SPACE STANDARDS IN LOW-COST HOUSING
WITH SPECIFIC REFERENCE TO URBAN AREAS
OF CENTRAL SUDAN

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This thesis is devoted to the formulation of space standards for low-cost housing in urban areas of central Sudan. It was prompted by the desire to provide some useful basis for the development of effective policies and programmes to deal with the problems arising from rapid population growth in the region.

A preliminary analysis of housing literature in the Sudan suggested the need for the development, as a prerequisite, of a conceptual and methodological framework within which the question of space standards can be viewed. The development of this framework is the centre of our concern in Volume I of this thesis. The meaning and uses of space standards are reviewed, their forms and basic criteria examined and their methods discussed. Of necessity, the discussion is first pursued in broad terms, but Volume I ends with the development of a method of approach particularly applicable to central Sudan.

To apply the method, it was essential to undertake field observations and interviews in a number of housing projects in urban areas of central Sudan. These aimed to provide some insight of the social and functional requirements of the low-income families. One of the projects visited was chosen for detailed appraisal and the results obtained are reported in the first part of Volume II. The second part goes on to establish, in the light of the evidence received, some design and planning criteria. Finally, some recommendations on space standards are put forward, some ways for the imple-
mentation of the standards are suggested and some lines for further investigation are pointed at.

On the whole, the findings of the field investigations support the views raised in Volume I: that there is a need to adopt concepts and terminologies relevant to existing circumstances; that there is a need to consider and exploit the factors of time and change in the formulation of standards; and that there is a need for a more comprehensive approach to the questions of housing and space standards.
IN TRODUCTION TO THE STUDY

In common with most recently developed countries, the Sudan is undergoing a gradual shift of its population from rural to urban areas. The Sudan is not yet highly urbanized when measured by European or even African or Asian standards, but in certain parts of the country the typical problems of rapid urban growth are already evident: there is a shortage of housing; the cost of house building is beyond the means of the average income earner; overcrowding and slums are not uncommon; and in recent years squatter settlements have sprung up on the fringes of some towns. The region of central Sudan in particular has received the maximum share of economic and social development and towns in this region have been growing at a comparatively faster rate.

Until recently, the solutions to the housing problem have been piece-meal. Whenever the need was felt, more money was raised and more houses were built or plots of land allocated as was justified by the urgency of the problem and by political fashion. The standards adopted were arbitrary. This "short-term" approach to the housing problem has produced no significant results. Indeed it has added to the complexity of the problem; first by providing further inducements for mass migration to major towns - and creating the need for more houses in these towns - and second by encouraging an unplanned growth of towns. The attempts of some distinguished Sudanese architects, planners, engineers and foreign consultants have recently succeeded in high-
lighting the need for a more rational policy and for more realistic housing standards and programmes.

There exist wide differences of opinion on the policies and standards that must be developed and applied. Attention is particularly drawn to the differences of opinion with regard to the size of the residential unit (or plot) which should be taken as basis of the physical plan. The advocates of higher densities call for a considerable reduction of the size of the urban plot. This view is opposed by some on the grounds that the Sudanese family values privacy and private open space and that there are usually wide stretches of land around towns to justify larger plot sizes. Both views have one thing in common; they are arbitrary and are based on guess-work as to what should be economical in terms of density or adequate in terms of family requirements of privacy and private open space.

The present study investigates the provision of space in the family home.1 It aims to map the different factors which enter into the provision and utilization of the space in the home and to make certain recommendations on space standards. This is undertaken with specific reference to low-cost housing in urban areas of central Sudan.

Low-cost housing is defined for the purpose of the

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1. The Sudanese concept of the space in the home, it will be shown, extends to include all that private and semi-private open space in the immediate vicinity of the house.
present study as that type of housing provided under direct government supervision, control or assistance in cash or kind for urban low-income families. The definition of the low income family will be discussed in some detail later in the study, but at this stage it is necessary to accept the general definition of the low-income family as "that unable to buy or rent at current market rates, a house that according to official and social standards is considered decent, safe and sanitary."¹

Urban areas of central Sudan are defined for the purpose of the present study as those towns, with populations of 20,000 people or more, contained within a circle having Wad Medani as its centre and limited from the north by Atbara, south by Kosti, east by Gadaref and west by El Obied, (figure 1). This definition excludes other major towns of the Sudan (such as Port Sudan) which, although they have similar housing problems, are known to present different social, economic or geographical conditions. Within the region of central Sudan (according to this definition) there are some "micro-variations" but these are assumed to be of little or no significance since the population within this boundary shares the same type of culture, economic structure and general way of living. Also, the whole region belongs to the same type of climate; namely, hot-dry of the monsoon type.

The question of space standards is very closely interwoven with the whole fabric of the housing problem. It cannot be viewed from a single plane; for example, increasing urban densities or reducing building costs. It will be necessary to consider and to reconcile a number of competing demands, some of which are deeply rooted in the values held by society. Only through such an overall approach to the problem could optimum solutions be reached.

The search for a method of optimization has led to an extensive study of the methodology for the assessment of space standards both in the Sudan and in other countries (developed and developing). It did become apparent, however, that there is as yet no comprehensive methodological approach for the formulation of space standards. Different objectives have governed the formulation of space standards at different times and in different places. Consequently, different methods have been employed as was justified by the specific context of the problem. One universal pitfall of both the past and present procedures, however, is their failure to accommodate the factors of time and change.

The other point which became apparent is that the methods currently employed for the formulation of standards in industrially advanced countries are not suitable for developing nations. That is simply because the concepts they apply and the techniques they employ are not relevant. I have, nevertheless, made use of their approaches - at least in spelling the grammar of the subject - for developing a method relevant to central Sudan. Although this method has
been developed with close reference to the Sudan, I see no reason why it should not be applicable to other developing countries after some modifications to suit local conditions.

The method places emphasis on two aspects; first, the interdependence between standards and family and society needs, resources and objectives; and second, the need to consider the factors of time and change in arriving at optimum solutions.

