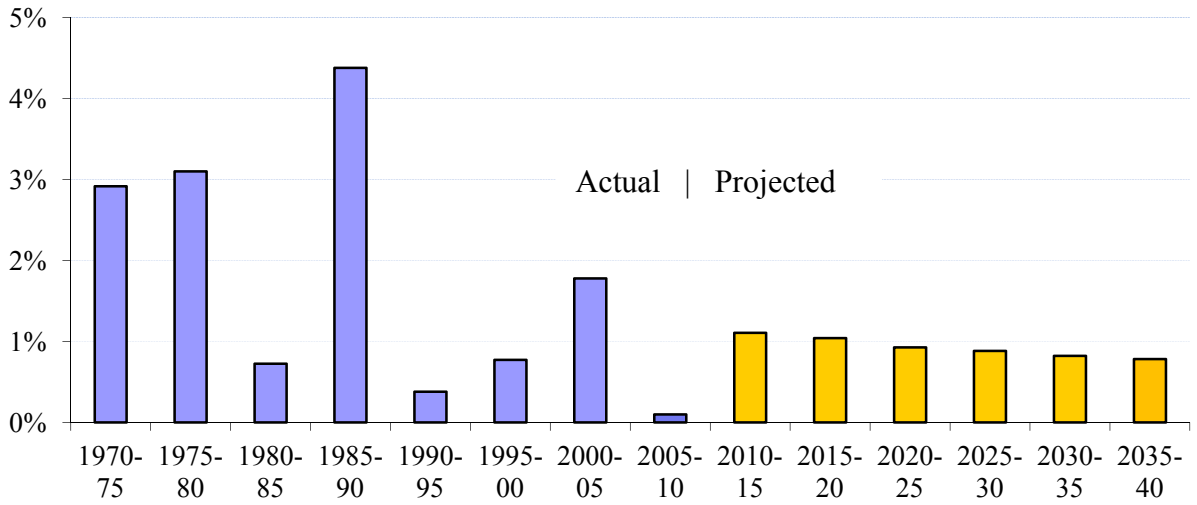


Table 1-7. Actual and Projected Civilian Jobs

	1980[1]	1990[1]	2000[1]	2010[2]	2020[3]	2030[3]	2040[3]
State Total							
Total Jobs	530,417	681,354	721,661	792,057	881,400	964,600	1,044,900
W&S Jobs	454,618	575,925	589,148	623,573	673,800	716,200	753,700
Self-employed Jobs	75,799	105,429	132,513	168,484	207,600	248,300	291,200
Hawaii County							
Total Jobs	45,948	66,884	79,142	93,900	112,200	131,400	151,700
W&S Jobs	34,847	52,088	59,122	66,300	75,700	84,500	93,100
Self-employed Jobs	11,101	14,796	20,020	27,600	36,600	46,900	58,600
Honolulu County							
Total Jobs	423,522	515,631	522,866	562,800	611,800	653,400	690,400
W&S Jobs	369,265	442,944	436,758	458,600	489,000	513,600	534,100
Self-employed Jobs	54,257	72,687	86,108	104,200	122,700	139,900	156,200
Kauai County							
Total Jobs	21,718	32,610	36,441	40,900	46,500	52,000	57,500
W&S Jobs	17,968	26,599	27,939	29,500	31,900	34,000	35,800
Self-employed Jobs	3,750	6,011	8,502	11,400	14,600	18,000	21,700
Maui County							
Total Jobs	39,229	66,229	83,212	94,400	110,900	127,700	145,300
W&S Jobs	32,538	54,294	65,329	69,200	77,100	84,200	90,700
Self-employed Jobs	6,691	11,935	17,883	25,200	33,700	43,600	54,600

	Average Annual Growth Rate					
	1980-90	1990-00	2000-10	2010-20	2020-30	2030-40
State Total						
Total Jobs	2.5%	0.6%	0.9%	1.1%	0.9%	0.8%
W&S Jobs	2.4%	0.2%	0.6%	0.8%	0.6%	0.5%
Self-employed Jobs	3.4%	2.3%	2.4%	2.1%	1.8%	1.6%
Hawaii County						
Total Jobs	3.8%	1.7%	1.7%	1.8%	1.6%	1.4%
W&S Jobs	4.1%	1.3%	1.2%	1.3%	1.1%	1.0%
Self-employed Jobs	2.9%	3.1%	3.3%	2.8%	2.5%	2.2%
Honolulu County						
Total Jobs	2.0%	0.1%	0.7%	0.8%	0.7%	0.6%
W&S Jobs	1.8%	-0.1%	0.5%	0.6%	0.5%	0.4%
Self-employed Jobs	3.0%	1.7%	1.9%	1.6%	1.3%	1.1%
Kauai County						
Total Jobs	4.1%	1.1%	1.2%	1.3%	1.1%	1.0%
W&S Jobs	4.0%	0.5%	0.5%	0.8%	0.6%	0.5%
Self-employed Jobs	4.8%	3.5%	3.0%	2.5%	2.1%	1.9%
Maui County						
Total Jobs	5.4%	2.3%	1.3%	1.6%	1.4%	1.3%
W&S Jobs	5.3%	1.9%	0.6%	1.1%	0.9%	0.8%
Self-employed Jobs	6.0%	4.1%	3.5%	3.0%	2.6%	2.3%

[1] Actual figure, source: U.S. Bureau of Economic Analysis (BEA)
[2] County figures for 2010 are DBEDT estimates while state figures for 2010 are from the BEA
[3] DBEDT projections, figures presented here can be different from those in the appendix tables because of rounding.

Rapid expansion of older population has raised concerns over the future labor supply. Labor force is determined by the size of the working-age population and the labor force participation rate. Although the working-age population, consisting of persons 16 years of age and over, is expected to grow faster than the total population, the faster growth will largely be attributable to the expansion of the older population segment consisting of persons 65 years and over. Consequently, the growth of the labor force will slow down significantly during the projection period as the older population group leaves the workforce and moves into retirement.

The number of employed is expected to grow slower than job growth. The state's total civilian employed is projected to reach 708,500 by 2040, an annual growth of 0.6 percent and a 20.6 percent increase from the 2010 level. Due to multiple job holders, the number of employed has typically been lower than the total number of jobs. While the ratio of employed to jobs tends to be affected by economic conditions at the time, it has largely shown downward trends, particularly in 2000s. The statewide ratio of employed to total jobs decreased from 0.81 in 2000 to 0.74 in 2010. This trend is expected to continue over the projection period, lowering the rate to 0.68 in 2040.

