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Requirements for New Housing in Hawaii, 1965-70 . . . a Forecast

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Contents

	<i>Page</i>
Introduction -----	1
Pattern of Lumber Use -----	1
Trends in Housing Construction -----	2
Factors Affecting Demand for New Housing -----	3
Population -----	3
Income -----	4
Age Distribution of Houses -----	5
Forecasting New Housing Construction -----	5
Appendix -----	6

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Housing construction is the largest single market for lumber, plywood, and other wood-base panel products.¹ The major uses of lumber are in structural framing, flooring, siding, concrete forms, millwork, and cabinets. The single most important user of lumber has traditionally been the construction industry. In the United States, this industry in 1962 used nearly three-fourths of all lumber produced (*table 1*). Housing construction and upkeep and improvements in housing took up about half of all lumber produced. These two uses together accounted for 70 percent of the total lumber used in construction.

How large and important is the housing construction market in Hawaii? What factors affect the demand for new housing? What changes, if any, can be expected in the near future in the demand for housing? Answers to these and related questions would be helpful to the State's timber products industry for planning and management purposes. To obtain answers, this study was made as one of a series examining the present and po-

Table 1.--Lumber consumption in the United States, by end use, 1962¹

End use	Billion board feet	Percent of total
Construction:		
Residential, new	14.0	37.5
Non-residential, new	5.0	13.4
Upkeep and improvements	5.4	14.5
Railroads, mines, farms	3.2	8.6
Subtotal	27.6	74.0
Shipping	4.3	11.5
Manufactured products	4.2	11.3
Miscellaneous	1.2	3.2
Total	37.3	100.0

¹U. S. Forest Service. *The demand and price situation for forest products 1964*. U.S. Den. Agr. Misc. Publ. 983, p. 6. 1965.

tential markets for Hawaii-produced timber.

This paper provides estimates of the needs for new housing units in Hawaii during the period 1965-70, and describes the factors that may affect housing construction in the State.

Pattern of Lumber Use

The pattern of lumber demand in Hawaii is probably similar to that for the rest of the United States. Otteson reported that "The primary demand for lumber (in Hawaii) comes from the construction industry. Between 80 and 85 percent of Hawaii's annual lumber imports are consumed by this industry."²

A study by Baldrige³ of demand for lumber

in construction also indicates that about 80 percent of the State's lumber imports were used by the construction industry in 1959. Based on these data and Frazier's estimate⁴ of average annual consumption for the period 1959-61, it is estimated that between 65 and 75 million board feet of lumber are used annually by the building and construction industry in Hawaii.

¹ Phelps, R. B. *Wood products used in single-family houses inspected by the Federal Housing Administration, 1959 and 1962*. U.S. Dep. Agr. Stat. Bull. 366, p. 7, 1965.

² Otteson, Conner Piper. *A study of lumber distribution in Hawaii*. 1961. (Unpublished master's thesis on file Univ. Hawaii, Honolulu.)

³ Baldrige, Milton C., Jr. *Markets for materials in construction in Hawaii*. 84 pp. Menlo Park, Calif: Stanford Research Institute. 1959.

⁴ Frazier, G. D. *Estimated demand for lumber and plywood in Hawaii by the year 2000*. p. 7. U.S. Forest Serv. Res. Paper PSW-23. Pacific SW. Forest & Range Exp. Sta., Berkeley, Calif. 1965.

Trends in Housing Construction

Residential construction in Hawaii is an important segment of total construction demand. In constant dollars, residential construction value increased almost $3\frac{1}{2}$ times between 1954 and 1962 (table 2; fig. 1).

The decline in private construction activity during World War II left Hawaii with an acute housing shortage. Further, Hawaii did not fully share in the expansion of new housing construction after the war as experienced by the rest of the United States in general. During the immediate post-war years (1946-50), the pent-up demand for housing in Hawaii was counter-balanced by a large cutback in defense expenditures by the Federal Government and the unsettling effect of several major strikes on Hawaii's economy.

