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PROPOSED METHODS OF ESTIMATING HOUSING NEEDS

Note by the Statistical Office of the United Nations

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I. INTRODUCTION

1. At its tenth session the Statistical Commission requested the Secretary-General "... to prepare, in collaboration with appropriate agencies and in consultation with Governments of States Members of the United Nations or members of the specialized agencies, non-governmental organizations and experts, studies on the uses of social statistics for the formulation of social policies".^{1/} In accordance with this request, a series of studies was initiated on the possible utilization of statistics for the following aspects of housing programmes: (a) to measure housing conditions; (b) to estimate housing needs; and (c) to test the compatibility of housing needs and economic resources. The first study was prepared and issued under the title Statistical Indicators of Housing Levels of Living.^{2/} The present study on methods of estimating housing needs is the second in the series and the third, on the subject indicated in (c) above, will be prepared subsequently. One of the purposes of these studies is to determine the nature of the statistics which are needed for housing programmes.
2. Because of a desire to improve housing conditions or to prevent their deterioration, a number of countries have found it necessary to make systematic estimates of their housing needs. This study is based on the premises and assumptions made in connexion with estimates of housing needs for eighteen countries or areas and on analytical works published on the subject. It is hoped that it will foster an exchange of information on the methods used in arriving at such estimates and that such an exchange will be of assistance to housing and statistical agencies in under-developed countries, particularly in those going through a period of rapid urbanization.
3. It should be noted that estimates of housing needs do not necessarily imply that the needs will be satisfied nor that governments will be financially able to fulfil them. They are intended to show the magnitude of the job to be done in housing construction by the country as a whole (i.e. by the private construction

^{1/} E/3126, para. 121.

^{2/} E/CN.3/R.2. Distribution of this study has been restricted because of its tentative nature.

industry as well as by the government, non-profit organizations and households) in order to maintain or improve housing conditions.

4. Housing need has been considered in various ways. In connexion with estimates for the United States for example, it has been stated that "an estimate of housing needs is nothing more than an indication of how much safe, sanitary acceptable housing we will need by some specified future date if all the families who will want housing are to have decent homes".^{3/} Although the concept has not always been defined in precise terms, estimates are generally based on statements about the desirability of certain housing conditions (e.g. that each household or family should have a separate dwelling, that density of occupation should not exceed a certain level) and are expressed in terms of dwellings, facilities, repairs etc., necessary to attain such conditions. Housing need may be defined therefore as the number of dwellings to be built, facilities to be provided and repairs to be effected in order to maintain or improve housing conditions in conformity with nationally adopted standards. Such standards vary according to climate, culture, the degree of urbanization and the stage of economic and social development.

5. It should be noted that the present study deals with housing needs considered from the point of view of the need for adequate housing for the population rather than the demand for housing in the market sense. That there is a relationship between the two should not be overlooked since the availability of housing and the ability to pay for it undoubtedly influence household formation, however, these aspects will be dealt with in a subsequent study.

^{3/} See Annex I, No. 23.

II. BASIC STATISTICAL UNITS AND INDICATORS OF HOUSING CONDITIONS
INVOLVED IN ESTIMATING HOUSING NEEDS

6. The basic statistical concepts involved in making estimates of housing needs are: the "housing unit" and certain classes of housing units, especially the "dwelling"; the "private household"; and statistical indicators of housing conditions. These basic concepts and indicators are discussed in the following paragraphs.

7. Housing units. A housing unit is a structurally separate and independent place of abode. It may either (1) have been constructed, built, converted or arranged for human habitation, provided that it is not at the time of the inquiry used wholly for other purposes, and that in the case of mobile, improvised and collective premises it is occupied at the time of the inquiry, or (2) although not intended for habitation actually be in use as such at the time established as reference for the inquiry.

8. It should be noted that the essential features of a housing unit are separateness and independence. The above definition is intended to cover all possible kinds of places of abode but for the purpose of estimating housing needs it may be necessary to consider only certain classes of housing units. For the purpose of this study the number of persons living in conventional (permanent) dwellings, rustic (semi-permanent) housing units, improvised housing units and housing units not intended for habitation has been considered. The housing requirements of collective households have not been included although it is recognized that in some countries such households constitute a substantial proportion of the population, neither has the extent to which mobile housing units are occupied been considered.

9. Conventional (permanent) dwellings. A dwelling is a room or suite of rooms and its accessories in a permanent building or structurally separated part thereof which by the way it has been built, rebuilt, converted, etc., is intended for habitation by a private household and is not, at the time of the inquiry, used wholly for other purposes.

10. Rustic (semi-permanent) housing units. A rustic housing unit is an independent enclosure which has been rudely constructed or erected (e.g. having mud walls, thatched roof, etc.) with locally available rustic materials such as

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stones, sun-dried bricks, bamboo, palm, straw or any similar vegetable materials for the purpose of habitation by a private household and is not at the time of the inquiry used wholly for non-residential purposes.

11. Improvised housing units. An improvised housing unit is an independent makeshift or structure built of assorted waste materials without a predetermined plan for the purpose of private habitation and which is being utilized as living quarters at the time of the inquiry.

12. Housing units not intended for habitation. A housing unit not intended for habitation is one that has not been built, constructed, converted or arranged for human habitation but which is, nevertheless, actually in use as living quarters at the time of the inquiry. Such a housing unit may be located in a permanent structure (stable, barn), or may be a natural shelter (cave, etc.).

13. For more precise definitions of the above concepts and of the groups of housing units excluded from the calculation of housing needs, namely, mobile housing units and collective housing units, reference should be made to General Principles for a Housing Census.^{4/}

14. Private household. (a) One-person household. A person who lives alone in a private housing unit or who as a lodger, occupies a separate room or rooms in a part of a housing unit but does not join with any of the other occupants of the housing unit to form part of a multi-person household as defined below.

(b) Multi-person household. A group of two or more persons who combine to occupy the whole or part of a housing unit and to provide themselves with food or other essentials for living. The group may pool their incomes and have a common budget to a greater or lesser extent.

15. The basic criteria under the above concept of household are that the persons who constitute the household (1) jointly occupy the whole or part of a private housing unit and (2) share the principal meals (unless prevented by, for example, working conditions) and have common provisions for basic living needs.^{5/}

^{4/} ST/STAT/SER.M.28.

^{5/} For more details concerning the definition of household reference is made to Principles and Recommendations for National Population Censuses (ST/STAT/SER.M/27) and Handbook of Population Census Methods, Volume III (ST/STAT/SER.F/5/Rev.1).

16. Statistical indicators of housing conditions. The following indicators are considered to reflect generally accepted aims of housing programmes;^{6/}

1. Per cent of the population living in "dwellings".
2. Per cent of occupied dwellings with three or more persons per room.
3. Per cent of occupied dwellings with piped water (urban).
4. Per cent of the population living in substandard housing units (e.g. those classified as "rustic", "improvised", and "not intended for habitation").
5. Average number of persons per room, for "dwellings" only.
6. Per cent of occupied dwellings with flush toilet (urban).
7. Index of dwelling increase in relation to population growth.

These indicators are used in connexion with the calculation of the housing needs of private households.

^{6/} For a detailed discussion of indicators see: E/CN.3/R.2; ACC/WPSSP/I/9/Rev.1, paras. 25-28; and E/CN.3/273.

III. OUTLINES OF METHODS WHICH HAVE BEEN USED IN ESTIMATING HOUSING
NEEDS FOR THIRTEEN COUNTRIES

17. The following paragraphs show the premises on which estimates of housing needs are based, the types of estimates which have been made and the methods used in their calculation.

18. Chile 1952-1982^{7/}

Estimates for the country as a whole are based on the assumption that a separate dwelling is required for each married couple (legally married or consensual union) and for widowed and divorced persons up to the age of sixty. No provision is made for single persons to occupy separate dwellings because it is stated that these would be few and that their number would be provided for by the fact that not all widowed or divorced persons below the age of sixty would want to occupy separate dwellings. The proportions of these groups are estimated for three alternate population projections. Estimates of dwelling requirements are based on a persons per room ratio of 2, and estimates of dwelling construction on a ratio of 13 m² per person. Estimates are shown for the period 1952-1982 at five-year intervals. 1952 was selected as the starting point since both a housing census and a census of population had been taken in that year.

(a) Number of dwellings required for married couples. Married couples include legally married and consensual unions. This figure was obtained by determining from population censuses the number of single women in 1920, 1930, 1940 and 1952. Estimates are shown by age group for the years 1952, 1957 and 1962. After 1962 the proportion of single women is assumed to remain constant. The estimate of dwellings required is obtained from the number of married women derived from the foregoing calculations.

(b) Number of dwellings required for widowed persons. Estimates of the number of widowed persons have been obtained by using the estimates of countries with similar characteristics (Belgium and Ireland) and applying them to the population projections of Chile. Estimates are shown by age groups for five-year periods from 1952 to 1982.