Table 1-8. Actual and Projected Civilian Employed

	1980[1]	**1990**[1]	**2000**[1]	**2010**[1]	**2020**[2]	**2030**[2]	**2040**[2]
State Total	419,750	537,600	584,850	587,400	633,000	672,400	708,500
Hawaii County	40,850	56,300	70,750	75,150	88,000	100,900	113,900
Honolulu County	322,800	401,250	416,450	414,500	434,200	448,500	459,900
Kauai County	18,700	25,200	29,000	29,050	32,300	35,300	38,000
Maui County	35,650	54,900	68,700	68,700	78,500	87,700	96,600
Average Annual Growth Rate							
	1980-90	1990-00	2000-10	2010-20	2020-30	2030-40	
State total	2.5%	0.8%	0.0%	0.8%	0.6%	0.5%	
Hawaii County	3.3%	2.3%	0.6%	1.6%	1.4%	1.2%	
Honolulu County	2.2%	0.4%	-0.0%	0.5%	0.3%	0.3%	
Kauai County	3.0%	1.4%	0.0%	1.1%	0.9%	0.8%	
Maui County	4.4%	2.3%	0.0%	1.3%	1.1%	1.0%	

[1] Actual figure, source: Hawaii State Department of Labor & Industrial Relations
[2] DBEDT projections

II. Hawaii Population and Economic Projection Methodology

The DBEDT 2040 projection series are produced using the Hawaii Population and Economic Projection and Simulation Model, which was developed by the Department in 1978 and refined over the years. It is an inter-industry econometric model that generates economic forecasts for the state and its four counties on an annual basis.

The 2040 Series uses the detailed population characteristics from the 2010 decennial census, 2010 job and income data from the Bureau of Economic Analysis, and the 2007 Hawaii input-output (I-O) tables as baseline data for the projection.

The model contains five blocks: final demand, income, output, employment, and population. The final demand components are either projected by a set of econometric equations or exogenously given. The statewide projected final demands are allocated to each industry using the relevant final demand vectors in the 2007 I-O table. Industrial outputs are then derived by multiplying the projected final demands by the total requirements matrix of the 2007 I-O table.

Jobs are derived by dividing each industry's projected output by job-to-output ratio. Once jobs are projected, labor income is estimated as a function of total jobs.

The population projection is done separately using the cohort component method. However, the demographic module interacts closely with the economic module, as the demographic size and characteristics are key factors in the determination of many economic variables.

For endogenous variables, regression-based analyses are conducted to capture economic relationships among the variables. To capture county-specific behavior, the variables are estimated at the county level whenever necessary data are available. When data are not available at the county level or when estimations at the county level involve excessive randomness, variables are estimated at the state level and the state-level estimates are allocated to each county using other relevant information.

With a few exceptions, variables are estimated in logarithmic forms so that the estimated coefficients represent elasticities of dependent variables with respect to the change in explanatory variables. When the estimation results show the presence of autocorrelation in error terms, AR (autoregressive) terms are added to the equations to correct the problem.

The following sections describe the demographic and economic modules of the model.

1. The Demographic Module

The resident population is divided into three components: military personnel, military dependents, and other civilians. The number of military personnel and their dependents stationed in Hawaii is mainly the result of national defense considerations, with the state's economic situation having little impact. In the current projections, the population of active-duty military personnel and their dependents were assumed to be exogenous using information available at the time of the projection. The projected totals were then allocated to each age and sex category using the age and sex composition of military personnel and their dependents. The age and sex composition of military personnel and their dependents were derived from the American Community Survey 5 year data set covering the period from 2006 to 2010.

The other civilian component of population was projected from a base population using the cohort-component method. Other civilian population at a year t is estimated as the population from the previous year, plus births minus deaths plus net migration.

$$CIVILIAN_{t,k} = CIVILIAN_{t-1,k-1} + BIRTHS_t - DEATHS_{t,k} + NETMIG_{t,k}$$

where $CIVILIAN_{t,k}$: number of other civilians at age k in year t
$BIRTHS_t$: number of newborn babies in year t
$DEATHS_{t,k}$: number of other civilians deceased at age k in year t
$NETMIG_{t,k}$: number of net migrants at age k in year t

The foundation data sets used for population projections include the 2010 decennial population census, intercensal estimates for the 2001-2009 period by the U.S. Census Bureau, and birth and death data collected by the Hawaii Department of Health. At the county level, the U.S. Census Bureau provides only an abridged population table containing data by 5-year age intervals. In order to produce a single age-sex population table for the other civilian population for each county, the single-year age by sex tables for each county and state from the decennial censuses were used as supplementary information.

Projection of the population is based on a complex set of assumptions about fertility and mortality. These assumptions play a key role in determining the size of natural population increase and age structure of the population in the future. Methodologies used in estimating current levels of fertility and mortality rates, and assumptions about their future levels are explained in detail below.

Fertility Rates

An age-specific fertility rate indicates the probability that a woman of childbearing age will give birth in a given year. Multiplied by the number of females of childbearing age, fertility rates estimate the number of births that will take place in a given year.

The age-and sex-specific fertility rates for each of the four counties were estimated using the birth data from the Hawaii State Department of Health. These data contain detailed information on each individual birth compiled by the sex of baby, the age of mother, the residence and military status of the baby's parents. Since the size of military dependent population was

assumed to be determined by the number of the armed forces stationed in Hawaii, births by military dependent female or female in the armed forces were removed from the calculation.

The age-and sex-specific fertility rates for other civilian population were then calculated by dividing the number of other civilian births for each gender by the number of other civilian women in each age category. In order to mitigate random fluctuation in estimates due to small sample size, data for three years from 2007 to 2009 were averaged to produce the 2008 estimates of age-specific fertility rates for each county (Appendix Tables A-22 through A-26).

The next step was to adjust the calculated 2008 fertility rates for the likely change in the future fertility rates. The difficulty lies in the fact that the direction of the future fertility change is not clear. Fertility rates in most developed countries have declined sharply for many decades since the end of baby boom years. In the U.S. the downward trend continued until around 1980. Since then, the fertility rates of the U.S. have been relatively stable. Fertility rates in Hawaii have shown similar trends as in the U.S. albeit the total fertility rate of Hawaii has shown a slight increase in 2000s.