The study is reported in two separate volumes:—
Volume I investigates the theoretical and methodological background for the formulation of space standards. It ends up with the development of a method of approach relevant to central Sudan. Volume II describes the application of the method to urban areas of central Sudan. It includes recommendations on space standards and discusses some related aspects of design, planning, management and policy. Finally, it suggests lines for further investigation.
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WITH SPECIFIC REFERENCE TO URBAN AREAS
OF CENTRAL SUDAN

VOLUME I:
A THEORETICAL APPROACH TO THE
FORMULATION OF SPACE STANDARDS
Standards are relative. They reflect the values that people hold and the opportunities available for them to achieve these values. As both values and opportunities vary among different nations, one can only expect to find different standards; different in both their concepts and magnitudes. Rapoport summarized this view in a recent article as follows:

"As people perceive problems, possible solutions and ideal environments in different ways, they define basic needs differently; consequently they define different standards (temperature, sound, space, etc.), concepts (density, privacy, etc.) or domains (urban neighbourhoods, personal space, etc.). This leads to major design differences - different views of reality lead to different schemata and then to different actions and solutions."¹

At least in the field of housing and housing standards, these relationships were not always observed and one can find many situations where the attempts to solve housing problems - particularly those of developing nations - have been substantially influenced by concepts derived from other societies. This is not difficult to find reasons for in a time when the standards of living and ways of life in one society are communicated through various media to the average man in another. The result, however, was in many cases that

the 'problems', the 'solutions' and the 'ideal environments' have been perceived through a distorted looking glass; perceived by both the housing expert and the housing consumer.

The housing problems were described, not in relative terms that can take account of available social and economic possibilities, but in absolute terms - based on universal concepts and norms - which only encouraged despair. The housing solutions are usually provided 'piece-meal' to serve the lucky few who can afford to pay for such arbitrary standards. The ideal environments are not different from those Garden Cities advocated by Howard in Britain towards the end of the 19th Century. They are designed to create a good impression on the visitor to the town, but they differ from those Garden Cities in that they hide at their back ghettos and shacks which accommodate the bulk of the urban poor.

The consumer himself seems to have lost track of his basic needs. One often hears such statements as:-

"People in developing tropical countries are demanding houses of lime and cement built with more expensive and more fashionable materials;" and that "there appears to be a change in outlook and a change in values of even rural people who have come to expect costly accessories in their houses even though they cannot afford such expense."1

The considerations outlined above mean that it will

be necessary for a study on housing and space standards - in a developing country - to start from the basics; to analyse the nature of the housing problem, to clarify the concepts and to review accordingly the purpose and the method of the standards. These are the aims of the present volume.

Chapter 1 gives a brief account of the nature of the housing problem in urban areas of central Sudan and reviews the present housing and space standards. This is intended to enable an appreciation of the type of problems which exist and also to form a basis for our theoretical investigations, particularly in the last sections of this volume. Chapter 2 starts by describing the meaning and discussing the concepts of space standards and goes on to examine their objectives and criteria. Chapter 3 gives a short review of the type of standards which presently exist in different countries and discusses their methods and forms distinguishing between standards in developed and developing countries. It ends up by indicating the need for a more comprehensive approach to the questions of housing and space standards. This point is taken for further discussion in Chapter 4, where particular reference is made to the results of a number of recent studies on housing and standards in developing countries. The point will be put forward that space standards must be viewed simultaneously with other aspects of housing standards within a general framework set by national resources and objectives. In the light of this theoretical and methodological discussion,
Chapter 5 attempts to develop a method for the formulation of space standards applicable to the specific conditions in urban areas of central Sudan.

The central issues which run throughout the present study can be summarized in the following broad points:

1) There is a strong interdependence between the housing problem, housing standards and society values. The housing problem can be perceived in terms of a set of standards which are themselves the outcome of the type of values held by society. It follows that the only standards which have relevance in the formulation of housing programmes are those which have their basic expression in society values.¹

2) Only through an overall assessment of values and opportunities available can optimum solutions to the housing problem be arrived at. The adoption of 'piece-meal' measures, such as the provision of a limited amount of good housing, does not promise a solution to the problem of improving the housing conditions of the masses because of the wide gap between needs and national resources.

3) The habits of outdoor living and the social values held by many societies in developing tropical countries provide plenty of scope for cheap but

¹. Values are defined as "fundamental beliefs as to the nature and the purpose of human life, relationships of human beings to one another and the essential social conditions which make life meaningful." See: UNITED NATIONS; "Methods for Establishing Targets and Standards for Housing and Environmental Development." New York, 1968, p. 9.
effective measures for dealing with the problem.

4) Both values and opportunities of people change with time and it is important in the formulation of housing standards and programmes, not only to consider the factors of time and change, but also to exploit them for finding satisfactory solutions.

5) Improvements of housing quality must be obtained gradually as national and family economic conditions improve and the houses must be planned with an inbuilt potential for adaptability.
CHAPTER 1: BACKGROUND

1.1 GENERAL

Population increase, urban migration and poverty are considered among the primary forces behind the housing problems of most developing countries. The social changes which followed urbanization and, in particular, the awareness of higher standards of living and housing have aggravated the problem to a point where the cost of a socially acceptable dwelling is beyond the means of the average income earner.

The Sudan has by no means escaped these forces. Its population is growing fast.¹ Urbanization is becoming more and more significant and, although the Sudan is not yet highly urbanized when measured by European or even African or Asian standards,² the degree of urban growth so far reached in certain regions was sufficient to bring about all typical problems: the cost of house building is beyond the means of the average income earner; overcrowding and slums are not uncommon and in recent years squatter settlements have sprung up on the fringes of some towns.

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1. According to the First Population Census, 1955-56, the total population of the Sudan was around 10 1/2 million. The rate of population growth was given as 2.8% per year. DEPARTMENT OF STATISTICS, KHARTOUM: "First Population Census, 1955-56."