^{7/} Annex I, Nos. 4 and 5.

(c) Number of dwellings required for divorced persons. As in item (b) above the estimates of a country with similar characteristics (in this case France) were applied to the population projections of Chile. Estimates are shown at five-year intervals for the period 1952 to 1982.

(d) Number of dwellings required for the country as a whole. From the sum of the estimates shown above for 1952 the number of "socially acceptable" dwellings is subtracted to provide an estimate of present requirements. The number of "socially acceptable" dwellings is derived from a study by the Instituto de Economía, which distinguishes "dwellings" from ranchos, chozas, viviendas provisionales, etc. A further estimate of the shortage is based on the fact that a persons-per-room ratio of two should prevail.

(e) Number of dwellings required to house the population increase. This estimate is shown for five-year intervals from 1952 to 1982. Estimates are shown for three population projections and are based on average household size and the number of square metres required per person.

19. Colombia 1956-1961^{8/}

Estimates are based on the number of families exceeding the number of housing units and the extent to which housing units lack essential facilities (running water and toilet facilities). It is stated that construction material and the condition of housing units are not considered because of a lack of information and insufficiently clear criteria for distinguishing good and bad quality.

(a) The number of dwellings required for each family to have a separate housing unit (1951). This figure is obtained by relating the number of housing units to the number of families for each department in the country, separately for rural and urban areas. Data obtained from the 1951 census of housing.

(b) The number of housing units lacking essential facilities (running water and toilet facilities) 1951. Information on housing units lacking both the facilities was not available from the census data therefore the highest number of units that lacked one or other of the facilities is used for the estimate. Separate estimates are shown for each department for rural and urban areas.

^{8/} Annex 1, No. 6.

(c) Deficit in the cities with a population of 10,000 or more (including cities with smaller populations but located in areas of rapid economic development) 1951.

The deficit in the cities is related to the total deficit for each department. Sixteen cities are shown to be responsible for 87.3 per cent of the total housing deficit.

(d) Relationship between deficit in 1951 and 1956 in the same cities as in item (c) above. Estimates for 1956 are based on the estimated demographic increase in the population and the estimated number of dwellings constructed (based on construction licences). Allowance for deterioration of dwellings during the five-year period has not been included in the estimate. With one exception, the cities responsible for more than 5 per cent of the total deficit in the country are shown to be the ones in which the deficit was increasing most rapidly.

(e) Estimated housing deficit in 1961 for the sixteen cities shown to be responsible for 87.3 per cent of the total deficit under (c). Based on estimated demographic increase and an unchanged rate of construction.

20. Denmark 1950-1978^{9/}

The Ministry of Housing has estimated the housing demand likely to arise from demographic development. The estimates are based on recent trends in housing habits, in real income and in housing prices. The estimates cover the period 1950-1978 and are based on a population projection according to age and family status by five-year intervals. It is stated that the need for a reserve of vacant dwellings was considered as well as the need to replace dwellings in slum quarters, dwellings converted to business premises and dwellings left vacant as a result of internal migration but that so far no estimate of these housing needs has been attempted. The estimate is divided geographically for each borough with suburbs and for each urban district with more than 1,000 inhabitants. It is hoped that it will assist the municipalities in estimating the development of local housing needs, having regard to special local conditions. The various revised estimates will then be co-ordinated so as to agree with the national estimate.

^{9/} Annex I, No. 19.

21. France 1954-1963^{10/}

In France calculations of national and local housing needs are closely co-ordinated in establishing the housing programme. The central planning authority bases its estimates on a study made by the Ministry of Housing and Reconstruction in 1953, in which housing needs were subdivided into four categories, namely, those arising out of overcrowding, renewal of residential buildings, demographic increase and internal migration. In this connexion a normal dwelling is defined as containing one living room, one bedroom for the parents and one for two children of the same sex, or for one child if there are no more children of the same sex in the family. The number of dwelling units to be built in the urban areas until the end of the five-year plan (middle of 1963) in order to cover the needs defined above have been calculated as shown below. The housing needs of the agricultural population have been evaluated by essentially the same methods, attention being paid to certain special characteristics.

(a) The number of dwellings theoretically necessary as at 10 May 1954 (date of the census) to supply the inhabitants of overcrowded dwellings with adequate dwelling units (urban). This figure is obtained by means of a detailed sample survey of dwelling units found to be more or less overcrowded.

(b) The number of unsanitary slum dwellings that should be cleared (urban). A calculation has been made for each commune by the "Secretariat d'Etat à la Reconstruction et au Logement". The distribution according to type of household of the slum dwellers is calculated by means of statistical data on 7,000 slum dwellings.

(c) The increase in the number of households from May 1954 until the middle of 1963 (urban). Estimated by the Central Bureau of Statistics, on the assumption that it should correspond to the increase in the number of families.

(d) Internal migration. Future internal migration is calculated on the basis of observed trends, taking into account the directives of the third general plan for the development and modernization of economic and social activities in France, which forecasts that the population working in agriculture will decrease owing to its increasing average age and to the increase in its yield per capita.

(e) The number of dwelling-units built or started during the period May 1954 to December 1956. Estimated by means of existing statistical data.

(f) The number of formerly overcrowded dwellings made available by evacuation. Calculated from the statistics obtained as shown in item (a) above.

22. India 1951-1961^{11/}

Housing requirements are based on the premise that each household should be provided with a separate house, on the number of houses in rural areas that require reconditioning or to be entirely rebuilt, and on the extent to which dwelling construction is keeping pace with the population growth.

(a) The shortage of housing in urban areas in 1951. From the 1951 census data the number of occupied houses and the number of households was obtained. The housing shortage estimated on the basis that each household should have a separate house was 2.5 million.

(b) The estimated shortage of housing in urban areas in 1961. This is computed by adding to the shortage estimated in item (a) above the number of dwellings required for a 33 per cent increase in the population and necessary replacements of existing houses. By subtracting the estimated number of dwellings to be constructed by public authorities and private individuals and associations it is estimated that the housing shortage in 1961 will be twice that of 1951.

(c) The number of houses in rural areas which require to be reconditioned or entirely rebuilt. Based on a general consideration of information obtained from the 1951 census and from the "National Sample Survey" on its seventh round (October 1953 to March 1954). It was estimated that approximately 50 million of the houses in rural areas would require to be reconditioned or entirely rebuilt.

23. Italy 1951-1964^{12/}

The Italian Central Institute of Statistics has based its estimates of housing needs for 1951-64 on the assumption that the average density of occupation should be brought down to 1.3 in all municipalities now at a higher level and that

^{11/} Annex I, No. 18.

^{12/} Annex I, No. 17.

permanent dwellings should be provided at the same density for those who live in other premises and for the increase in population. New dwellings are assumed to have three rooms per dwelling.

(a) Number of dwellings required to reduce the average density of occupation and provide permanent dwellings for the total population, 1951. On the basis that the average density should be brought down to 1.3 persons per room in permanent dwellings and that permanent dwellings should be provided at the same density for those who live in other premises the room shortage is calculated from the 1951 census data and converted into the number of dwellings by assuming that new dwellings would have three rooms per dwelling.

(b) Number of dwellings required for the population increase 1951-1964. Population trends are estimated up to the end of 1964 on the basis of a continuation of the present level of net emigration and of a recent decrease in birth and death rates. It is assumed that the present level of density will be maintained for the increase in population.

(c) Sub-standard dwellings to be replaced, 1951-1964. This estimate includes current replacement needs.

24. Japan 1955-1958^{13/}

The Ministry of Construction estimates the housing shortage in 1955 for urban and rural areas on the basis that each family should have a separate dwelling and that dwellings are overcrowded if the total area of living space is less than 15 m² and at the same time there is less than 4.2 m² per person. Information from the 1955 census of housing is used in computing the estimates. Of the following estimates (a) through (d) are shown for 1955 for urban and rural areas. Estimates (e) through (g) are shown for the country as a whole.

(a) Number of families living in non-dwellings - living in a structure which is not fit for living such as a factory, school, warehouse etc., or in a place not intended for living such as under a bridge.

(b) Number of families living with other families - excluding those living with other families under allowable conditions.

^{13/} Annex I, Nos. 11 and 18.

- (c) Number of families living in excessively small or overcrowded dwellings - determined by applying the standards shown above.
- (d) Number of families living in old dwellings that have to be rebuilt - dwellings whose principal parts are so old or damaged that they need rebuilding.
- (e) Total housing shortage as of April 1958 - calculated from the estimates shown above and taking into consideration dwelling construction and population growth.
- (f) Number of new dwellings required annually to house the increase in the population. A survey of the nation-wide population growth was made for the previous thirty years and an estimate was made of the annual population increase thereafter.
- (g) Number of new dwellings required annually for replacements. In making this estimate the fact is considered that Japan is located in a geographic region subject to earthquakes and typhoons, and that nearly all dwellings are of wooden construction liable to cause much larger destruction by fires than in European cities where most of the buildings are fire-resistant.