Fertility rates change over time as a result of changes in age and ethnicity composition, maternity patterns, socio-economic factors, and changes in policies that may affect the cost of bearing and raising children. Since we do not have clear clues on the future direction of those factors, it often seems to remain an open question whether the fertility rates in a region would increase or decrease in the future.

The assumptions for future fertility rates used by the U.S. Census Bureau are not consistent across the projection series. In the population projections released in 1996, the U.S. Census Bureau assumed a slight increase in overall fertility, but the assumption varied by ethnic groups. For example, levels of fertility were assumed to increase slightly for Whites and Blacks, decrease slightly for Asians and remain constant for Hispanics. If we adopt the Census Bureau's assumption, we may have to consider an assumption somewhere between a slight decrease in fertility rate and constant fertility rate since Hawaii has large proportion of Asian population. The Census Bureau, however, held fertility rates constant throughout the projection periods in its 2005 population projections series for states, while the previous assumptions were kept for national population projections.[1] This inconsistency reflects the lack of consensus on the future trends of fertility rates in the U.S.

With a lack of both consensus and analysis on the direction of fertility changes in Hawaii, this projection assumed fertility rates for each county to remain constant at 2007-2009 average levels throughout the projection period.

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[1] *Methodology Summary, Interim Population Projections for States by Age and Sex: 2004 to 2030*, Population Projections Branch, Population Division, U.S. Census Bureau,
Methodology and Assumptions for the Population Projections of the United states: 1999 to 2100, Population Division Working Paper N0.38, Population Division, U.S. Census Bureau, January 2000.

Life Tables and Survival Rates

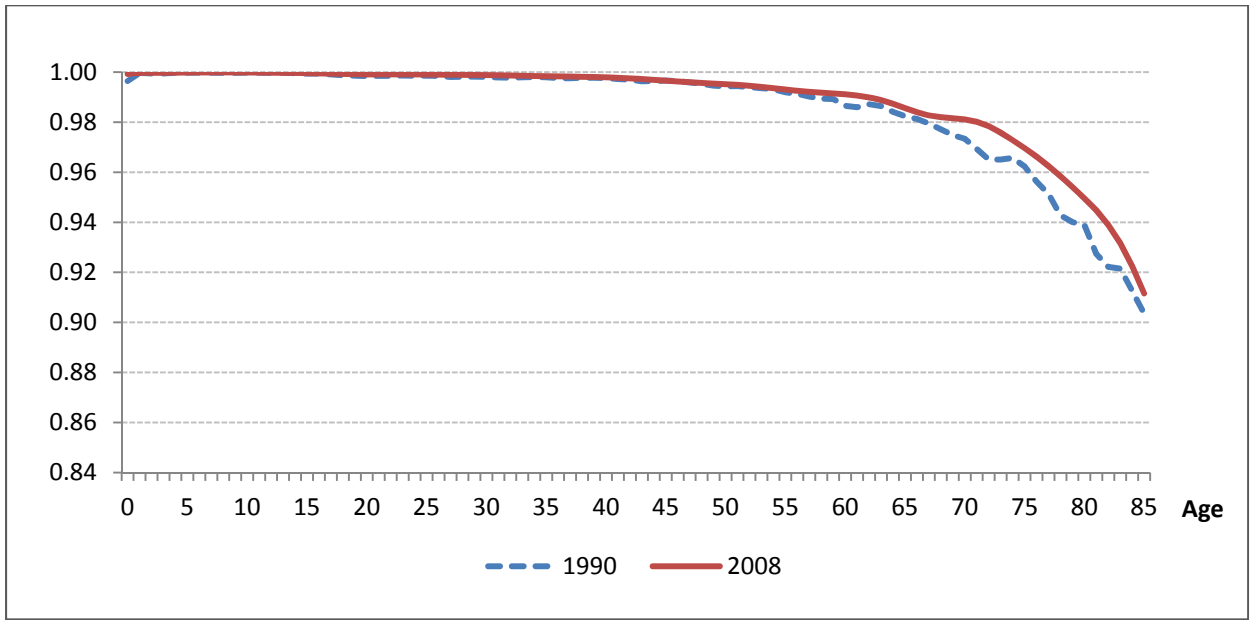
The life tables for the other civilian population component were developed for the four counties using the same life table methodology as used for the U.S. national life tables.[2]

First, mortality rates for the year 2008 were calculated by dividing the average deaths for 2007 through 2009 by the other civilian population in each category for the corresponding years. Next, the number of persons living at the beginning of each age interval was calculated. This statistic was standardized by beginning from a group total of 100,000 in the less-than-one age group. Then the number of expected deaths in each age group was subtracted from the number living at the beginning of that age interval to produce the number living at the beginning of the next interval.

In order to approximate mid-year (July 1st) conditions, the stationary population in the interval was calculated by subtracting half the number dying in each age interval from the number living at the beginning of the interval. Survival rates for each age were then calculated by dividing the stationary population in each interval by the population in the previous interval (Appendix Tables A-27 through A-36).

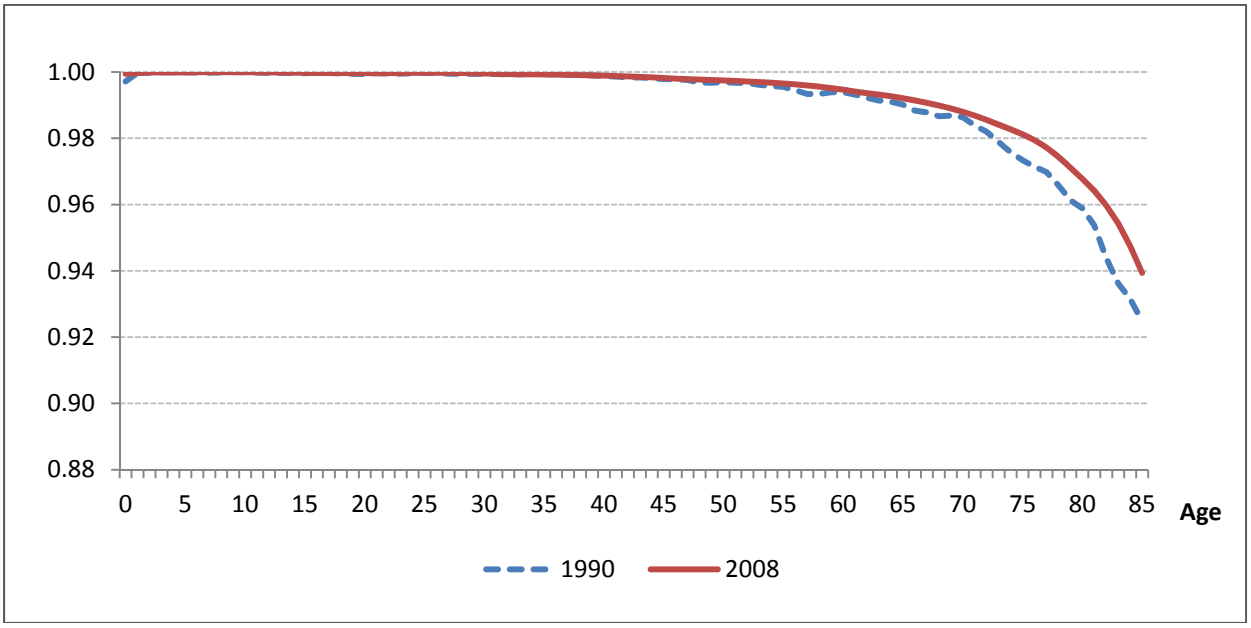
Compared to fertility rates, the future direction of changes in mortality rates is less controversial. With better health services and increased affluence, mortality rates have generally decreased over time and will continue to decrease (Figures 2-1 and 2-2).