2. Of the total population by 1955-56, 78.0% lived in rural settlements, 8.3% lived in urban settlements while 13.7% were nomads. See DEPARTMENT OF STATISTICS ... ibid. The present estimate of the urban population of the Sudan is around 11%. 
1.2 POPULATION GROWTH IN URBAN AREAS OF CENTRAL SUDAN

Most of this urban growth is taking place in the region of central Sudan. For various administrative and geographical reasons the region of central Sudan has received the maximum share of economic and social development and towns in this region have been growing at a comparatively faster rate. Towns in this region include Khartoum, the capital of the Sudan and the seat of its government; Omdurman, the National Capital; Khartoum North, the industrial capital; Wad Medani, the administrative centre for the Gezira irrigated scheme; El Obied, the commercial centre for the agricultural and cattle grazing region of the west; and Atbara, an industrial town north of Khartoum, (figure 1).

The impact of urbanization in the towns of central Sudan began to be felt in the early 1950's and particularly after independence in 1956. In the period after independence, industry was conceived as one of the best ways to save currency and to open new employment opportunities. More and more industries were therefore established which drew their labour from rural areas. As most government machinery and social services were centred in the major towns of central Sudan, these towns have attracted both industrial and commercial establishments. It was natural

1. For example, about 70% of the industrial establishments of the Sudan by 1965 were centred in the three towns alone (Khartoum, Omdurman and Khartoum North), see, EL BUSHRA EL 8. "The Location of Industry in the Sudan." A paper prepared around 1967 (mimeographed).
figure 1:
URBAN AREAS OF CENTRAL SUDAN
that they have attracted as well the majority of rural
emigrants, most of whom were young men seeking employment.
The table below shows the population growth in 6 major
towns of central Sudan in the period 1955-1964. Information
for earlier years is not available.

TABLE 1

POPULATION INCREASE IN 6 MAJOR TOWNS OF CENTRAL SUDAN
(Note: Population figures are given in thousands).

<table>
<thead>
<tr>
<th>Town</th>
<th>Population by 1955</th>
<th>Population by 1964</th>
<th>Population increase</th>
<th>Population increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omdurman</td>
<td>114</td>
<td>185</td>
<td>72</td>
<td>63%</td>
</tr>
<tr>
<td>Khartoum</td>
<td>93</td>
<td>173</td>
<td>80</td>
<td>86%</td>
</tr>
<tr>
<td>Khartoum North</td>
<td>39</td>
<td>80</td>
<td>41</td>
<td>105%</td>
</tr>
<tr>
<td>Wad Medani</td>
<td>48</td>
<td>64</td>
<td>16</td>
<td>34%</td>
</tr>
<tr>
<td>El Obied</td>
<td>52</td>
<td>62</td>
<td>10</td>
<td>19%</td>
</tr>
<tr>
<td>Atbara</td>
<td>36</td>
<td>48</td>
<td>12</td>
<td>33%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>382</td>
<td>613</td>
<td>231</td>
<td>61%</td>
</tr>
</tbody>
</table>


1.3 OVERCROWDING AND SLUMS

The increasing rate of expansion in urban areas of
central Sudan brought about the need for more housing. It
corresponded in time (early 1950s) with an economic
inflation resulting from an exceptionally high price for the
Sudan cotton. This economic inflation reflected itself,
amongst other things, in a high cost of living. For the
low wage urban dweller, this meant an unanticipated increase in the cost of house building while rents accounted for a considerably high proportion of his income.¹

Till that time, apart from a few government resettlement schemes, there was complete absence of any organization responsible for the improvement of the housing conditions of the low income groups. Local building materials were underdeveloped and needed high maintenance costs while imported materials were beyond the means of most lower and middle income groups. This, coupled with many other social factors, encouraged families to overcrowd together in existing dwellings. The dwellings themselves were of substandard quality and lacking most of the basic facilities. Examples of these existed in the Old Deims south of Khartoum, El Mourada in Omdurman and El Danagla in Khartoum North.

Kenrick, in a study of El Mourada in Omdurman (1953) found the average occupancy rate to be more than 12 persons per house,² while Fawzi, describing the Old Deims prior to rehousing wrote as follows:—

"At the time of resettlement, 1949, there were twelve Deims altogether, comprising some 5000 'houses' built of jalous (mud) and accommodating thirty thousand people who lived in conditions of terrible overcrowding.

The plots were very much undersized - varying from thirty to fifty square metres. The typical house consisted

¹. FAWZI, S. "Social Aspects of Low-Cost Housing in the Northern Sudan." Khartoum, 1954. See particularly the "Preface" by the Commissioner of Labour.

of a single room of about 5 x 5 metres, and at the beginning had no compound - compounds were subsequently allowed and the residents provided themselves with some privacy by walling in a small area around their rooms. To make things worse, there were no proper latrine arrangements and the people had to use the empty spaces around their Deims, which was both unhygienic and offensive to the ordinary sense of decency amongst the people."1

1.4 THE START OF GOVERNMENT ACTION.

The start of government action in the field of low cost housing dates back to the early 1950s when an ad hoc committee was formed under the chairmanship of the Commissioner of Labour carrying the name of "The Workers Housing Committee." Its main aim was "to co-ordinate and plan measures for the improvement of the workers housing throughout the Sudan." In 1953, the Workers Housing Committee became a permanent department in the Ministry of Local Government and was given the name of "The National Housing Authority." Its aims were:-

1. To build houses and distribute them to low wage earners on hire-purchase basis throughout the Sudan.

2. To conduct research into building materials and construction techniques with a view to reducing building and maintenance costs.2

1. FAWZI, S. Ibid., p. 41.

2. HAMID, A. (Director of the National Housing Authority) "National Housing and the Experiment of Khartoum North," a paper (in Arabic) delivered at the Round Table Conference, Khartoum, March 1967.
Since its inception in 1953, the National Housing Authority has completed three main housing projects (in Khartoum New Deims, Port Sudan and Khartoum North) comprising some 1,500 houses. It has also administered an aided self-help housing project in the town of Omdurman; model plan types were distributed and model houses were built to guide the people in their house construction and building materials were provided and sold at their market value.

Parallel with the National Housing Authority's projects, the government, since 1962, has adopted a policy of allotting plots of land for different income groups in closed auctions. Land was sold on leasehold at nominal prices. For the low income groups, the plots were planned at a standard size of 300 sq. m. and sold at about 60 Sudanese pounds per plot. The cost of the essential community services is undertaken by the government but the tenants pay nominal charges, sometimes amounting to less than one shilling per month.