25. Netherlands 1953-1980^{14/}

The Netherlands Central Bureau of Statistics has calculated the housing shortage on the basis of a comparison between the number of households (excluding those living in hotels, institutions, ships, caravans etc.) and the number of dwellings according to several alternative assumptions. Two of the main assumptions are (a) that a separate dwelling is needed for every household of two or more persons, with the exception of those who are owners or tenants of hotels, and for every household of one person who already occupies a separate dwelling or who is the main tenant where households are doubled up, and (b) the same as for (a) with the exception that one person who is the main tenant doubled up with households of two or more persons is not assumed to need a separate dwelling. From studies of the number and types of households reported in the 1947 census of population and housing it has been estimated that 99.08 per cent of households of two or more persons need a dwelling and an additional 5.04 per cent or 3.65 per cent of this figure (99.08 per cent) is allowed for one person households depending upon whether the needs are calculated according to assumption (a) or assumption (b).

^{14/} Annex I, Nos. 12 and 17.

(a) The housing shortage at the end of 1953. The housing and family census of 1930 was used as a starting point for calculations based on assumptions (a) and (b) above and the information is brought up to date every year. Separate estimates based on assumptions (a) and (b) are shown for 1953.

(b) Replacement needs 1955-1980. It is stated that probably two-thirds of the housing stock was built in the present century but, nevertheless, many dwellings are considered as sub-standard and due for demolition. Part of the reason for this is thought to be the low standard of building during the last quarter of the nineteenth century. On the basis of these considerations an estimate is made of the replacement need by 1980 and from this the annual replacement need is calculated in absolute figures and as a percentage of the present housing stock.

26. Peru 1956-1986^{15/}

Housing needs are calculated on the basis that each family should have a separate dwelling and that the average family is composed of five persons. It is stated that some types of housing units need to be eliminated entirely, e.g. improvised houses or callejones in run-down areas. In connexion with metropolitan areas it is stated that density of occupation should not exceed two persons per bedroom allowing one additional room for other purposes. The estimates are based on the 1940 census and on studies and experimental censuses which have been carried out in various parts of the country - mainly in urban areas. Estimates are obtained separately for metropolitan, urban and rural areas. Metropolitan areas are considered according to separate zones distinguished by the types of housing prevailing. Data concerning the physical condition of the dwellings, economic and social condition of the families and the number of families according to the types of dwellings are used to arrive at the proportion of dwellings that need to be replaced, the number required so that families can have separate dwellings and the number that need to be repaired. Urban areas are considered in terms of each city using available data from previous surveys and special surveys of a descriptive nature which deal with the physical, social and economic characteristics of each city. For rural areas a small survey was undertaken

^{15/} Annex I, No. 15.

from which the proportion of rural dwellings according to their physical condition was obtained. This serves as the basis for the estimates of dwellings required in rural areas. The following categories of estimates are shown for metropolitan, urban (two classes according to the size of cities) and rural areas:

- (a) Number of new dwellings required.
- (b) Number of dwellings that require major or minor repairs in order for them to be serviceable.
- (c) Number of new dwellings required to house the population increase. This estimate is shown for a thirty-year period. The population increase is based on the 1940 census of population.
- (d) Replacement needs. Replacement needs are calculated on the basis that the average length of life of dwellings will vary according to the quality of the material used and construction techniques employed and that these improve according to the degree of urbanization. The average life span is estimated at 100 years in metropolitan areas, 75 years in urban areas (or alternatively 75 years in cities of from 10 to 100 thousand population and 50 years in cities of from 2 to 10 thousand population) and 50 years in rural areas. Thus the annual replacement need is calculated at 1 per cent, 1.3 per cent and 2 per cent respectively.

27. Sweden 1956-1965^{16/}

In 1955 a Royal Commission was requested to formulate a long-term programme of general economic development, and in connexion with this the Royal Housing Board carried out an analysis of housing needs for the period 1956 to 1965. The starting point of the analysis is a distinction between housing needs in urban and rural areas. For urban areas continuing expansion and a consequent increase in the number of dwelling-units needed is taken into account. For rural areas it is anticipated that depopulation will continue and that the number of households requiring dwelling-units will accordingly decrease. The housing problem in rural areas appears to be one of replacing unsatisfactory dwellings.

^{16/} Annex I, No. 19.

(a) The number of dwellings required for the number of households in urban areas by the end of 1960 and 1965. A population projection shows the adult population distributed in age groups and according to sex and civil status by the end of 1960 and 1965. The projection was based on the assumption of decreasing mortality and unchanged relative migration losses to urban areas of each age rural population group. Two alternative assumptions are made as to civil status, one implying constant relative distribution of each age group according to civil status and the other a relative increase of married persons within each age group. In order to proceed from the population projection to a projection of the future number of households,* the Housing Board also makes certain assumptions concerning the household ratios, i.e. the percentage of heads of households within various groups of the population (distributed according to sex, age and marital status). The alternative assumptions imply constant or continually increasing household ratios. It is stated that the assumed increase of the household ratios compared with other factors affecting housing demand plays a very important part and it was necessary to place considerable weight on factors other than changes in the size and composition of the population.

(b) The number of dwellings needed as a reserve in urban areas. Estimated at 2 per cent of the dwelling stock.

(c) The number of dwellings required for replacement needs in rural and urban areas was estimated on the basis of certain census data and current statistics on housing construction.

(d) Estimates of the distribution by type of dwellings to be constructed. It was considered that with a rising level of living the demand for dwellings in one and two dwelling houses and terrace houses would be likely to increase at the expense of the demand for flats. A relative increase in the construction of small houses was therefore recommended. A relative increase in the number of flats with three rooms and a kitchen at the expense of smaller flats was also found desirable.

28. United Kingdom (England and Wales only) 1951^{17/}

Estimates are based on the premise that a separate dwelling is required for each private household but that only one quarter of one person households want

* A household is defined as the group of persons living in a dwelling.

separate dwellings. It is assumed that where sharing households occupy four or more rooms with exclusive use of a water closet such accommodation could probably be converted into separate dwellings. It is further assumed that two-thirds of the family nuclei presently forming part of a private household would like to form separate households if housing were available and also that a number of brothers or sisters of the household head who are unmarried and without dependants, middle-aged married couples living with their married children and grown-up sons and daughters might prefer to live separately.

(a) Need for dwellings in 1951. This figure was obtained by a calculation of the four groups shown below:

(i) Net households lacking separate accommodation. This calculation begins with the number of occupied dwellings and private households shown by the 1951 census. From the difference between the number of occupied dwellings and the number of households the number of furnished vacant units are subtracted since it is felt that they were unoccupied only temporarily. Also subtracted are the number of households considered to be content to continue sharing dwellings - this is assumed to be three quarters of the one person households sharing dwellings. A further deduction is made for the number of households which occupy four or more rooms in a shared dwelling but have exclusive use of a water closet since it is argued that such accommodation could be converted into separate dwellings.

(ii) Dwellings required for family nuclei wanting to break away. This figure is based on the assumption that two out of three family nuclei forming part of a composite household want to form separate households. A family nucleus is any group in a composite household (other than those which make up the primary family unit) of the following types: (1) a married couple, with or without children, but excluding children that are themselves married or are accompanied by children of their own, in which case they would form a separate family nucleus; and (2) a lone parent, married, widowed, or divorced, if accompanied by one or more children.

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- (iii) Frustrated households. These are brothers or sisters of the household head who are unmarried and without dependants, middle-aged married couples living with their married children, and grown-up sons and daughters, all of whom might, for one reason or another, prefer to live separately.
- (iv) Net need for overcrowded households. Calculated by obtaining the number of overcrowded households and making allowance for dwellings which are underoccupied.

29. United States 1950-1960^{18/}

Estimates are shown of non-farm housing needs only. It is assumed that each non-farm family needs a separate dwelling and that an allowance of 4 per cent should be made for vacant units to provide for seasonally occupied dwellings, dwellings vacant because they are being held for rent or sale and to allow for a choice of dwellings. The number of sub-standard dwellings in urban and rural areas is considered to be equal to the number reported as in need of major repairs (i.e. where important parts of the building like floors, roof, plaster walls or foundations need major repairs or replacement) in the 1950 census of housing. In addition dwellings in urban areas which lack private bath or toilet are considered sub-standard. Replacement needs are estimated on the basis that dwellings normally last for a period of seventy-five years.

(a) Non-farm dwelling units needing replacement or rehabilitation (1950-1960).

This estimate represents the total of the four estimates shown below:

- (i) Urban and rural non-farm units which were dilapidated and urban units which lacked private bath or toilet in 1950. The number of dilapidated units was considered to be equal to the number reported in the 1950 census of housing as in need of major repairs.
- (ii) Currently standard non-farm units which will deteriorate by 1960. Estimated on the basis of the number of units which will become seventy-five years old by 1960. Information obtained from the census data.