Figure 2-1. Survival Rates for Males in Hawaii



[2] "United States Life Tables, 2003", *National Vital Statistics Reports*, Center for Disease Control and Prevention, April 2006.
Palmore, J. and R.Gardner, *Measuring Mortality, Fertility, and Natural Increase*, East-West Center, Honolulu, 1994.

Figure 2-2. Survival Rates for Females in Hawaii



The question is to what degree and in what pattern the mortality rates would decrease in the future. In this projection, age- and sex-specific mortality rates were adjusted in the following manner using methodologies used by the U.S. Census Bureau. Firstly, target life expectancies at birth for the four counties in Hawaii were developed using target life expectancy for the nation developed by the Census Bureau as a reference. The middle series projections of the Census Bureau, that were published in January 2000, were based on the assumption that average life expectancy at birth for the U.S. will increase gradually from 1999 values of 74.1 years for the male population and 79.8 years for the female population to 2050 values of 81.2 years for the male population and 86.7 years for the female population.[3] Based on a review of historical relationship between life expectancy in Hawaii and that of the U.S., target life expectancies for the four counties in Hawaii in 2040 were developed as presented in Table 2-2.

Table 2-1. Life Expectancy at Birth for the U.S. and Hawaii: 1980-2008 (Total Residents)

	United States			**Hawaii**		
	Both Sexes	Male	Female	Both Sexes	Male	Female
1980	73.7	70.0	77.4	77.8	74.5	81.5
1990	75.4	71.8	78.8	78.9	75.9	82.1
2000	77.0	74.3	79.7	79.8	77.1	82.5
2005	77.8	75.2	80.4	80.5	77.6	83.4
2008	NA	NA	NA	81.1	78.3	83.9

Source: Hawaii State Data Book, multiple issues.
Life expectancies for Hawaii for 2001- 2008 are estimates by DBEDT.

[3] *Methodology and Assumptions for the Population Projections of the United states: 1999 to 2100*, Population Division Working Paper N0.38, Population Division, U.S. Census Bureau, January 2000.

Table 2-2. Projected Life Expectancy at Birth for Hawaii: 2008 and 2040 (Other Civilian)

	Life Expectancy in 2008[1]		Projected Life Expectancy in 2040[2]	
	Female	Male	Female	Male
State of Hawaii	83.9	78.3	88.3	83.0
Hawaii County	82.8	76.5	87.2	81.1
Honolulu County	84.1	78.8	88.6	83.5
Kauai County	83.1	77.9	87.5	82.5
Maui County	83.6	77.8	88.0	82.4

[1] DBEDT Estimates.
[2] DBEDT Projections.

The next step involved adjusting mortality rates to meet the target life expectancies. To develop the pattern of mortality decline in the future, the Census Bureau collected expert opinions regarding how much faster the mortality rates of some age groups will decline in the future relative to the others. They divided the population into three age groups: under 15, between 15 and 65, and over 65. Their survey found that "average annual rate of mortality decline" experienced by the age group under 15 years will be 2.1 times higher than that of the age group over 65 years until 2020 and 1.6 times higher for the year after 2020. For the age group between 15 to 64 years, it will be 1.3 times higher than that of the age group over 65 years until 2020 and 1.2 times higher for the year after 2020. [4]

In this projection, the same rates of mortality decline as developed by the Census Bureau were assumed with one modification. The age group over 65 years was further divided into two groups: age group between 65 and 84 and age group over 85. This modification was introduced with the notion that mortality rates for extremely high ages tended to be underestimated in Hawaii. Underestimation of mortality and overestimation of population at extremely high ages have been reported by many demographers.[5] In order to reduce this potential exaggeration of older population, it was assumed that mortality rates of the age group over 85 years would decrease at a rate lower than that of the age group between 65 to 84 years throughout the projection period.

Using these assumptions, life tables for the projection period were constructed to project annual population and deaths of other civilians for each county.

Net Migration

Net migration includes net domestic migration and net international migration. In this version of the projection, the international migration was assumed to remain constant at its average of the past 10 years. On the other hand, the net domestic migration was assumed at a level that was 15 percent lower than observed in the past 10 years.

[4] See same reference as in the footnote 3, pp12-13.
[5] Wilmoth, J.R., "Are Mortality Rates Falling at Extremely High Ages: An Investigation Based on a Model Proposed by Coale and Kisker", *Population Studies*, Vol.49. No.2, July 1995, pp281-295.

The projected net migration for the state total was then allocated to each county using the patterns observed in the past 10 years, and each county total was allocated to each single age-sex category using distributions from the American Community Survey (ACS) migration data.

2. The Economic Module

Projection of GDP and Final Demand

Gross Domestic Product (GDP) for states is the state equivalent of GDP for a nation. Two approaches can be used to estimate GDP for a state: the income approach and the expenditure approach. GDP estimates published by the U.S. Bureau of Economic Analysis (BEA) are measured using the income approach as the summation of the factor income earned and costs of production. We estimated GDP using the expenditure approach as follows;

$$GDP = C + I + G + (X – M)$$

where C : Personal consumption expenditures
I : Private investment
G : Government spending, including government investment
X : Exports
M : Imports

Conceptually, the two approaches should yield the same estimates since they are basically two different methods for measuring the state's overall economic activity. However, due to many practical details involved in calculating nominal and real GDP, the estimates of GDP included in the projections need to be compared to the BEA's estimates of GDP with caution.