A different housing system also operates under the central government. To encourage house building and ownership, loans are made available for government employees for building or improving their houses. Some government ministries and departments also contribute by providing housing for their employees closer to their places of employment (e.g. Sudan Railways, police and army). Such houses are usually provided for rent at nominal charges.
The Sudan's Ten Years Development Plan 1961/71, expected that, over the plan period, the major portion of investment in housing would come from the private sector. It was estimated that investment by the private sector in modern housing would amount to 55 million pounds. The contribution of the public sector was planned as 7 million pounds of which 5 million was to be in the form of loans for government employees, one million for government housing and one million for mass housing. It was assumed that the production of traditional or African style housing in rural areas would be sufficient to keep pace with the population increase.

1.5 THE PRESENT SITUATION

Government efforts have succeeded in providing more houses but they have neither alleviated the housing shortages of the low income groups nor have they reduced the cost of house building to what the low income earner can afford - and the problem persists:

The houses provided under the hire purchase schemes - despite all the efforts taken to reduce their cost and to make easy the terms of repayment - remain beyond the reach of the majority of the low income groups. Indeed, by definition, only those families with incomes in the range (12-25) Sudanese pounds per month were qualified for such

houses, and there are many families with incomes below this range.\(^1\) Even amongst those who were qualified, only a small minority have succeeded in finding a house in the hire purchase schemes because of the low rate of house production and the high competition.\(^2\) It will therefore be fair to say that the production of housing in the hire purchase schemes has succeeded in meeting the needs of few families (mostly those who may be classified as middle income groups) but has failed to produce houses in quantities sufficient to satisfy an appreciable part of the housing need or at prices that could be afforded by the low income families.\(^3\)

The distribution of plots of land amongst the urban families appears to be a more satisfactory solution for the low income groups; but in as far as the gap between income and cost of building - to the present standards - remains high, this too cannot be relied upon completely. Experience

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1. These points will be discussed in more detail in Volume II, but it is necessary to refer here to the results of the Department of Statistics Population and Housing Surveys which showed that by 1965, 80% of the economically active populations of urban areas of central Sudan had incomes within or below the range (12-25) Sudanese pounds per month, (50% had incomes below this range). See: DEPARTMENT OF STATISTICS, "Population and Housing Surveys," 1964/65.

2. It will be remembered that about 1,500 have been built under hire purchase schemes during the period (1953-67). Estimates of housing needs by the end of 1966 amount to more than 60,000 dwellings in urban areas of central Sudan (see later). This means that only 0.25% of the housing need was met by the production of houses in the hire purchase schemes.

3. The cost per house by 1967 ranged from 800 to 900 Sudanese pounds (exclusive of cost of land and community services). The average tenant pays 25% of his monthly salary for mortgage and some other 15% for such things as rates, electricity and water (see later).
has shown that some of the plots of land allocated to low income groups have been sold because the tenants were unable to raise sufficient money for building. ¹

Where they have been able to find a financier - at very high rates - they have been compelled to sublet their houses completely or partly so as to be able to repay their debits. ²

Housing loans, whether public or private, are not available for everyone. Public housing loans go for government employees and officials and private housing loans for families with relatively higher incomes. ³

Meanwhile, the need for housing is becoming more and more pressing. That is partly because of the accumulating deficit over the years and partly because of the ever increasing rate of urban growth which the government housing projects themselves tend to stimulate. The Town Planner's Office, Ministry of Local Government, estimated the housing deficit in urban areas of central Sudan by 1965 as 64,000 houses. ⁴ In the Three-Towns (Khartoum, Omdurman and Khartoum North) it was estimated that to meet the need due

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2. It was found that between 25% and 30% of the government projects visited for the purpose of the present study are either completely or partly sub-let.


to population increase alone, some 33,000 houses should have been found by 1965. Only 10,000 houses had been found, meaning a deficit of 23,000 houses by 1965.\(^1\) It has to be mentioned that the above figures do not include estimates of the number of houses required to replace obsolete housing stock\(^2\) or to alleviate overcrowding.\(^3\) Also, since 1965, a number of political and economic changes have taken place which have resulted in mass migration to towns and despite recent government efforts in distributing more plots - the magnitude of the present problems is rather likely to be more than the above figures may suggest.

A quantitative summary of housing needs cannot be sufficient to show the nature of the problem for the problem is not only the shortage of housing but also the inadequacy of existing housing stock and, increasingly, the wide gap between income and the cost of a socially acceptable house. Although these aspects are reflected in one way or another in the present housing shortages, it is necessary to investigate them in some detail. Perhaps a

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1. EL AGIB, A.A. Ibid.

2. A large proportion of the present housing stock in towns is built of materials with relatively short life. For example, nearly one quarter of the housing stock in El Obied town is built of straw and more than one half of mud. Mud houses account for 69% of the housing stock in Khartoum, 86% in Omdurman, 63% in Khartoum North, 74% in Atbara and 25% in Wad Medani. See: "Population and Housing Surveys 1964/65". Ibid.

3. With regard to overcrowding, the average occupancy rates vary between 2.4 and 2.6 persons per room in each of the 6 major towns. No statistics are given of the number of families per house but my own surveys showed that this varies between 1.25 and 1.5 families per house. "Population and Housing Surveys 1964/65". Ibid.
review of existing housing standards can help to illustrate these components of the housing problem.

1.6 REVIEW OF EXISTING HOUSING STANDARDS

In considering the government policy with regard to urban housing standards, two distinctive features immediately arise: the classification of urban land according to minimum standards of plot size, material of construction etc. and the discrepancy between these standards and the immediate needs and resources of families.

According to the Town Planning Regulations 1957, urban land can be divided into any or all of the following classes:

<table>
<thead>
<tr>
<th>AREA</th>
<th>MINIMUM PLOT SIZE(^1) IN SQ.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>First class</td>
<td>800</td>
</tr>
<tr>
<td>Second class</td>
<td>400</td>
</tr>
<tr>
<td>Third class</td>
<td>300</td>
</tr>
<tr>
<td>Shops</td>
<td>25</td>
</tr>
<tr>
<td>Stores, warehouses</td>
<td>300</td>
</tr>
</tbody>
</table>

The classification of land in this way is directly related to the standards of space, material, amenity and servicing. Minimum requirements regarding building materials and methods of construction are included in the building regulations but they also show a direct relationship to the class of land in which the building stands.