^{18/} Annex I, No. 23.

- (iii) Estimated losses through disaster, demolition, etc. (1950-1960). It is estimated that 40,000 units will be lost each year from fires, floods, tornadoes and other disasters or because the houses will be torn down or converted into business space or other use. The estimate for the ten-year period is based on this figure.
- (iv) Losses through removal of temporary housing (1950-1960). Estimated on the basis of the number of dwellings that should be built to take care of families now living in temporary and war veterans housing.
- (b) Net additional number of units which need to be added to the supply by 1960 to keep up with the rate of family formation. This figure is obtained by subtracting the effective supply of dwellings (i.e. the total number of dwelling units in non-farm areas less seasonally occupied dwellings or those reported as dilapidated or vacant units that were not on the market) in 1950 from the effective supply of dwellings needed in 1960. The effective supply of dwellings needed in 1960 is obtained from estimates by population experts of the number of families in 1960 and by adding an allowance for vacancies of 4 per cent.

30. Venezuela 1957-1967^{19/}

It is stated that had the information been available the estimate of the present housing deficit would have been based on the number of housing units in relation to the number of families; however, since this information was not available the estimate is based on the number of persons per room in housing units with one and two rooms and the number of dwellings required to reduce the density. Taking into account the poor quality of the housing stock and the number of units that would be lost through urban redevelopment the average life span of dwellings is calculated at thirty years. The number of new dwellings required annually to house the increase in population is based on the estimated annual population increase and in addition, estimates are shown of the work required to improve the structural condition of existing housing and provide essential facilities such as water, toilet facilities and suitable methods of disposing of garbage and other waste.

^{19/} Annex I, No. 25.

(a) The number of dwellings required to eliminate the accumulated housing deficit. This calculation is based on the number of persons per room in dwellings with one and two rooms. From this the number of new dwellings required annually to eliminate the housing deficit in ten years is estimated.

(b) The number of dwellings required to replace dwellings lost from the inventory. An estimate is shown of the number of new dwellings required annually to replace those lost from the housing inventory. Losses are estimated on the basis of an average length of life of thirty years for the present dwelling stock and on the number of dwellings that will be demolished to make way for urban redevelopment and similar projects.

(c) The number of dwellings required to absorb the demographic increase in the population. This figure is obtained by using an estimate of the annual increase in the population and assuming an average of six persons per dwelling.

(d) Total number of new dwellings required annually for a period of ten years. This estimate is obtained from items (a), (b) and (c) above.

(e) Estimates of the work required to improve the sanitary conditions of existing dwellings.

(i) Reconstruction: Estimates are shown separately of the number of dwellings requiring new floors, new walls and new roofs.

(ii) Facilities: Separate estimates are shown of the number of dwellings requiring a water supply, toilet facilities, and facilities for the disposal of garbage and other waste.

IV. GENERAL DISCUSSION OF METHODS OF ESTIMATING HOUSING NEEDS

31. The collection and analysis of housing statistics to establish estimates of housing needs implies some action in relation to the housing situation. With this in mind the desirability of isolating housing shortages by geographic divisions and distinguishing the population groups most seriously affected by such shortages according to their income, occupation, size of family or household etc., should be thoroughly explored in planning the collection and tabulation of housing statistics. However it will not be possible to deal in this study with housing estimates for selected population groups, or to analyse the interrelationships of household characteristics and housing conditions.

32. An examination of the estimates of housing needs which are available (see Table 1) and information regarding the methodology employed indicates that separate estimates are required of the current housing shortage and of the need which may be expected to arise in the future from the population increase and replacement requirements.

33. The estimates are based on housing census data, housing information collected in connexion with population censuses and on special surveys concerning housing needs. Nine of the eighteen estimates shown are for the country as a whole but it has been indicated that where adequate statistics are available these overall estimates are generally established separately for rural and urban areas or smaller geographic divisions and that estimates are directed more frequently towards the housing needs of the urban population with special attention to metropolitan areas. In some cases the estimates for the country as a whole serve as the basis for estimates for smaller geographic areas which are adjusted in the light of local conditions. These adjusted estimates are then co-ordinated to agree with the national estimate.

34. Estimates of present requirements generally include the number of dwellings required to replace sub-standard dwellings, the number of dwellings required for households and families to have separate dwellings and the number of dwellings required to reduce the density of occupation. Data for six countries include estimates of present requirements based on a distinction between dwellings of an acceptable type and those considered to be unacceptable.

35. Estimates of future requirements have been made for fourteen of the eighteen areas shown in Table 1. The estimates include the number of dwellings required to house the population increase for periods ranging from one to thirty years, the number of dwellings required to replace losses from the housing inventory, and the number required to provide for a reserve of vacant dwellings.

36. From the available information it appears that the major components of housing needs are the following:

(a) Present housing needs (shortage)

- (i) The number of dwellings required for private households living in unacceptable types of housing units.
- (ii) The number of dwellings required to provide separate dwellings for private households involuntarily doubled up with other households.
- (iii) The number of dwellings required to reduce the density of occupation.
- (iv) The number of dwellings required to replace sub-standard dwellings or the number of dwellings that require repairs and facilities in order to bring them up to acceptable standards.

(b) Future housing needs

- (i) The number of dwellings required to house the population increase at some future date.
- (ii) The number of dwellings required to replace those lost from the inventory.
- (iii) The number of dwellings required to allow for a reserve of vacant dwellings.

37. It should be noted that not all components are independent of each other and that there is overlapping of needs in some cases, as for example components (a), (ii) and (iii). It should also be noted that while housing needs under (a) refer to the situation as of a certain date the needs under (b) will arise over a period of time and should be satisfied as they occur. For the purposes of formulating a housing programme consideration would be given to whether the "present needs" can be absorbed in five, ten or twenty years and indeed housing programmes have been designed with a view to absorbing housing shortages in as many as thirty years. The following paragraphs deal with methods of estimating each of the components of housing needs indicated above.

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Table 1. Types of estimate which have been made of the housing requirements in eighteen selected areas

Country	Period for which estimates were made	Present requirements									Future requirements						Reserve					
		Required for the population living in unacceptable types of housing units			Required for households or families to have separate dwellings			Required to reduce the density of occupation			Number of Dwellings Considered to be sub-standard (i.e. in need of major repair, essential facilities, etc.)			Required to house the population increase			Required to replace those lost from the inventory			Required for a reserve of vacant dwellings		
		*T	U	R	T	U	R	T	U	R	T	U	R	T	U	R	T	U	R	T	U	R
1. Australia ^{1/}	1945-1955	X ^{2/}			X			X			X			X			X					
2. Chile	1952-1982	X ^{2/}			X			X			X			X			X					
3. Colombia	1956-1961				X	X ^{5/}	X				X ^{3/}	X ^{3/}	X ^{3/}			X ^{4/}						
4. Denmark	1950-1978				X	X ^{2/}										X ^{7/}	X ^{7/}	X ^{7/}				
5. France	1954-1963							X ^{8/}	X	X	X ^{6/}	X ^{6/}	X ^{6/}	X ^{7/}	X ^{7/}	X ^{7/}	X ^{7/}	X ^{7/}				
6. Départements d'Outre-Mer ^{**/}	1955-1985							X ^{8/}	X	X	X ^{6/}	X ^{6/}	X ^{6/}	X ^{7/}	X ^{7/}	X ^{7/}	X ^{7/}	X ^{7/}				
7. India ^{11/}	1951-1961						X						X ^{10/}			X			X			
8. Italy ^{11/}	1951-1964	X ^{12/}					X				X ^{14/}	X ^{14/}	X ^{14/}	X								
9. Japan	1955-1958	X ^{13/}	X ^{13/}	X ^{13/}	X	X	X	X	X	X	X ^{14/}	X ^{14/}	X ^{14/}	X	X	X	X	X	X	X	X	X
10. Netherlands	1953-1980				X	X	X							X								
11. Norway	1953				X	X	X															
12. Pakistan	1951	X ^{15/}			X	X	X															
13. Peru ^{16/}	1956-1986	X ^{17/}	X ^{17/}	X ^{17/}	X	X	X	X ^{19/}	X	X	X ^{18/}	X ^{18/}	X ^{18/}	X	X	X	X	X	X	X	X	X
14. Singapore	1956-1976	X ^{17/}	X ^{17/}	X ^{17/}	X	X	X	X ^{19/}	X	X	X ^{18/}	X ^{18/}	X ^{18/}	X	X	X	X	X	X	X	X	X
15. Sweden ^{21/}	1956-1965				X																	X
16. United Kingdom	1951				X																	X
17. United States ^{22/}	1950-1960	X ^{23/}	X ^{23/}	X ^{23/}							X ^{24/}	X ^{24/}	X ^{24/}	X	X	X	X	X	X	X	X	X
18. Venezuela	1957-1967							X			X ^{24/}	X ^{24/}	X ^{24/}	X	X	X	X	X	X	X	X	X

* TUR = Total Urban Rural.