Each component of GDP can be divided into many sub-components for an effective estimation. Exports were divided into tourism export and non-tourism exports. Government spending was defined in terms of three components: state and local government spending, federal military spending, and federal civilian spending. Due to lack of data at the county level, most components of final demand were projected at the state level.

In all estimation equations presented in this report, the subscript 't' indicates year while 'i' indicates industry.

Personal Consumption Expenditures

The annual estimates of personal consumption expenditures (PCEs) for the State of Hawaii were no longer available after 2000 when DBEDT decided to use BEA's estimates of GDP by State instead of estimating on its own. From then on, PCEs of Hawaii were estimated only once every few years as part of the construction of the Hawaii I-O tables. Historically, however, personal consumption had shown a relatively stable relationship with income. Assuming the continuation of the relationship over time, PCEs were estimated as a function of disposable personal income (DPI) as follows;

$$\ln(PCEs)_{t,state} = \beta_0 + \beta_1 \bullet \ln(DPI)_{t,\,state} + AR(1)$$

The first order autoregressive term- AR(1) - was included to correct the autocorrelation in error.

Private Investment

Determining the size of the capital stock of an economy, investment is a key element of long-term economic growth. In spite of this, forecasting future levels of investment is not an easy task due to its severe volatility and cyclical behavior. A number of different model specifications were examined using data from many different sources. At the end of numerous econometric exercises, the following specification was adopted.

Private investment (PIV) was modeled as a function of the demand for houses (DHOUSE), unemployment rate (UNEMPRT), and the previous level of PIV. The unemployment rate was included to account for the sensitivity of the private investment to short-term fluctuations of the economy. Demand for houses was calculated by dividing total population with average household size for that year. Average household size was assumed to gradually decrease from 2.89 in 2010 to 2.8 in 2040 based on its historical trend.

$$PIV_{t,state} = \beta_0 + \beta_1 \bullet UNEMPRT_{t,state} + \beta_2 \bullet DHOUSE_{t,state} + \beta_3 \bullet PIV_{t-1,state}$$

$$DHOUSE_{t,state} = \frac{Population_{t,state}}{HouseholdSize_{t,state}}$$

Government Spending

The projection of state and local government spending (SLGS) was projected as a function of personal income (PI) as follows.

$$\ln(SLGS)_{t,state} = \beta_0 + \beta_1 \bullet \ln(PI)_{t,\,state} + AR(1)$$

Federal government spending was divided into two categories: military spending and civilian spending. Federal government civilian spending (FGCS) was estimated using an econometric model, while exogenously determined growth rates were applied to project military spending. Similar to state and local government spending, federal government civilian spending was assumed to depend on statewide personal income while federal government military spending was assumed to grow at about 1 percent annually in real terms over the forecast period.

$$\ln(FGCS)_{t,state} = \beta_0 + \beta_1 \bullet \ln(PI)_{t,\,state} + AR(1)$$

Exports

Exports consist of the commodities and services that are sold to people and businesses outside the State of Hawaii. If constraints in local production capacity are not considered, the level of exports would depend solely on factors outside the economy. For this reason, future levels of exports were either exogenously given or projected using a separate model.

Exports consist of tourism exports (visitor expenditures) and non-tourism exports. A detailed description of the methodology used for the projection of visitor expenditures is presented at the end of this section.

With little information on factors affecting non-tourism exports, they were modeled to be determined by the size of output. That is, exports for each industry were calculated assuming that the proportions of output to be exported in total output would remain constant at the levels in the 2007 I-O table.

Imports

The 2007 I-O tables contain information on proportions of inputs imported from outside the Hawaii economy for each industry and final demand sectors in that year. It was assumed that these proportions would remain constant over the projection period. Total imports were then estimated by multiplying the projected outputs and final demands by these import coefficients.

Projections of Output

Historical data on industrial outputs in Hawaii are not available on an annual basis. The U.S. Census Bureau publishes output data by industry at five-year intervals with a three year lag. The 2007 I-O tables of Hawaii were updated based on the 2007 Economic Census, which was the most recent release of output data by the Census Bureau at the time of the construction of the I-O tables.

The 2007 Hawaii I-O tables are available in two versions of industry aggregations. A detailed table includes 68 industry sectors, while a condensed table has 20 industry sectors. Industry classification in this projection series is consistent with the classification in the condensed version of the 2007 I-O tables. A detailed description of the 2007 Hawaii I-O tables is available on the DBEBT's web site at http://hawaii.gov/dbedt/info/economic/data_reports/2007-io.

The I-O tables include detailed information on flows of goods and services among the final demand and the producing sectors in the economy. Annual outputs for each industry were projected by applying the final demand-output relationships in the 2007 Hawaii I-O tables to the annually-projected final demands. To estimate final demand for an industry, each component of projected final demands was distributed among industries using the final demand coefficients derived from the I-O table. Total final demand for an industry was then estimated by summing up the individual components. The industry outputs were estimated using industries' projected final demands and the total requirement matrix from the 2007 I-O table. These projected outputs, in turn, formed the basis for projecting job counts by industry.

Projections of Jobs

Jobs data reported in this projection series are consistent with the BEA job data in definition and coverage with the exception that military jobs were subtracted from the BEA jobs data to calculate civilian jobs.

The projection of jobs involves two types of jobs: wage and salary jobs and self-employed jobs. In this projection, total jobs (wage and salary jobs plus self-employed jobs) were first projected for each industry using the ratios of total jobs to output, and then the wage and salary jobs and self-employed jobs were estimated based on their relationships to total jobs.