These two factors contributed to the most severe contraction in business activity in Hawaii's history and to an actual outflow of people from the Islands in 1951 and 1952. From 1951 to 1954, the value of new residential housing (adjusted to eliminate changes in construction costs) declined from 30

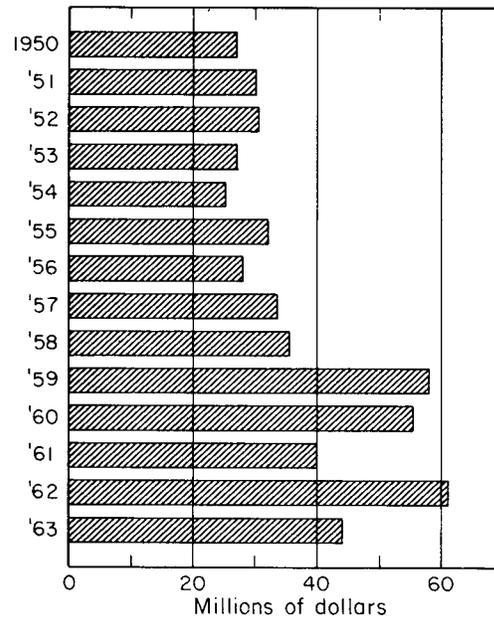


Figure 1.—Dollar value of new residential housing in Hawaii, adjusted by changes in construction costs for the period 1950-63.

Table 2.—Selected economic data for Hawaii, 1951-65¹

Year	Population	Value of construction ^{2,3}	Value of new residential construction (building permit value ³)
		<i>Millions of dollars</i>	
1951	471,853	99	30
1954	474,391	88	25
1955	491,899	97	36
1956	512,200	110	33
1957	538,296	134	42
1958	560,448	174	48
1959	580,505	216	81
1960	595,024	275	78
1961	612,763	268	60
1962	635,888	268	94
1963	655,546	269	71
1964	674,951	318	80
1965,	702,030	343	--

¹Hawaii Dept. of Health. *Civilian population—State of Hawaii*. 1950-63 (midyear). Rev. Sept. 13, 1963.

²Adjusted by an index of construction costs to eliminate changes in the price level.

³Bank of Hawaii, Dept. of Business Research. *Annual Reports 1951-6.5*.

Honolulu Redevelopment Agency. *Redevelopment and housing research*. No. 23, p. 52, July 1963 and No. 25, p. 52, July 1965.

Builders Report Pacific. *Annual index of construction costs 1951-65*.

to 25 million dollars per year.

Beginning [sic] in 1955 the trend was reversed and Hawaii experienced a revival in housing construction activity which reached record heights in 1965. New housing construction was stimulated not only

by the shortage resulting from World War II, but also by (a) a marked increase in defense expenditures and military personnel in Hawaii, (b) the influx of tourists, and (c) the large growth in population over the period.

Factors Affecting Demand for New Housing

Demand for new housing can be closely tied to three factors: (a) population growth and family formation; (b) sufficient disposable income to activate new construction activity; and (c) the age distribution of the existing housing units.

These factors have influenced construction activity in the past and may reasonably be expected to do so in the future. Each of these three factors will be considered separately in forecasting new housing construction.

Population

Hawaii's population increased 39 percent between 1950 and 1963 and 48 percent between 1950 and 1965.⁵ This growth has been a factor in the demand for housing, and thus in the demand for lumber. If military personnel are included in the population data, the increase would be even greater. The large influx of people from the mainland, Hawaii's substantial natural increase in population (births over deaths), and the increase of military dependents have all contributed to the State's growth in population.

Predicting the demand for new housing necessitates a prediction of the expected change in population over the period. Numerous forecasts of Hawaii's population are available. The State Department of Planning and Economic Development lists 21 different sets of population projections.⁶ Together these studies are characterized by their wide variance in defining population, the time-span covered by the forecast, and different methodologies used. As a result, the population estimates differ substantially among studies.