** Martinique, Guadeloupe, French Guiana, Réunion.

- 1/ An estimate of the present "housing shortage" is shown in addition to the dwellings required to replace sub-standard units but the basis for the estimate is not clear.
- 2/ Types considered unacceptable are pieza de conventillo, rancho, ruca or choza, vivienda provisional, vivienda callampa.
- 3/ Housing units which lack essential facilities.
- 4/ For cities with a population of 10,000 or more.
- 5/ Copenhagen metropolitan area.
- 6/ Refers to slum dwellings.
- 7/ Estimates also made of housing needs resulting from internal migration.
- 8/ Stated in terms of the number of rooms needed.
- 9/ Dwellings that are in a bad state of repair and need to be reconstructed.
- 10/ Number of "houses which would need to be reconditioned or entirely rebuilt".
- 11/ Estimates shown for the country and for Northern and Southern Italy separately but it is indicated that estimates are derived from calculations for municipalities.
- 12/ For the population living in "other premises" as distinguished from "permanent dwellings".
- 13/ Based on the number of families living in a "structure which is not fit for living such as a factory, school, office-room of a firm, warehouse etc. or at a place not intended for living such as under a bridge".
- 14/ Refers to dwellings whose principal parts are so old or damaged that they need rebuilding.
- 15/ Based on the number of families living in "well-built houses" and the number who live in "huts, temporary tenements or who are without a house".
- 16/ All estimates are shown for the country and for rural, urban and metropolitan areas.
- 17/ Improvised houses or callejones in rundown areas.
- 18/ Number of dwellings that require major or minor repairs in order for them to be serviceable.
- 19/ Requirements based on overcrowding in "buildings which are structurally sound".
- 20/ Refers to "dilapidated residential buildings".
- 21/ Estimates are shown of dwellings to be constructed by type.
- 22/ Estimates refer to nonfarm families and dwellings.
- 23/ "Temporary housing".
- 24/ "Number of urban and rural nonfarm units which were dilapidated and urban units which lacked private bath or toilet".
- 25/ Dwellings that require reconditioning or facilities.

V. METHODS OF ESTIMATING PRESENT HOUSING NEEDS (SHORTAGE)

38. Estimates of the current housing shortage are a measure of the extent that the housing stock falls short of certain standards established in relation to the structures, the density of occupation, the facilities or the provision of separate dwellings for families or households. The standards adopted in each country are influenced by climatic, cultural and social conditions as well as by the actual housing situation, the extent to which improvement seems possible in view of the economic resources available and by population attitudes in relation to housing.

Methods used to estimate the number of dwellings required for the private households living in unacceptable types of housing units

39. Estimates of this type are based on census data which provide the number of households or families living in housing units considered to be of an unacceptable type. These units are variously specified as "non-dwellings", "huts", "temporary tenements", "provisional housing units", "ranchos", "viviendas callempas", "piezas de conventillo", "callejones in rundown areas", "places not intended for living, such as under a bridge", "improvised houses", "temporary dwellings" and factories or warehouses used as dwellings. They are distinguished from acceptable types specified as "dwellings", "permanent" or "private dwellings", "pukka" or "well built houses".

40. A direct count of private households occupying unacceptable housing units would provide an indication of this component of the housing deficit. Where a direct count is not available, or where it is believed that the number of households would be changed considerably if the same population could move to adequate dwellings, the number of dwellings required for households living in housing units considered to be unsatisfactory or who are without shelter of any kind may be estimated as follows:

$$D_1 = \frac{P_{uhu}}{S_h}$$

P_{uhu} = Population living in unacceptable types of housing units, namely "rustic", "improvised" and "not intended for habitation" plus those without shelter of any kind.^{20/}

^{20/} For definitions of these types of housing units see General Principles for a Housing Census, Annex I, No. 20.

S_h = Average size of private households in the same population, or assumption regarding this magnitude.

Methods used to estimate the number of dwellings required to provide separate dwellings for private households involuntarily doubled up with other households

41. One of the most common aims of housing policy is to create the conditions which enable all private households to have separate dwellings. A private household may be composed of a family nucleus and some nonrelated persons, of several family nuclei or of any other combination of individuals pooling all or part of their income or having their principal meals together, and sharing the same housing unit. Frequently more than one private household occupy the same dwelling and it can be safely assumed that some members of existing households would prefer to break away and form separate households. However, it is not possible for all doubled up households or potential households to occupy separate dwellings nor, in all cases, would they prefer to. Therefore the basic problem to solve in estimating this component of housing need is to determine the proportions of doubled-up private households and individuals which would occupy separate dwellings if more dwellings were available. Special surveys would be required to investigate the desire for separate accommodation, the ability to pay for it, and the likelihood that certain members of existing households, such as young married couples living with their parents, grown-up children, widowed and divorced persons would break away to form separate households and occupy separate dwellings if they were available.

42. The methods used in estimating the additional number of dwellings that would be necessary in order to eliminate involuntary doubling-up vary from a simple comparison of the number of private households, as indicated by the population census data, with the existing number of private housing units, to an elaborate evaluation of the potential number of households in the existing population based on assumptions and surveys.

43. The information available is insufficient to allow a systematic examination of assumptions and methods used in evaluating this component of housing need. Nevertheless a certain value (D_2) has been assigned or estimated for this component of the housing need of several countries as indicated in Table 1.

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Methods of estimating the number of dwellings required to reduce the density of occupation (persons per room)

44. A widely recognized indicator of housing conditions is the average number of persons per room (for a detailed discussion of the significance of this average see E/CN.3/R.2), and great emphasis is placed on the collection of adequate information on this subject in housing census. The policy has been established in some countries for housing programmes to aim at reducing the average density of occupation of dwellings to certain levels (e.g. 1.3 persons per room in Italy). An estimate of the number of dwellings that would be needed to bring down the density from a level d to a standard level d_S might be obtained as follows:

$$D_3 = \frac{P_D - R_D \times d_S}{S_H}$$

D_3 = Dwellings needed in order to bring down the density of occupation from a level d to a standard d_S . (It will be noted that $D = \frac{P_D}{R_D}$)

P_D = Population living in dwellings

R_D = Rooms in dwellings

d_S = Desired density of occupation

S_H = Average size of private households

45. It should be noted that the needs D_2 (dwellings required to eliminate undesirable doubling-up) overlap with the need D_3 (dwellings required to reduce the average density of occupation) since the new dwellings which would reduce doubling-up would also reduce the average density. D_2 and D_3 should therefore be considered as overlapping estimates although they are a reflection of different problems. The extent of overlapping of D_2 and D_3 should be studied with reference to the circumstances of each case.

46. It should be noted that while the reduction of doubling-up requires additional dwellings, the reduction of the average density of occupation may be accomplished by increasing the number of dwellings or the number of rooms in existing dwellings.

47. It is recognized that a rather low density may co-exist with a substantial proportion of overcrowded dwellings, where overcrowding is statistically compensated by under-occupation of dwellings. Such compensation may be attributed to a shortage of housing in certain size (number of rooms) and/or rent groups, co-existing with an over supply of housing in other size and rent groups.

Overcrowding, therefore, may be caused by either an insufficient number of rooms
/...

in the total housing stock or by an inadequate distribution of dwellings by size and rent levels vis-à-vis the distribution of private households by size and income.

48. To what extent overcrowding is due to a general lack of dwellings or is a problem of inadequate distribution of existing dwellings could only be determined in the light of actual data. To this effect, a statistical table such as the one depicted in Graph No. 1, showing the distribution of dwellings cross-classified by number of rooms and number of occupants* would be very useful.

49. Graph No. 1 shows in the upper righthand corner the cells whose frequencies would correspond to dwellings with three or more rooms per person, which could be considered under-occupied. In the lower left corner are the cells containing the number of dwellings with three or more persons per room, which, under any circumstances, would be considered overcrowded. The number of overcrowded dwellings minus the number of under-occupied dwellings may be considered as the "net overcrowding" which could be attributed to insufficient capacity of the dwelling stock. This component of housing shortage can be expressed as follows:

$$D_4 = D_{oc} - D_{uo}$$

D_4 = net overcrowding

D_{oc} = overcrowded dwellings

D_{uo} = under-occupied dwellings

50. It should be noted that, because, in general, overcrowded dwellings are smaller than those that are under-occupied, the number of rooms in the latter may more than offset the number of rooms in overcrowded dwellings. This observation points out the possibility that overcrowding may in certain cases be alleviated by the subdivision of a certain proportion of large dwellings.

51. Other standards, instead of three persons per room, could be used to estimate overcrowding, such as over two persons per room or a varying number of persons per room according to the size of the dwelling and the household. Estimates of overcrowding have also been based on the number of persons per bedroom, the number of square metres per person, and on the family composition (age, sex and relationship of family members) in relation to the number and type of rooms occupied.