Total jobs (TJOB) for each industry at the state level were projected by multiplying corresponding outputs with industry specific total jobs-to-output ratios. As a result of productivity increase, more output per job and thus, fewer new jobs are required to increase output by a given amount. The job-to-output ratios were derived from the 2007 I-O tables and adjusted from the 2007 levels to reflect this advancement in production technology. Because of unavailability of annual output data, estimates of labor productivity growth were developed using the historical ratios of jobs and real GDP for each industry. The projected statewide total jobs by industry were then allocated to four counties based on historical trends.

$$TJOB_{t,i,state} = OUTPUT_{t,i,state} \bullet \left(\frac{TJOB}{OUTPUT}\right)_{t,i,state}$$

$$\left(\frac{TJOB}{OUTPUT}\right)_{t,i,state} = \left(\frac{TJOB}{OUTPUT}\right)_{t-1,i,state} \bullet \text{Productivity Factor}_i$$

Wage and salary jobs (WSJOB) were projected using the projections of total jobs, and industry and county specific ratios of the wage and salary jobs to the total jobs. The ratios of wage and salary jobs to total jobs were also adjusted to account for the observed trend of the increasing share of self-employed jobs. The statewide share of self-employed jobs out of total jobs increased from 14 percent in 1980 to 21 percent in 2010. The increasing trend is found in all four counties, albeit not to the same degree.

$$WSJOB_{t,i,county} = TJOB_{t,i,county} \bullet \left(\frac{WSJOB}{TJOB}\right)_{t,i,county}$$

$$\left(\frac{WSJOB}{TJOB}\right)_{t,i,county} = \left(\frac{WSJOB}{TJOB}\right)_{t-1,i,county} \bullet \text{Annual Changing Factor}_{county}$$

Self-employed jobs (SEJOB) for each industry for each county were then calculated as the residual.

$$SEJOB = TJOB - WSJOB$$

Projections of Employment and Labor Force

Employment can be defined in two ways. One is *person-based* and the other is *position-based*. In general, employment data that are published with labor force and unemployment data are based on household surveys, and are therefore, *person-based*. In this case, employment is defined as the number of people who are employed in a given period regardless of whether the person is working full-time or part-time.

On the other hand, the position-based employment is defined as the number of positions, full-time or part-time, in a given period. In this report, the term "Employment (or Employed)" is used to denote the *person-based* employment, and "Jobs" is used to denote the *position-based* employment.

Typically, *jobs* exceed *employed* because of multiple-job holders. If a person holds two part-time positions, the person would be counted once in the employment data but twice in the jobs data. The ratio of e*mployed* to total jobs in Hawaii was 0.74 in 2010.

EMPLOYED was estimated as a function of total jobs. Although the ratio of employed to total jobs has shown decreasing pattern in all four counties, the decreasing patterns are quite different across counties. For this reason, EMPLOYED was estimated for each county separately.

$$\ln(\text{EMPLOYED}_{t,\,\text{county}}) = \beta_0 + \beta_1 \bullet \ln(\text{TJOB}_{t,\,\text{county}}) + \text{AR}(1)$$

Labor force (LFORCE) consists of all members of the civilian non-institutionalized population aged 16 and over who have a job or are actively seeking one. It is calculated by multiplying the working age population - population aged 16 and over – with the labor force participation rate.

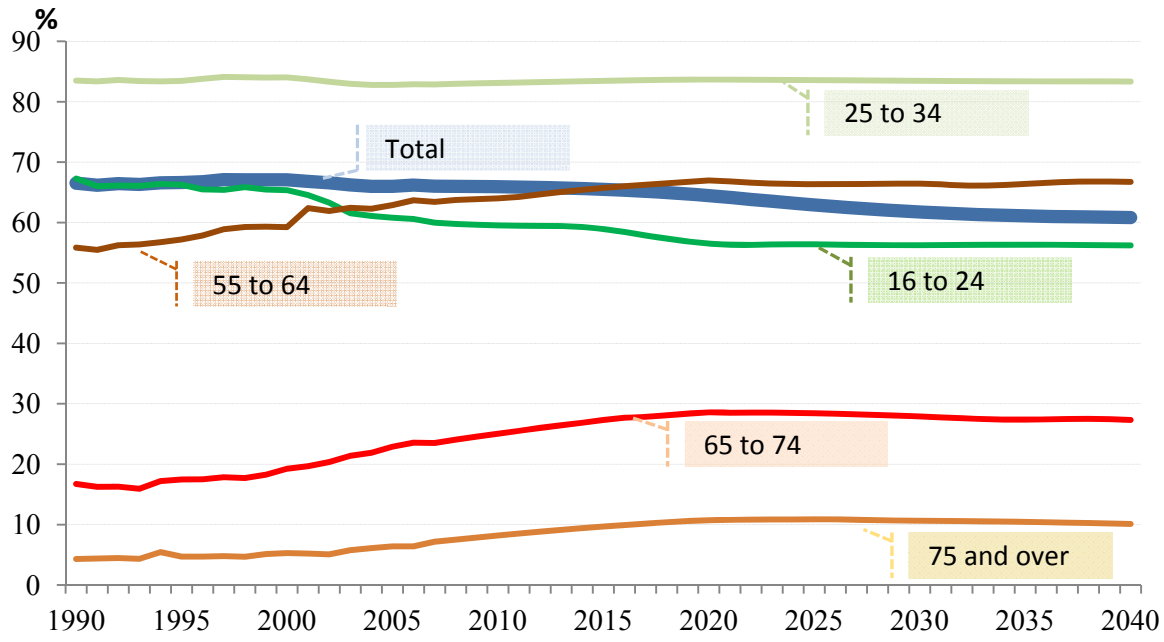
$$\text{Labor Force} = \text{Working Age Population} \bullet \text{Labor Force Participation Rate}$$

Labor force participation rates are affected by labor market conditions in the short term while the long term trend is determined by the composition of the working age population. The labor force participation rate in the U.S. peaked at 67.1 percent during the period from 1997 to 2000 and has gradually declined since 2000. The steady increase in the labor force participation rate until 2000 was mainly caused by the increasing share of women in the labor force. With the labor force participation rate of women stabilized, the long-term labor force participation rate is expected to gradually decrease over time due to the aging of the population.

Unlike the national trend, the labor force participation rate in Hawaii peaked at 68.5 percent in 1990 and has declined since then. It is not immediately clear whether the decline of Hawaii's labor force participation rate in the 1990s was mainly a result of high unemployment rates during the period or a result of an aging population. However, one thing is clear at this point as the baby boom generation enters retirement, the impact of the aging population on the labor supply will become more important in the coming decades.

In the previous projections, the labor force participation rate was estimated at the aggregate level using an econometric model. With increasing attention on the aging population and its impact on the labor supply, however, a new approach was employed in the current projection. To fully incorporate the different labor participation patterns by age, the labor force was projected by single age by multiplying the projected population by the age specific labor force participation rate. For future participation rate by age, a long-term projection by the U.S. Bureau of Labor Statistics (BLS) was used. The total labor force was then calculated as the sum of the projected single age labor forces. Figure 2-3 depicts the long-term trends of the BLS projections of participation rates by age group.