⁵ Population estimates are from the Research, Planning, and Statistics Office, Hawaii Department of Health. They include visitors and civilian dependents of military personnel, but exclude military personnel and residents absent for business.

⁶ Department of Planning and Economic Development, State of Hawaii. *Research Memorandum 5, annotated bibliography of population projection for Hawaii issued since 1959.* 9 pp. Honolulu, April 27, 1964.

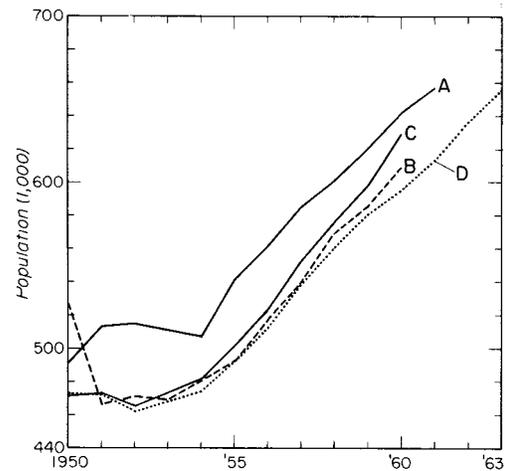


Figure 2.--Comparison of some population projections for State of Hawaii, 1950-62. Sources: A. *Statistical abstract of the United States, 1962, table 6, p. 9*; B. Lucas, Ernesto dela Cruz, "Evaluation of market data as a guide for forest development in Hawaii," 1963, (Unpublished master's thesis on file, Graduate School, Univ. of Hawaii, Honolulu, Hawaii); C. Otteson, C. P., "Lumber distribution in Hawaii," 1961. (Unpublished master's thesis on file in Dept. Bus. Admin., Univ. of Hawaii, Honolulu.) (Based on de facto population for July 1 of years shown. Includes visitors and civilian dependents of military personnel, excludes military personnel and residents absent for business or other reasons.)

percentage growth in population from an initial base year. After about 1954 the rate of increase for all four series is about the same. This factor is of prime importance for the purpose of forecasting new housing needs.

Total lumber consumption depends to a great extent on new construction, which in turn depends upon the rate of increase in population. If population increases at a constant annual rate, then the amount of lumber used in construction would be relatively constant from year to year. If population increases at an increasing annual rate, then other things being equal, lumber consumption and construction can be expected to increase over time.

This relationship accounts at least in part for the declining per capita consumption of lumber. A constant rate of usage per unit change in population implies a decreasing per capita consumption. In assessing changes in per capita consumption patterns, the relevant measure is the ratio of change in lumber consumption to change in population.

Two additional characteristics of the population affect the level of housing construction. The first is the rate of family formation. The second characteristic is the average household size. Owing to the youthfulness (median age: 24.5 years) of its population, Hawaii can expect a relatively larger rate of family formation in coming years. This expectation will tend to increase housing demand over what it would have been otherwise.

Hawaii has more persons per occupied housing unit than any other state. The average for the United States is 3.0 persons per housing unit.⁷ The average number of persons per dwelling unit for Hawaii is now about 3.5 (*table 3*). This figure is computed by dividing the number of dwelling units into the population. Except for a slight rise in 1965, the State trend since 1950 has been steadily downward. Such a change suggests a shift in housing needs, for as the average declines a larger number of houses are required to meet the needs of a given population.

As of April 1, 1965, the State average rose slightly, to 3.51. The ratio for Oahu (city and county of Honolulu) then was 3.60. From this it appears that the housing inventory is growing at a slower rate than the population of Oahu,⁸ but at

Table 3.--Persons per dwelling unit in Hawaii, 1950-1965¹

Year	Population per dwelling unit
1950	3.96
1952	3.71
1954	3.57
1956	3.59
1958	3.72
1960	3.57
1962	3.50
1964	3.48
1965	3.51

¹Honolulu Redevelopment Agency. *Redevelopment and housing research*. July 1964, p. 30 and July 1965, p. 10.

a faster rate than the population on the neighboring islands.