52. As indicated in paragraph 45 with respect to D_2 and D_3 , D_4 also overlaps with those components and the extent of overlapping would need to be determined in each case.

* (The number of occupants of a dwelling is approximately equal to the number of persons in the private household and identical when the household occupies the whole dwelling.) /...

GRAPH 1. Distribution of dwellings cross-classified by number of rooms and number of occupants

Number of persons in the households	Number of rooms in the dwelling												
	1	2	3	4	5	6	7	8	9	10	11	12+	
1			■	■	■	■	■	■	■	■	■	■	■
2						■	■	■	■	■	■	■	■
3	■								■	■	■	■	■
4	■												■
5	■												
6	■	■											
7	■	■											
8	■	■											
9	■	■	■										
10	■	■	■										
11	■	■	■										
12	■	■	■	■									
13	■	■	■	■									
14	■	■	■	■									
15+	■	■	■	■	■								

Under-occupied →

← Overcrowded

Methods used to estimate the number of dwellings considered to be substandard

53. This estimate depends upon the recognition of substandard conventional (permanent) dwellings. It may include the number of dwellings in need of structural reconditioning or for which certain essential facilities need to be provided as well as the number that need to be demolished and replaced by new dwellings. Difficulty has been experienced, however, in establishing suitable criteria to distinguish substandard dwellings and in the practical application of such criteria to the dwelling stock. Dwellings are sometimes considered substandard because they are in need of extensive structural repair (i.e. where important parts of the building like floors, roof, plaster walls or foundations need major repair or replacement), because they lack certain essential facilities, or because of a combination of both, or because of a general deterioration of dwellings and of the neighbourhood (slum dwellings). The criteria for determining substandard would vary from rural to urban areas. For example in urban areas dwellings without flush toilets and an adequate water supply system may be considered substandard irrespective of the state of repair while dwellings lacking similar facilities in rural areas may not be so considered. Also, in countries where rustic housing units constitute a substantial part of the housing inventory, as in tropical areas, the extent to which such units are provided with essential facilities may provide the criteria for their being considered standard or substandard.

54. Surveys conducted by trained inspectors would be the most suitable means of obtaining the necessary information for this type of estimate. In general a special survey of housing conditions would be required for this purpose, however, in some cases it has been stated that the data obtained at a housing census regarding the need for major repairs agrees fairly well with the proportions found in inspection surveys of the same areas.

VI. METHODS OF ESTIMATING FUTURE HOUSING NEEDS

55. Utilizing similar standards to those used in estimating present housing needs with perhaps some adjustments to allow for improved levels of housing, the number of additional dwellings necessary to house the population growth at some future date and the number required to replace housing lost from the inventory may be calculated to provide the estimates of future housing needs. The estimates of future needs and current housing shortage should include separate provision for a certain proportion of vacant dwellings.

Methods used to estimate the number of dwellings required to house the population increase at some future date

56. Estimates of population increase and assumptions regarding household formation provide the bases for estimating this component of future housing needs. The future population growth is estimated for periods ranging from three to thirty years, either for the country as a whole, or separately for rural and urban areas and sometimes for urban areas only. Estimates are generally based on observed trends of birth rates, mortality and migration, and assumptions are made about the future population movements from rural to urban areas.

57. All calculations aimed at estimating housing requirements will depend substantially on the size of the population and the average size of the households involved. For estimating present requirements these factors may be determined by means of censuses and surveys. For estimating future requirements, however, although population projections are generally available they are frequently not expressed in terms of households. Factors which may affect the size and distribution of future households will therefore need to be considered.

58. In order to translate population growth into estimates of housing requirements it is necessary to estimate the number of groups which would need separate dwellings. In a preliminary approximation it may be considered that the number of these groups is identical with the number of private households and assumptions may be made as to the expected proportion of the population which will be living in private households. The number of private households may then be estimated as follows:

/...

$$H_t = \frac{P_t}{S_H}$$

H_t = number of private households as of mid-year t

P_t = population estimate as of mid-year t

S_H = assumed average size of household as of mid-year t

59. More elaborate methods of estimating the future number of households, taking into consideration the projected distribution of the future population by age-sex, marital status, and expectations about income, urban-rural distribution and other factors could also be made, and a separate methodological study on this matter is being prepared by the United Nations.

60. In making these estimates adequate consideration must be given to factors other than change in the size and composition of the population such as the density of occupation at which the population increase is to be housed, i.e. whether it would be at the prevailing level or at an improved level of density, and trends in the preference of the population for certain types of dwellings.

61. Table 2 illustrates the magnitude of housing needs, for various rates of population increase and size of households. Housing requirements are shown for the absolute increase of a population of one million assuming rates of increase ranging from 1-4 per cent and average sizes of household from 2.5-6. Figures are grouped separately to show the number of dwellings required to provide all households with conventional (permanent) dwellings, 97.5 per cent of households and diminishing percentages down to 70 per cent.

62. Table 2 and Graph No. 2 illustrate the range of variation of the number of dwellings required for varying household sizes and rates of population growth. It will be seen that the number of dwellings required for a population increase of 1.5 per cent varies from 5,000 to 6,000 with a decrease in the average size of household from 3.0 to 2.5. Since the calculations shown are based on a population of one million it can be seen that a decrease in the average size of households increases substantially the number of dwellings required. (But the size of dwellings required for smaller households would also be smaller, and the density of occupation and the distribution of households by size would need to be taken into account in order to estimate the distribution of dwellings by size.)

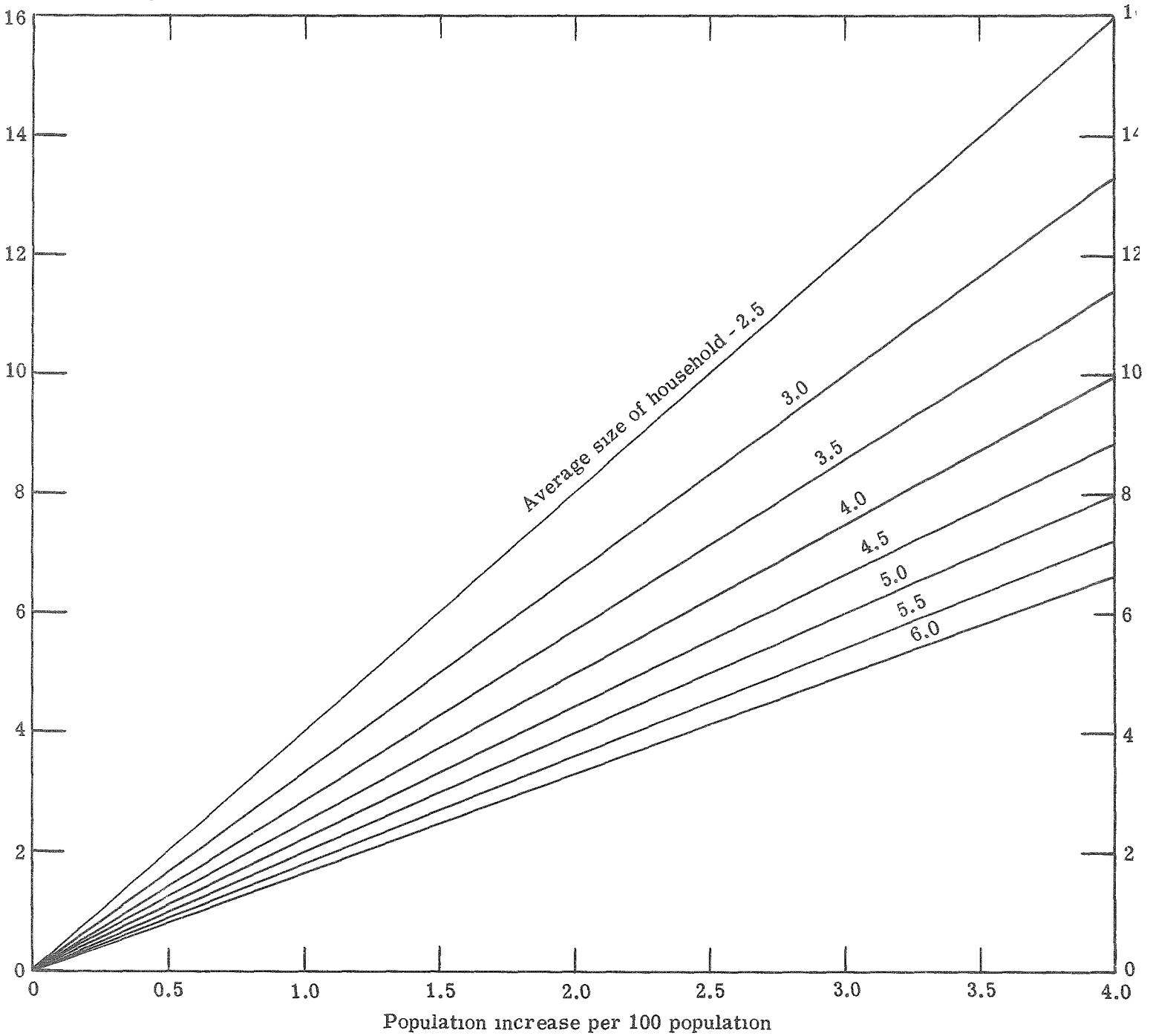
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Table 2. Number of Dwellings Required for the Absolute Increase of a Population of One Million