Figure 2-3. Projection of Labor Force Participation Rate by Age Group (BLS)



Once the civilian labor force and employed were projected, the unemployed (UNEMP) and unemployment rate (UNEMPRT) were calculated as follows;

$$UNEMP_{t,state} = LFORCE_{t,state} - EMPLOYED_{t,state}$$

$$UNEMPRT_{t,state} = \frac{UNEMP_{t,state}}{LFORCE_{t,state}} \bullet 100$$

Projections of Income

Personal income (PI) was projected in terms of four components: labor income, transfer payments, property income (dividends, interests and rent), and contributions for government insurance. Each of these components was projected as described below, and the following formula produces the projections of personal income;

Personal Income = Labor Income + Transfer Payment + Property Income
– Contributions for Government Social Insurance

Labor Income

Labor income (LINC) includes wages and salaries, supplements to wages and salaries, and proprietors' income. It was projected for each county as a function of total jobs in the county.

$$\ln(LINC)_{t,\ county} = \beta_0 + \beta_1 \bullet \ln(TJOB)_{t,\ county} + AR(1)$$

Transfer Payments

Transfer payments (TRANS) include retirement and disability insurance, Medicare and other medical benefits, unemployment insurance, and other federal assistance payments.[6] Thus, it was modeled to depend on the size of population aged 65 year and over (POP65) and unemployment rate (UNEMPRT).

$$\ln(TRANS)_{t,\ county} = \beta_0 + \beta_1 \bullet \ln(POP65)_{t,\ county} + \beta_2 \bullet UNEMPRT_{t,\ county} + AR(1)$$

Property Income

Property income (DIR) includes dividend income, personal interest income, and rental income. Many factors, such as interest rate, stock price, and housing price, will affect the future size of property income. Due to the large uncertainty involved with these variables, however, property income of each county was estimated based on its historical relations to personal income.

$$\ln(DIR)_{t,county} = \beta_0 + \beta_1 \bullet \ln(PI)_{t,\ county} + AR(1)$$

Contributions for Government Social Insurance

Contributions for government social insurance (CGI) consist of employer contributions for government social insurance and employee and self-employed contributions for government social insurance. It was estimated as a function of labor income.

$$\ln(CGI)_{t,\ county} = \beta_0 + \beta_1 \bullet \ln(LINC)_{t,\ county} + AR(1)$$

Disposable Income

Subtracting personal tax from the projected personal income gives disposable income.

Disposable Income = Personal Income – Personal Tax

Personal tax is estimated as a function of personal income. Since total personal tax is more or less determined as a proportion of aggregated income, personal tax was estimated in raw value rather than in logarithm. In this way, personal tax would grow about at a same rate as personal income.

$$PTAX_{\ t,\ state} = \beta_0 + \beta_1 \bullet PI_{t,\ state} + AR(1)$$

[6] Retirement benefit accounted for 33% of total transfer payments while medical benefits accounted for another 38% of total transfer payments that Hawaii residents received in 2010.

Tourism Projections

The tourism projections underlying the DBEDT 2040 series reflect a combination of econometric analyses and relationship modeling. Visitor arrival, visitor days, and daily visitor census projections in this report are for visitor arrival by air. Visitor arrival to Hawaii by cruise ships was assumed to be constant at the 2010 level throughout the projection period. In 2010, arrivals by cruise ships accounted for 1.4 percent of total visitors with 101,200 visitors.

Visitor Arrival Projections

Visitor arrivals in Hawaii have gone through several different growth phases. Between 1960 and 1973, arrivals grew at a double digit rate with an average annual growth rate of 18.3 percent. The growth slowed down between 1973 and 1990 with visitor arrivals growing at 5.7 percent annually before a decade long stagnation started. Visitor arrivals increased only 0.3 percent annually during 1990 to 2000. Starting in 2004, Hawaii visitor industry experienced rapid growth again, with visitor arrivals peaking in 2006 with 7.5 million visitors. Due to the global economic downturn, however, visitor arrivals decreased by 10.4 percent in 2008 and another 4.4 percent in 2009 to 6.4 million visitors. With an 8.7 percent increase in visitor arrivals, a significant portion of the 2008-2009 loss was recovered in 2010.

The latest short-term forecasts by DBEDT (Quarterly Statistical & Economic Report: 1Q 2012) projected that visitor arrivals would grow at over 2 percent annually for the next 3-4 years. This projection for the near future is incorporated in the current version of the long-range projections. Long term visitor growth, however, will be affected not only by outside economic conditions but also the supply constraints in the state. Given the maturity of Hawaii's tourism industry and the increasing competition from other destinations, Hawaii's visitor arrivals are expected to grow at a slower rate into the long-term future.