According to the U.S. Bureau of the Census, a housing unit is defined as "A house, an apartment, or other group of rooms, or a single room . . . when it is occupied or intended for occupancy as separate living quarters, that is, when the occupants do not live and eat with any other persons in the structure and there is either (1) direct access from the outside or through a common hall, or (2) a kitchen or cooking equipment for the exclusive use of the occupants of the unit."⁹

Income

Translating housing needs into effective housing demand depends to a great extent on the level of family income. The magnitude of effective housing demand depends mainly on (a) proportion of family income available for housing, and (b) construction costs. For example, while there may exist a need for 10,000 new housing units owing to the dilapidated condition of old substandard housing units, effective housing demand may or may not exist--depending upon the income level of these family units and the replacement cost of new housing in the State.

About 20 percent of families on Oahu now live in substandard housing (*table 4*). Most of these families fall into the \$4,000 to \$6,999 income group. In 1962 the median household income on Oahu was \$6,883.¹⁰ This relatively modest income would indicate a need for lower priced housing in the lower and middle income ranges. For this

⁷ *Supplemental research notes to the redevelopment and housing research report, July 1963*. p. 5. Honolulu Redevelopment Agency, Honolulu, Hawaii. August and September 1963.

⁸ Honolulu Redevelopment Agency. *Redevelopment and housing research*. p. 3. Honolulu, Hawaii. July 1965.

⁹ U.S. Bureau of Census. *U.S. Census of housing, 1960. Final report*. p. 14. HC(1)-13. Govt. Printing Office, Washington, D.C. 1963.

¹⁰ Honolulu Redevelopment Agency. *Redevelopment and housing research*. p. 50. July 1964.

Table 4.--Distribution of housing for Oahu, by quality and household income, October 1962¹

Annual income before taxes (dollars)	Total	Quality of housing ²		
		Standard	Substandard	Not reported
		<i>Number</i>		
Less than 4,000	19,200	12,300	6,500	500
4,000 - 6,999	47,200	36,000	10,400	900
7,000 or more	62,700	54,300	7,700	800
All households	129,100	102,600	24,600	2,200

¹Adapted from Honolulu Redevelopment Agency. *Redevelopment and housing research*. July 1963, p. 42; totals corrected by the author.

²Substandard housing is defined as an occupied housing unit that is either dilapidated or with 1.51 or more persons per room.

need to be translated into effective housing demand hinges on the ability of the construction industry to furnish new housing at a price attractive to this income group.

Age Distribution of Houses

The replacement demand for housing can be expected to be related closely to the age distribution of existing housing units. The older the existing housing units, the greater will be the expected replacement demand.

The age of the average housing unit in Hawaii in 1962 was relatively low (*table 5*). Among existing units, 51.5 percent have been constructed since 1950. Given the high proportion of newly constructed housing in Hawaii, demand for replace-

Table 5.--Age distribution of houses,¹ on Oahu, October 1962²

Year built	Percent
Before 1930	12.2
1930 - 1944	23.3
1945 - 1949	11.2
1950 - 1954	14.7
1955 - 1959	22.6
1960 - later	14.2
Not reported	1.9

¹Total number of households: 129,200.

²Honolulu Redevelopment Agency. *Redevelopment and housing research*. July 1963, p. 18.

ment housing in the next 35 to 40 years can be expected to be a relatively small proportion of the total existing housing units.

Forecasting New Housing Construction

Forecasting construction activity requires evaluation of the factors determining housing demand. The rate of increase in population has an important bearing on housing construction. It is reasonable to expect that new housing needs to accommodate Hawaii's constant rate of growth in population would itself be a relatively constant amount from year to year. This does not mean that actual construction will be constant each year. Rather one would expect actual construction to fluctuate somewhat as the industry adjusts to demand, strikes, and land availability.

The Hawaii Department of Health's population series for the State indicates that the population has grown at an average rate of 4.2 percent per year over the base year of 1954. Projecting this growth rate into the future yields an estimate of 793,200

people in Hawaii by 1970--an increase of about 100,000 persons over the 1965 population. Assuming 3.5 persons to a household, Hawaii will need about 28,500 new housing units between 1965 and 1970. This addition is solely to meet the estimated increase in population (*appendix*).