Percentage of population living in dwellings	Percentage population growth	Average size of household							
		2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
100%	1.0	4,000	3,333	2,857	2,500	2,222	2,000	1,818	1,667
	1.5	6,000	5,000	4,286	3,750	3,333	3,000	2,727	2,500
	2.0	8,000	6,667	5,714	5,000	4,444	4,000	3,636	3,333
	2.5	10,000	8,333	7,143	6,250	5,556	5,000	4,645	4,167
	3.0	12,000	10,000	8,571	7,500	6,667	6,000	5,455	5,000
	3.5	14,000	11,667	10,000	8,750	7,778	7,000	6,364	5,833
	4.0	16,000	13,333	11,429	10,000	8,889	8,000	7,273	6,667
97.5%	1.0	3,900	3,250	2,786	2,438	2,166	1,950	1,773	1,625
	1.5	5,850	4,875	4,179	3,656	3,250	2,925	2,659	2,438
	2.0	7,800	6,500	5,571	4,875	4,333	3,900	3,545	3,250
	2.5	9,750	8,125	6,964	6,094	5,417	4,875	4,431	4,063
	3.0	11,700	9,750	8,357	7,313	6,500	5,850	5,319	4,875
	3.5	13,650	11,375	9,750	8,531	7,584	6,825	6,205	5,687
	4.0	15,600	13,000	11,143	9,750	8,667	7,800	7,091	6,500
95%	1.0	3,800	3,166	2,714	2,375	2,111	1,900	1,727	1,584
	1.5	5,700	4,750	4,072	3,563	3,166	2,850	2,591	2,375
	2.0	7,600	6,334	5,428	4,750	4,222	3,800	3,454	3,166
	2.5	9,500	7,916	6,786	5,938	5,278	4,750	4,318	3,959
	3.0	11,400	9,500	8,142	7,125	6,334	5,700	5,182	4,750
	3.5	13,300	11,084	9,500	8,313	7,389	6,650	6,046	5,541
	4.0	15,200	12,666	10,858	9,500	8,445	7,600	6,909	6,334
90%	1.0	3,600	3,000	2,571	2,250	2,000	1,800	1,636	1,500
	1.5	5,400	4,500	3,857	3,375	3,000	2,700	2,454	2,250
	2.0	7,200	6,000	5,143	4,500	4,000	3,600	3,272	3,000
	2.5	9,000	7,500	6,429	5,625	5,000	4,500	4,091	3,750
	3.0	10,800	9,000	7,714	6,750	6,000	5,400	4,910	4,500
	3.5	12,600	10,500	9,000	7,875	7,000	6,300	5,728	5,250
	4.0	14,400	12,000	10,286	9,000	8,000	7,200	6,546	6,000
80%	1.0	3,200	2,666	2,286	2,000	1,778	1,600	1,454	1,334
	1.5	4,800	4,000	3,429	3,000	2,666	2,400	2,182	2,000
	2.0	6,400	5,334	4,571	4,000	3,555	3,200	2,909	2,666
	2.5	8,000	6,666	5,714	5,000	4,445	4,000	3,636	3,334
	3.0	9,600	8,000	6,857	6,000	5,334	4,800	4,364	4,000
	3.5	11,200	9,334	8,000	7,000	6,222	5,600	5,091	4,666
	4.0	12,800	10,666	9,143	8,000	7,111	6,400	5,818	5,334
70%	1.0	2,800	2,333	2,000	1,750	1,555	1,400	1,273	1,167
	1.5	4,200	3,500	3,000	2,625	2,333	2,100	1,909	1,750
	2.0	5,600	4,667	4,000	3,500	3,111	2,800	2,545	2,333
	2.5	7,000	5,833	5,000	4,375	3,889	3,500	3,182	2,917
	3.0	8,400	7,000	6,000	5,250	4,667	4,200	3,819	3,500
	3.5	9,800	8,167	7,000	6,125	5,445	4,900	4,455	4,083
	4.0	11,200	9,333	8,000	7,000	6,222	5,600	5,091	4,667

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GRAPH 2. Number of dwellings required (in thousands) for the absolute increase of a population of one million according to various rates of population, growth and size of household



63. It should be noted that the number of households may be increasing at a higher rate than the total population because of smaller families, decreasing age at marriage and the establishment of households by other than biological families (in 1950 almost one quarter of all occupied non-farm dwelling units in the United States were occupied by households other than husband-wife families)^{21/} and that the availability of dwellings would also facilitate the formation of additional households.

64. In view of the above paragraphs, dwellings required to house the increase in population at some future date may be expressed alternatively as follows:

$$D_{5t}' = f_t \times \frac{PG_t}{S_{H_t}}$$

D_{5t}' = new dwellings needed as a result of the population growth experienced during the year t

PG_t = population increase during year t

S_{H_t} = assumed average size of households by mid-year t

f_t = proportion of all private households that should be living in separate dwellings by mid-year t, according to adopted standards

or $D_{5t}'' = f_t \times H_t$ where H_t is the estimated number of new households that be formed during year t

65. It will be noted that generally it will be more feasible to use the expression D_{5t}' which perhaps can give sufficiently accurate results, since it depends essentially on estimates of the average size of private households which are believed to vary slowly and follow rather regular tendencies. Further studies are needed on this matter.

Methods used to estimate the number of dwellings required to replace those lost from the inventory

66. In addition to the new dwellings needed to house the population increase and improve housing conditions an estimate must be made of the number of dwellings

^{21/} Annex I, No. 24.

required to replace those which will be lost from the inventory during a stated period. The number of dwellings required annually for replacement purposes accounts for a substantial proportion of the total housing need - from 17 to 45 per cent in twelve countries for which data is available. Considerable variation in this figure results from the fact that in some countries present housing requirements are combined with future replacement needs while in others the two estimates are considered independently. For the purpose of this discussion replacement needs are considered independently of present accumulated housing requirements which have already been discussed in part V.

67. Dwellings may be lost from the inventory for the following reasons:

- (a) Because of obsolescence (age)
- (b) Demolition in connexion with slum clearance, reconstruction of towns, construction of industrial installations or other reasons such as the construction of dams, etc.
- (c) Disasters, such as fires, floods, earthquakes, typhoons, accidents, etc.
- (d) Dwellings falling out of use because of changed distribution of the population, or because of a preference for certain types.
- (e) Conversions of dwellings for non-residential purposes.

68. Adequate statistics concerning the extent and causes of loss from the housing inventory are usually lacking. Intercensal estimates of the total losses could be made on the basis of changes in the inventory but this requires more accurate figures concerning dwelling construction and conversions than are usually available (under-estimates of dwelling construction may conceal compensating under-estimates of losses). However, among the causes of loss shown above some reasonable estimate should be possible of the replacement needs which will arise from (a) and (b). Items (c), (d) and (e) will need to be estimated on the basis of past experience, estimates of internal migration and of other considerations. It should be noted that replacements and losses may not necessarily be at a one-for-one ratio and factors such as changes in the size of households and improved levels of density, which may be expected to affect the ratio, should be considered in estimating replacement requirements.

69. Estimates of the number of dwellings which will be lost from the inventory because of their age (item (a)) would be facilitated if statistics concerning

the age and condition of the housing stock were available. Such information considered together with the kind of material used for construction and methods of construction would provide the basis for a reasonable estimate of the number of years which dwellings might be expected to last and the rate at which they might need to be replaced.

70. Statistics concerning the age and condition of the housing stock are not always available however, and an over-all appraisal for the purpose of estimating the present age and average length of life may be made on the basis of general considerations of special circumstances, such as periods of war or other disaster when substantial losses have occurred, and periods of increased building activity when substantial sectors of the housing inventory may have been renewed, the material more frequently used in the construction of dwellings in the country and the methods of construction employed. In view of the fact that the quality of construction material and construction techniques improve according to the degree of urbanization, allowance has sometimes been made for variations in the average length of life of dwellings according to whether they are located in metropolitan, urban or rural areas.

71. The following extract concerning the calculation of replacement needs on the basis of the age of the housing stock has been taken from The European Housing Developments and Policies in 1954:^{22/}

72. "Turning now to the problem of replacement, the ideal method is to identify all dwellings due for immediate demolition and dwellings which are becoming obsolescent and should be demolished over, say, the next twenty years. This would give a clear-cut picture to which should be added an estimate of the number of dwellings that should be demolished or that would fall out of use for other reasons. The application of such a method requires a comprehensive survey of the quality and age of the existing housing stock. Even if such information could be collected, however, the problem of evaluation remains extremely difficult, particularly the technical assessment of houses which might be demolished at the end of say, ten, fifteen and twenty years.