In general, the higher the class of land the more sophisticated

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1. REPUBLIC OF THE SUDAN. "Town Planning Regulations 1957".
is the material and method of construction that constitutes the minimum required by regulation for building on it. Also such features as gardens, courtyards, number of rooms and facilities provided follow a similar pattern. The implication of this was that the houses in each class were roughly of the same price range and attracted people of roughly the same economic and social status.

There may be good reasons for the classification of urban land in the manner shown above. It is, however, interesting to note that the space standards follow very closely with the family economic class irrespective of its size or type. For example, the minimum space standards specified for the first class areas are twice as much as those specified for the second class areas and almost three times as much as those specified for the third class areas. This follows in a time when all available statistics indicate that the lower income families are usually associated with larger household sizes. Relative to the dwellings in the first and second class areas, those in the third class areas

1. Doxiadis Associates wrote in their Report about the Master Plan of Khartoum as follows:-
"Classification of land should be done following the distribution of families in accordance with their annual income. This measure would result in a more rational proportioning of the area occupied by each class". DOXIADIS ASSOCIATES "The Future of the Capital: a Long-Term Program and a Master Plan for the Development of the Capital". Preliminary document prepared for the Government of the Republic of the Sudan, Athens, May 59, p. 117.

2. For example, in Khartoum the average size of household varies from about 4 persons in the first class areas to about 6 persons in the third class areas. The figures for Khartoum North are 4·6 and 6·8 respectively. See: DEPARTMENT OF STATISTICS "Population and Housing Surveys 1964/65".
appear to be far undersized. In Khartoum, for example, the occupancy rates vary from an average of 1.1 persons per room in the first class areas to an average of 3.0 persons per room in the third class areas.\(^1\) In terms of plot space per person, the range varies between 150 sq. m. per person to 35 sq. m. per person in the first and third class areas respectively.

Land within the same residential class is almost always subdivided into standard plots of the same size and shape which are grouped together in a grid iron pattern with wide roads in between. From an aesthetic point of view, this produced a feeling of repetition and monotony, particularly in the third class areas where large portions of land are usually covered with rows and rows of houses of the same plan, size and material. From a functional point of view, the standardised plot size allowed insufficient flexibility within the housing areas to meet the needs of different family sizes and types. Thus within the same land classification area some houses are underoccupied while others are extremely overcrowded.

This lack of balance is also repeated in a different way; between the dwelling and its immediate surroundings. Although the density standards in almost all new housing areas are extremely low (measured by national or international standards), patches of extremely high density exist within the housing areas. The best example in this respect

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1. "Population and Housing Surveys..." Ibid.
is the dwelling itself, where in many cases, one or two families of more than 10 persons occupy a one or two roomed house in conditions of terrible overcrowding in a time when the dwelling itself is surrounded by wide roads and large neglected open spaces. The area occupied by roads in particular appears to be far more than that justified by the requirements of access.¹

In the past, the Sudanese towns have grown unguided by a rational plan. Whenever the need was felt, land was acquired piecemeal for residential or commercial purposes and this resulted in lack of cohesion and excessive horizontal expansion.² At present, the rising sizes of the urban plots and the considerable areas occupied by roads in and around housing areas are amongst the primary causes for this horizontal expansion. The housing densities of both the new and the old parts of towns are low. They vary from 15 to 20 persons per acre in the first class areas to between 60 and 65 persons per acre in the third class areas.³

¹ Doxiadis Associates calculated the area covered by roads in relation to that covered by plots in a residential section of Khartoum and another of Omdurman as 46.8% and 30.1% respectively. They remarked that: "In Khartoum roads clearly cover an unduly high percentage of the total area and planning is rendered uneconomic both from the angle of development cost and that of communication costs, owing to the wide area over which the town has spread". DOXIADIS ASSOCIATES. Ibid., p. 98.


³ For comparison, densities vary from around 300 ppa in most North African countries and 150 to 200 ppa in most countries of East and West Africa. Few African countries have densities comparable with those in the Sudan. South Africa, for example, achieved a density of 40 ppa. In South Africa the size of the plot ranges between 250 and 350 sq. m. Of this only 15% is roofed and the rest is left for gardening and other functions. See: UNITED NATIONS "Housing in Africa", Chapter 3, 1966.
Obviously, development at such low densities has brought about problems of urban land, urban transport and urban economics. It meant that municipalities could not allocate sufficient funds for the provision of community facilities and services. A discrepancy thus immediately arises between the dwellings and their immediate environment. The wide roads have to remain unpaved and the large open spaces around the houses have to be neglected because funds cannot be raised to improve them into clean and habitable spaces. The absence of community facilities in most housing areas is notable. This seems to follow irrespective of the class of land or the type of families. There is evidence that some of the tenants in Khartoum first and second class areas have recently moved out because of the lack of commercial and educational facilities.\(^1\)

The minimum housing standards recommended for the third class areas appear to be too high for the majority of the low income groups. It is estimated that more than one-third of the average family income is accounted for by house rent, rates and electricity and water consumption. This represents a considerable part of an already tight budget. The minimum standards have moreover been rising progressively. Parallel with the rising housing standards are the rising costs of labour and building materials. The result is a rapid increase in the cost of house building.

\(^1\) EL AGIB, A.A. Ibid.
Unfortunately, this increase in house building costs is not associated with a proportionate increase in the real incomes of families. The gap between family income and the cost of the minimum house is therefore becoming progressively wider. Table 2 below shows the increase in the cost of the minimum house in government projects between 1953 and 1967. For comparison, the cost of the house is expressed as a multiple of the average monthly income of the tenants in each scheme.