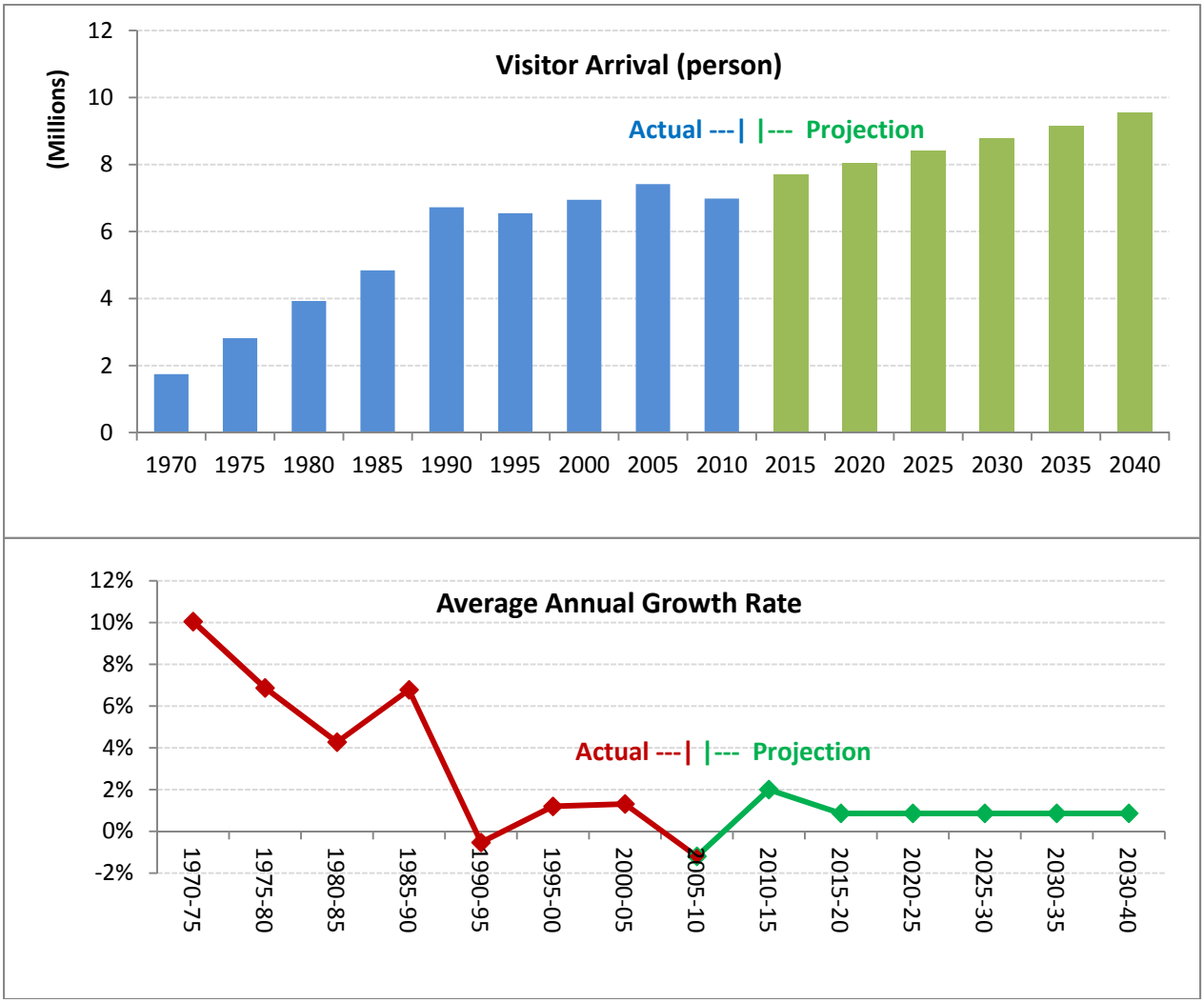
The long term visitor growth was projected assuming that it would follow the 1980 to 2010 trend after filtering out the high growth period of 1987-1991 and 2004-2006, and the decreases due to the terrorist attack in September 2001 and the worldwide recession in 2008;

$$\ln(VA_{t,state}) = \beta_0 + \beta_1 \cdot Time + \beta_2 \cdot D8791 + \beta_3 \cdot D0406 + \beta_4 \cdot D01 + \beta_5 \cdot D0809$$

Where: VA = Visitor arrivals, total at state level
Time = time trend, starting from 1980
D8791 = dummy variable representing the period of 1987 to 1991
D0406 = dummy variable representing the period of 2004-2006
D01 = dummy variable representing 2001
D0809 = dummy variable representing the period of 2008-2009
Period estimated: 1980 – 2010

The modeling results showed that the average annual visitor arrival growth for the period was about 0.9%.

Figure 2-4. Visitor Arrival Projection



Visitor Days and Daily Visitor Census

Visitor days and daily visitor census were projected by the following sequence and assumptions:

1. Growth of total visitor arrivals: projected using econometric models
2. Domestic and international arrivals = total arrivals × share of domestic and international visitors; shares were developed based on historical trends
3. Visitor days = arrivals × average length of stay; average lengths of stay were developed for international and domestic visitors based on historical trends
4. Visitor days by county = statewide visitor days × county share of visitor days, county shares of visitor days were developed based on historical trends
5. Arrivals by county = visitor days / average length of stay by county; average lengths of stay by county were developed based on historical trends
6. Average daily visitor census = visitor days/ 365 or 366 for leap years

Table 2-3 presents the assumptions used in projecting visitor days, daily census, and the arrivals by county.

Table 2-3. Assumptions for the Projections of Visitor Days and Daily Visitor Census

	1990	2000	2010	2020	2030	2040
Share of Visitor Arrival (%)						
Domestic	64.2	64.0	71.9	69.0	67.0	65.0
International	35.8	36.0	28.1	31.0	33.0	35.0
Length of Stay (days)						
Domestic	9.6	10.1	10.0	10.0	10.0	10.0
International	6.3	6.6	7.7	7.7	7.7	7.7
County Share of Visitor Days (%)						
Hawaii	10.8	12.9	13.9	14.2	14.6	15.0
Honolulu	53.6	50.4	48.7	47.7	46.8	46.0
Kauai	11.2	10.7	11.0	11.2	11.4	11.5
Maui	24.4	26.0	26.5	26.9	27.2	27.5
Length of Stay by County (days)						
Hawaii	5.4	6.3	7.1	7.1	7.1	7.1
Honolulu	5.9	6.6	7.4	7.4	7.4	7.4
Kauai	5.2	6.1	7.5	7.5	7.5	7.5
Maui	6.0	7.1	8.1	8.1	8.1	8.1

Visitor Expenditures

Total visitor expenditures are calculated as the sum of the following three components.

Total Visitor Expenditure = Air visitor expenditure + Supplemental business expenditure + Cruise visitor expenditure

The future values of the air visitor per-person per-day spending (PPPD), supplemental business expenditure and cruise visitor expenditure were derived by applying annual growth rates to their actual values in 2010. Annual growth rates for each expenditure were developed based on the historical trends (see Table 2-4). Using the projected PPPD, air visitor expenditures were calculated by multiplying it with the projected visitor days.

The total visitor expenditure was then allocated to the four counties based on the projected county shares of total expenditures. The county expenditure shares were developed based on the past trends and the projected shares of visitor days (see Table 2-5).

Table 2-4. Assumptions on the Annual Growth Rate of Visitor Expenditure (%)

	2010-2015[1]	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
Air visitor PPPD	4.3	2.8	2.5	2.5	2.5	2.5
Supplemental business expenditure	3.3	3.3	3.3	3.3	3.3	3.3
Cruise visitor expenditure	11.2	3.5	3.5	3.5	3.5	3.5

[1] It includes the actual performance in year 2011.

Table 2-5. Assumptions on the County Shares of Expenditures (%)

	2002	2005	2010	2020	2030	2040
Hawaii	13.8	14.0	12.5	12.9	13.2	13.5
Honolulu	48.0	48.5	50.7	49.5	48.7	47.9
Kauai	10.5	9.8	10.3	10.5	10.7	10.8
Maui	27.8	27.8	26.6	27.1	27.5	27.8