In addition to new housing to meet growth in population, new units will be required because of replacement of older existing units. Since Hawaii's housing stock is comparatively young, the replacement demand will probably not be substantial. Nevertheless, assuming a 40-year life for the average house, about 12 percent of today's existing houses can be expected to be replaced by 1970 (*table 5*). Therefore, the housing replacement demand is estimated to be 15,800 housing units between 1965 and 1970.

Combining the estimates based on population growth and replacement demand indicates a need for 44,300 new housing units during the period 1965-1970.

The major factor that affects new housing needs is population growth. Population is expected to increase at a constant rate over the forecast period; therefore new housing needs are expected to be relatively constant from year to year.

The above forecast pertains to the estimated new housing units needed in Hawaii by 1970. The major component of this total can be expected to be single family homes. Single family houses have comprised from 45 to 60 percent of all new housing units constructed (table 6). Assuming that this trend remains unchanged, then the number of new single family houses is expected to be between 20,000 and 26,000.

A more precise forecast of the proportion of single family houses as a part of total housing unit construction for each year is not practicable. The construction of several large multi-unit structures in a particular year could significantly change this proportion for that year.

In contrast to a continued strong demand for single family houses is the contention by some that "increased acceptance of apartment dwelling has

Table 6. --Number of new single-family houses compared to all new housing units constructed, State of Hawaii, 1959-64¹

Year ending March 31	Number of new housing units constructed	Number of new single family units constructed
1959	7,455	--
1960	10,571	--
1961	10,936	4,867
1962	6,349	4,113
1963	8,861	4,448
1964	7,212	4,321

¹Honolulu Redevelopment Agency. *Redevelopment and housing research*. July 1963-64.

become a part of the Hawaii scene, as it has also nationally."¹¹ The high cost of land, the inability of contractors to satisfy the lower price market for houses, and the expected large increase in the number of young family units who usually start out with apartments have been given as reasons stimulating the demand for more apartments. However, even if shifts occur in the composition mix of total housing demand, such changes still should not affect the forecast of total housing units needed by 1970.

¹¹ *Residential market, 1964--leveling off*. pp. 24-25. Hawaii Bus. and Ind. June 1964.

Appendix

- Forecast of Housing Needs, 1965-1970
- (1) Growth rate (percent) of population over base year 1954
 $= ((1960 \text{ pop.} - 1964 \text{ pop.}) / 1954 \text{ pop.}) / 6$
 $= ((595,024 - 474,391) / 474,391) / 6$
 $= 4.2 \text{ percent average annual growth rate over base year}$
 - (2) 1970 population forecast
 $= ((1954 \text{ pop.} \times 16 (.042)) + 1954 \text{ population})$
 $= ((474,391 \times 16 (.042)) + 474,391)$
 $= (318,791 + 474,391) = 793,182$
 - (3) Estimate of new housing needed due to population increase
 $= (1970 \text{ pop.} - 1965 \text{ pop.}) / 3.5 \text{ persons per house}$
 $= (793,182 - 693,560) / 3.5$

- $$= 99,622 / 3.5$$
- $$= 28,463 \text{ new houses needed}$$
- (4) The 1965 population is an estimate calculated similar to the 1970 population estimate
 $((1954 \text{ pop.} \times 11 (.042)) + 1954 \text{ pop.})$
 - (5) Replacement demand for housing
 (Existing stock of houses \times percent built before 1930)
 $= (129,200 \times 12.2)$
 $= 15,762 \text{ houses expected to be replaced}$

The 40-year useful life estimate for a house is taken from Bulletin F published by the Internal Revenue Service.¹² It represents the estimated life of a house of average construction.

¹² Internal Revenue Service. *Depreciation rate tables, useful lives*. Bull. "F". 46 pp. Commerce Clearing House, Inc. 1962.