**TABLE 2**

**INCREASE OF THE COST OF THE MINIMUM HOUSE* IN GOVERNMENT SCHEMES BETWEEN 1953 AND 1967.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost of Minimum House (in Sudanese pounds)</th>
<th>Cost of House as a multiple of Average Tenant's Monthly income.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1953</td>
<td>250</td>
<td>25</td>
</tr>
<tr>
<td>1962</td>
<td>517</td>
<td>34</td>
</tr>
<tr>
<td>1963</td>
<td>557</td>
<td>37</td>
</tr>
<tr>
<td>1966</td>
<td>705</td>
<td>47</td>
</tr>
<tr>
<td>1967</td>
<td>820</td>
<td>55</td>
</tr>
</tbody>
</table>

**SOURCE:** Various documents available from the National Housing Authority.

*Calculations are based on the cost of the conventional two-roomed minimum house. The figures exclude the cost of land.

The table indicates clearly a widening gap between tenant's income and the cost of the minimum house. Thus whereas the cost of the minimum house was equivalent to about 2 man-working years by 1953, it was equivalent to
about 4½ man-working years by 1967. It must be emphasised, however, that the 1967 minimum house had improved physical standards (e.g. more plot space, a bathroom, an aqua-privy and so on).

1.7 SPACE STANDARDS

A number of changes have taken place in the recommended minimum housing standards over the past 20 years or so. Of particular interest are those which have taken place in the recommended minimum space standards.

It has been noted that before Resettlement (1949), the size of the plot in the Old Deims of Khartoum varied between 30 and 50 sq. m. The Deims Resettlement Scheme was based on an average plot size equal to 100 sq. m. The studies undertaken in the early 1950s showed that this figure was on the low side and that the desirable standard at that time was somewhere around 200 sq. m. This figure was taken in 1953 as the basis for the New Deims Housing Scheme.\(^1\) By 1959 the minimum standards had risen to around 300 sq.m.

For example, Khartoum North Housing Project (1959) was built to two model plan types; the first on a minimum plot size of 250 sq. m. and the second 300 sq. m. Also in 1963 the government distributed plots of land among the low income groups in closed auctions and the size of the plot was fixed at a standard size equal to 300 sq. m. In recent years more plots of land have been distributed and the minimum plot size, for no obvious reason, was raised to

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1. FAWZI, S. Ibid.
It is interesting to note that as far back as 1958 Doxiadis Associates (who had been commissioned to advise on the future development of the Master Plan of the Three Towns) had recommended considerable reductions in the sizes of the urban plots. They suggested that the problems of urban densities and costs of community development can be viewed from three different angles: decrease of plot size, introduction of economic type of roads and economic layout of communities. Their subsequent plans therefore assumed plot sizes to vary from a minimum average of 120 sq. m. for the lowest income groups to a maximum average of 720 sq. m. for the highest income groups.\(^1\) It is apparent that their proposals have not been met with much approval for, as shown above, the minimum standards for the low income groups continued to rise. In recent projects the minimum space standards averaged about 400 sq. m. (i.e. more than 3 times those suggested by Doxiadis).\(^2\) The reasons which have been voiced were mostly connected with the Sudanese family desire for privacy and private open space.

1.8 **SUMMARY AND CONCLUSIONS**

From the brief review given above, it will become clear that the housing problem in urban areas of central

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1. **DOXIADIS ASSOCIATES.** Ibid., pages 192, 236 and 280.

2. This will eventually mean that the land allocated by Doxiadis Plan for residential purposes has to be increased to more than threefolds. It is now generally believed that the Plan is needing substantial revision in the light of this and other developments.
Sudan does not only originate from the need for more housing and the lack of resources, but also from the inadequacy of the present policies and standards to cope with this situation. The houses built by the government in the hire-purchase schemes do not promise to produce an appreciable result because insufficient funds can be raised to make them available for every family in need.\(^1\) They are moreover built to such standards and at such unit costs that make them unattainable except to the few. The distribution of plots of land cannot by itself be relied upon to solve the problem. There is more to housing than simply distributing vacant plots of land. In as far as the gap between income and the cost of building to the present standards remains high, this solution can only result in a situation where the housing programmes intended for the low income families go for other families with relatively higher incomes.

The standards presently adopted are arbitrary. Although they appear to have been formed with concern for such aspects as family privacy, density, building costs and the like, it is evident that no systematic research has yet been carried out to determine what is sufficient in terms of

\(^1\) It was stated in the Sudan's Ten Year Development Plan that: "It would be virtually impossible for the government to allocate a substantial part of its scarce resources to modern house building at a time when so many other types of investments will have to be carried out." The Plan, as stated above, only made a provision of one million pounds for National Housing during the plan period and expected the larger part of investment to come from the private sector. See: REPUBLIC OF THE SUDAN: "The Ten Year Plan of Economic and Social Development, 1961/62-1970/71," Ministry of Finance and Economics, Khartoum, Mar. 1962, p. 54.
privacy and economic in terms of density or feasible in terms of cost. The absence of theory in these respects is notable.\(^1\)

The inadequacy of the present standards does not only arise from their arbitrary nature but also from their lack of coherence. This is reflected in the persistent lack of balance between needs of different family types and the standards applied; between the groups of houses and their direct and essential facilities; and between different environmental standards within one and the same house or housing area. Until very recently, the formulation of standards was delegated to various departments in different ministries each of which appeared to have its own financial limitations, its own philosophy and its own scale of values.\(^2\)

For example, decisions relating to the size of the urban plot and standards of residential density were taken by the Town Planning Department (Ministry of Local Government). Those relating to community services and facilities were undertaken by the municipal authority in each town. Standards of accommodation, construction and servicing were formulated by the National Housing Authority and by various committees set from time to time for the purpose. Other

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2. In May, 1969, a new Ministry of Housing was established for the first time to incorporate these various departments. However, at the time of writing this thesis, the work of the Ministry is still at the early preparatory stages.
decisions relating to housing standards are also included in the Building Regulations and the Town Planning Regulations. This subdivision of responsibility has led to lack of co-ordination in policies and standards and has in fact resulted in a great loss of value.\(^1\)

The contrast between different opinions about the size of the urban plot is, in my view, a manifestation of the confusion which exists as to the role of housing standards generally. Quite different answers can be obtained to the question of space standards if the basic criterion is to increase densities and reduce costs or if it is to ensure privacy and private open space for the family. Both opinions, one calling for higher densities and the other for more privacy and open space for the family, appear to have shifted the emphasis away from the basic problem and are therefore inadequate as guides for realistic solutions.