^{22/} Annex I, No. 16.

73. "An approximate replacement rate might be determined solely on the basis of statistics of the age distribution of the existing housing stock. ... Generally a house may be regarded as ripe for demolition when it is 100 years old, and frequently sooner. If a life of 100 years can be taken as a guide, the annual replacement rate could be calculated by taking one-tenth of dwellings now between 90 and 100 years old. To this should of course be added the number of dwellings which would have to be pulled down for other reasons.

74. "In most countries statistics are not available on the age distribution of the existing housing stock, or are confined to a breakdown into broad categories, for example houses built before 1900. On the other hand, there is often available demographic information relating to 100 years ago from which estimates could be derived of the number of houses at present about 100 years old. It would also have to be assumed that dwellings were being built then at a sufficient rate to match the increase in population. A starting point might be to establish the difference in the total size of the population in 1870 compared with 1850 and then calculate what this figure represents as a percentage of population at the present time. If the same percentage is now applied to the existing housing stock the result may be regarded as an approximation of the number of dwellings built between 85 and 105 years ago. Dividing by 20 the number of dwellings arrived at with the aid of this calculation would give the approximate replacement rate for the next twenty years. The method suggested is clearly of a very rough character and would need refinement when applied in any given country. In some countries, for example, adjustments would have to be made for the large number of old dwellings destroyed or damaged during the war. In others, such as Austria, Finland, Norway, Sweden and the Union of Soviet Socialist Republics, account would have to be taken of the fact that the life-time of a timber house is normally considered less than 100 years.

75. "The discussion in this section should be regarded as of a broad and preliminary character since the drawing up of housing programmes on a scientific basis is a matter of great complexity and the underlying concepts and methodology have not yet been fully explored. The Housing Committee has decided to go more fully into the matter at a later session."

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76. The extent to which dwellings will be demolished or removed (item (b)) during a stated period may be estimated by reference to programmes in connexion with slum clearance, community development programmes which involve the demolition of existing dwellings or plans in connexion with industrial or other projects that may require dwellings to be demolished in certain areas.

77. The number of dwellings which will be lost from the inventory because of disasters (item (c)) is difficult to estimate with any degree of accuracy but consideration of certain factors may be helpful in providing a rough approximation of this figure. For example, the susceptibility to fire of the construction material generally employed, the geographic location of the area in relation to the possibility of floods, typhoons, earthquakes, and the extent of such losses in the past may help to provide an estimate of future losses.

78. For item (d) trends that may have become evident concerning the rate and direction of internal migration and factors that may affect it, such as the development of new industries in certain areas, irrigation programmes, etc., trends in personal preference for certain types of dwellings, e.g. detached houses, may provide a basis for estimating the number of dwellings falling out of use on account of a changed distribution of the population. It should be noted, however, that although changes in the distribution of the population may be substantial in countries experiencing a period of rapid urbanization, they may not necessarily result in vacant dwellings in rural areas but in an improved level of density in rural areas, and that rural dwellings that become vacant may provide housing for the natural increase of the rural population.

79. Estimates of replacement needs for the countries shown below have been extracted from The European Housing Situation.^{23/} They are expressed as a percentage of the total housing stock obtained from the same source. The figures in parentheses show the number of years that would be required to replace the entire housing stock were the rates of replacement shown to be maintained. It should be noted that a rather low replacement rate may be the result of the destruction of large numbers of old dwellings during World War II and of increased construction activity since that time.

^{23/} Annex I, No. 17.

Table 3. Estimated percentage of the housing stock to be replaced annually and number of years in which the entire housing stock would be replaced

	<u>Percentage</u>	<u>Years</u>
Bulgaria ^{1/}	.33	(300)
Denmark ^{2/}	.35	(286)
France ^{3/}	.79	(127)
Hungary	.39	(256)
Netherlands	.66	(152)
Norway ^{4/}	.76	(132)
Poland	.36	(270)
Portugal ^{5/}	.45	(222)
Spain	.49	(204)
Switzerland	.5	(200)
United Kingdom ^{6/}	.69	(145)

1/ Almost all dwellings are of brick and reinforced concrete and the greater part were built in this century.

2/ The number of old dwellings is relatively low and almost all residential buildings are of brick.

3/ An estimated 5 million dwellings are more than 100 years old.

4/ Based on the assumption that demolition between 1956 and 1985 corresponds to the approximately 210,000 existing dwellings built before 1900 (the age of obsolescence is lower than that for most other countries since the majority of dwellings are of timber).

5/ Calculated as 1 per cent of the housing stock 100 years ago.

6/ Replacement needs are calculated on the number of dwellings built 100 years ago.

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80. The following countries made an over-all appraisal of the housing stock, taking into consideration various factors of construction and condition of the dwellings, and arrived at an average age for the dwelling stock which provided the basis for the estimates of annual replacement needs.

Table 4. Estimated percentage of the housing stock to be replaced which have been derived from an estimated average length of life of the dwelling stock

	<u>Percentage</u>	<u>Years</u>
India	2.0	50
Peru		
Metropolitan areas	1.0	100
Urban areas*	1.3	75
Rural areas	2.0	50
Venezuela	3.3	30

* An alternate replacement estimate is shown for urban areas according to the size of cities. For cities of a population of from 10-100 thousand: 1.3 per cent (75); for cities with a population of from 2-10 thousand: 2.0 per cent (50).

81. Japan and the United States have considered their replacement needs in relation to standard units rather than the total housing stock. The United States shows estimates based on the existing number of standard units which will become seventy-five years old during a ten-year period. Japan's estimate of replacement needs although not stated to have been based on standard units has been made in addition to separate estimates of dwellings required for families living in "old dwellings that have to be rebuilt (or in superannuated dwellings)" or in "non-dwellings".

82. In view of the discussion in paragraphs 66-81, the dwellings needed to replace those lost from the inventory during a certain year may be estimated as follows:

$$D_{6t} = O_r \times D_t + D_{1t} + D_{nrt}$$

D_{6t} = Dwelling that will be lost from the inventory during the year t.

O_r = Rate of replacement due to obsolescence, computed on the basis of either the average length of life or the proportion of dwellings reaching the age of replacement.

D_t = Total number of dwellings at mid-year t.

D_{1t} = Demolitions and losses through disasters in year t.

D_{nrt} = Dwellings falling out of use or converted for non-residential purposes, during year t.

Reserve of vacant dwellings

83. Normally there is a certain proportion of the housing inventory which is inactive. It consists of dwellings which are vacant because they are for sale or for rent, or because they are being held off the housing market for other reasons, and dwellings which are seasonably vacant such as beach or country houses. Besides providing for the households and families who occupy more than one dwelling, these inactive dwellings permit a certain amount of choice in the selection of dwellings and provide for some mobility of the population in regard to housing.

84. In estimating housing needs it would be useful to include an estimate of the number of dwellings that would be required to provide for the inactive portion of the housing inventory. Such an allowance for a reserve of vacant dwellings has been included in the estimates of two countries for which information is shown in Part III. In Sweden, a reserve of 2 per cent of the total dwellings is estimated for urban areas and in the United States a reserve of 4 per cent is estimated for non-farm areas.

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VII. CONSOLIDATION OF ESTIMATES OF TOTAL HOUSING NEEDS

85. In considering the total estimates of housing needs the extent to which the various components may overlap should be considered in order to avoid duplication of the estimates. For example if an estimate is shown of the number of dwellings required for the population living in "rustic" and "improvised" housing units and those "not intended for habitation" then other estimates should refer only to the population living in "dwellings". Also replacement needs should refer only to the replacement of dwellings in good condition if the replacement of sub-standard units has been taken into account in estimates of present requirements. If estimates of internal migration have been used as the basis for estimates of replacement needs, on the assumption that there will be dwellings falling out of use in rural areas, then estimates for urban areas should be examined to determine whether internal migration has not already been taken into account in the estimates of dwellings required for the population increase in urban areas.

86. It has not been possible to set forth a set of rules for the consolidation of estimates. Tentatively the total need D_t for new dwellings to be provided by construction or conversion during the year t may be expressed as follows:

$$D_t = K_v \times \left[\frac{D_1 + D_2 + D_3 + D_4}{T} + D_{5t} + D_{6t} \right]$$

K_v = Coefficient reflecting the number of vacant units; K_v is always greater than 1.

T = Number of years which it will take to absorb the present housing needs (shortage).

D_1 , D_2 , D_3 , D_4 , D_{5t} and D_{6t} have been defined in Parts V and VI (attention should be given to the overlapping of some of these terms).

ANNEX I

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