All the above factors seem to call for a more rational and comprehensive approach to the questions of housing and space standards. They suggest that space standards are needing to be directed to serve a more general purpose; that of finding at least tolerable living conditions for the majority of urban families within the limits set by available resources and by various other climatic and social factors. These lines of thought will be examined

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later in the study, but at the beginning it is necessary to clarify the meaning and concepts and to discuss the uses of space standards.
CHAPTER 2: THE MEANING AND USES OF SPACE STANDARDS

2.1 THE MEANING OF SPACE STANDARDS.

Broadly speaking, the standard of space in housing is defined as the measure of the intensity of dwelling occupation. It establishes a relationship between people and the amount of space they occupy;\(^1\) (e.g. floor space per person).\(^2\)

Space standard is one of the indices in the measurement of housing quality. Although it gives an indication of the amount of space available for the individual or the family, it does not by itself reflect the actual living conditions. In consideration of the latter, various other characteristics come into being. For example, the way this space has been subdivided between different functions and arranged within the dwelling (e.g. to secure privacy) affects considerably the living conditions of the occupants. A higher standard of space does not automatically mean better living conditions or greater degree of privacy; space standards can only give optimum thresholds within which good living conditions may be possible.

Space standards are specified by different countries in building regulations or by committees which are set from time to time for the purpose. They have been specified in

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2. There are in practice a number of other forms and units in which space standards are specified and these will be discussed in some detail later in this section.
the past as measures against overcrowding and ill-health and the earlier units in which they have been specified reflect this purpose (e.g. persons per room or cubic capacity of room per person). It was felt necessary by public health authorities, after recognition of the relationship between overcrowding and ill-health, to specify minimum mandatory standards in order to preserve the physical health of the occupants. In addition to these statutory minimums, and particularly in prosperous countries, committees are set up from time to time to review existing standards and to recommend new ones in the light of changed circumstances. These usually go beyond the public health concepts on which early legislation has been based. As such, they are usually intended as guides and may receive legal significance in connection with government subsidy or as required to qualify for special loans. In Britain, The Tudor Walters Report (1919), The Dudley Committee Report (1944) and The Parker Morris Report (1961) are good examples.

The form of legislation attached to space standards depends largely on the conditions under which they are formulated. This is in fact one of the key questions in determining housing or space standards. It may be possible to specify minimum mandatory standards, but it is not always possible to enforce them on new building. Such mandatory standards can prevent the construction of unsatisfactory dwellings but by raising building costs, they may remove a
considerable section of the population from the benefits of private building.¹

It is important to distinguish between the notion of standards as instruments of control and as means for satisfying the needs and expressing the aspirations of people. With improvements in preventive medicine, development in technology and the gradual awareness of the social and psychological effects of good housing the earlier emphasis of standards on health has been reviewed. Although minimum mandatory standards are still maintained by building bye-laws (and the housing conditions of many families in many countries are still to be raised to these standards), new types of standards have emerged. Space standards are today formulated for a number of reasons, in a number of forms and units and at varying degrees of precision and obligation.

2.2 CONCEPTUAL DIFFERENCES

Space standards first emerged under the climatic, social and economic conditions of the developed countries of the temperate zones. Their concepts and terminologies have been chosen and developed relative to these specific conditions. Any attempt to formulate space standards for the extremely different conditions of the developing countries of the tropical or subtropical regions will there-

¹ See ATKINSON, G.A. "Housing Standards with Particular Reference to Developing Countries in Tropical Regions" A Note prepared for the WHO Committee on Public Health Aspects of Housing, May 1961.
fore be forced into considerable conceptual and semantic problems which involve not only the meaning of space standards as such, but also of related aspects such as density, privacy, family, house and so on. Without such a 'filtration process' the definitions and terminologies will be irrelevant as guides for suitable solutions and can in fact be misleading as they may presuppose or suggest certain types of solutions.

For the European architect or housing expert, the term 'space standards' usually connotes the size of floor space or the number of rooms in the house related to the number of people occupying the house in order to maintain health, to ensure a certain degree of privacy and comfort in family living etc. The units which have been devised for the purpose reflect this concept of space standards (e.g. floor space per person or per family or number of persons per room). In a tropical country where a major part of family living takes place outside rooms and covered spaces, such a concept of space standards cannot be relied upon to describe the whole situation. The private open spaces around the house count as part of the 'space in the home' and must therefore be incorporated in our tropical conception of space standards.

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1. The units for the formulation of space standards must also be chosen in relation to this wider concept. Rate of floor space per person does not seem to be completely appropriate. Other units such as total living space or plot space per family seem to provide more useful bases both for the design and for calculations of density standards and total land requirements; (see later).
Societies also differ in their definitions of such terms as privacy and density and in the way they respond to them. Rapoport gives the example from the Amazon Valley where the concept of privacy "involves a tacit agreement whereby a person is able to obtain perfect privacy (at least in the sense of not being interfered with by others) by turning his face away from the centre of the house. Whoever does this is regarded as no longer present, and no one will look upon or disturb him no matter how urgent the need." In contrast to this simple concept, a recent study of a courtyard housing scheme in Scotland showed the tenants conception of privacy to involve three main features: freedom to live one's own life (together with that of one's own family) without outside interference or intrusion; freedom from seeing or being seen by neighbours or passers by when in the house or garden; and freedom from disturbance by noise. Under the Sudanese social and cultural conditions, my studies (reported in Volume II of this thesis) have shown that at least one aspect of privacy is far more important than all other aspects; the privacy of women folk against men visitors and passers by.

Edward Hall suggests that societies not only differ in their definitions of such terms as privacy and density,

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1. RAPOPORT, A. "Yagua, or the Amazon Dwelling". An article in the EKISTICS, Vol. 25, No. 147, Feb. 1968, pp. 107-108. See also, by the same author "House Form and Culture". New York, Prentice-Hall, 1968.

2. ARCHITECTURE RESEARCH UNIT "Privacy and Courtyard Housing". University of Edinburgh, 1968.
but also in the way they respond to them. 1

All the examples given illustrate the need for developing countries to establish concepts and terminologies for the formulation of standards relative to their own social, cultural, climatic and economic conditions.

2.3 OBJECTIVES FOR THE FORMULATION OF SPACE STANDARDS

Apart from health requirements, space standards are now formulated to facilitate privacy, comfort, convenience and pleasure in family living. At the same time, they are designed to achieve space economy and in some cases to comply with dimensions of industrialized building components.

Space standards are also observed at a different level; in the calculation of programmes for detailed planning and in appraising the quality of existing housing. Thus three main uses can be ascribed to the formulation of space standards as follows:

(1) TO ENSURE A RELATIONSHIP BETWEEN PEOPLE AND THE AMOUNT OF SPACE THEY OCCUPY

Space standards are usually formulated to provide sufficient accommodation for the family to meet its social and functional requirements such that there is neither overcrowding nor undue waste. This is usually related to the number of people in the family, their age and sex, the type of activities performed in the home and other

1. HALL, E.T. "The Hidden Dimension". Garden City, New York, 1966. See particularly the last four chapters. See also the paper delivered by the same author at the Delos Symposium, 1965.
considerations such as privacy and personal preferences. Most of these requirements depend on other qualitative aspects which are themselves determined by the type of culture. The ways in which people from different societies use their dwellings or formulate their preferences vary considerably. In most developing countries, there exist local habits and traditions which tend to obscure modern solutions based on foreign concepts and standards. The climate also plays an important part in shaping patterns of living. For example in tropical countries a great part of family activities is performed out of doors and this affects considerably the types and sizes of spaces to be provided in the tropical family home.

The major limiting factor is of course the family economic ability. Families who benefit from mass housing are usually poor and no form of government is able to subsidize, as a social service, all those families in need of housing. Under such circumstances, the adoption of modest standards related to local conditions remains as the only possible solution.

(ii) **AS A PLANNING TOOL**

Having arranged for a reasonable amount of space in the dwelling related to family needs and economic resources, then space standards can be used in a wider sense for planning purposes (e.g. estimation of total residential land requirements and calculations of building volumes and costs).

The subdivision of urban land between different uses
implies the specification beforehand of certain acceptable norms relating to floor space, open space, parking space, shopping space, etc. On the accuracy of the understanding of these requirements depends the success of the overall plan for the provision of various community facilities. The cumulative effect of these different indices is usually expressed in the form of density standards (so many persons or so many houses per acre).

The space within the dwelling is the first important consideration in the calculation of standards of residential density. When expressed as rate of floor space per person, space standards provide a useful planning tool - the coefficient of floor space.¹

Although the standard of space in the dwelling is only one of many indices determining density standards, the correlation between the two is of unquestionable importance in the creation of balanced communities. Where density standards have been arrived at independently, waste of land and lack of coherence have resulted. In Chapter 1, I have argued that the overcrowded conditions inside the dwellings in the majority of third class areas of towns in the Sudan is contrasted by an extravagant provision for roads and neglected open spaces. This, in my view, can only be explained by the lack of integration of space standards and density standards. Decisions about each of

these have been arrived at independently.

Space standards have also been employed by many countries for the assessment of overcrowding conditions and the calculation of building volumes and costs. For such purposes, the concepts have been standardized and expressed in units which could give a rough indication of the total building requirements. For example, in Romania 'a dwelling unit' is defined as 30 sq. m. of living floor space equivalent to 60 sq. m. of building floor area.¹ This definition of a dwelling unit was chosen to correspond to the average two-roomed dwelling.² In Sweden, a 'room unit' and a 'dwelling unit' are at present calculated as equivalent to 25 sq. m. and 80 sq. m. of floor space respectively.³ When the numbers of households to be provided for are known approximately, these measures are employed as bases for detailed planning (e.g. estimation of building volume and costs).

Where space standards have been employed for the assessment of overcrowding or underoccupancy, they have taken the form of minimum or maximum limits of floor space rates or number of rooms in the house. For example, in the Netherlands, a house is considered to have a basic defect if its total area is less than 30 sq. m. or it consists of

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¹ The living floor space is assumed to be equivalent to the sum of the areas of habitable rooms. See definitions below.
³ Ibid.
only one room. In Czechoslovakia, a dwelling is considered underoccupied if the total floor area of rooms exceeds the limit of 18 sq. m. per person, allowing an extra 6 sq. m. per household.

(iii) AS A GUIDE FOR DEVELOPMENT

Parallel with the use of standards for the general planning purposes is their use for obtaining good value for money and for the rationalization of housing production. These can be achieved in a number of ways: by establishing a good balance between the structural life-time of the dwelling and its useful life-time; by making use of the benefits of large scale production and by codifying decisions and summarizing experience gained.

Most countries specify in detail standards of floor space, sometimes as sizes of individual rooms and other times as sizes of overall dwelling areas. There seems to be little reason why, for example, a five-persons family house should be of an area equal to (say) 900 sq. ft. and not 925 sq. ft. or 875 sq. ft. The decision for either of these may have relatively little effect on the total cost of building. What appears to be more significant is for how long this dwelling will remain functionally and

1. Ibid.
2. Ibid.
3. It is generally recognised that once certain basic costly features in the dwelling have been provided - bathroom, kitchen, staircase etc. - the cost per sq. ft. of additional living space is comparatively cheap. See MINISTRY OF HOUSING AND LOCAL GOVERNMENT (BRITAIN) "Homes for Today and Tomorrow". Parker Morris Report, HMSO, 1961, p. 2.
structurally 'fit' to accommodate the family at different stages of its growth and development and with different patterns of living and types of requirements. This is probably a more cost-sensitive area than that suggested by 'micro-variations' of floor space (which are after all only empirical).

It should therefore be one of the objectives in the formulation of space standards to find the best balance between the present and future requirements of families and the functional and physical performance of dwellings so as to ensure the best value for money.\(^1\) In most western industrialized societies the family structure and living habits tend to follow a fairly predictable pattern bearing a direct relationship to certain desirable standards of living.\(^2\) Despite this fairly predictable pattern, every year thousands of houses in these countries are deemed 'unfit', a considerable portion of which, because of functional obsolescence; i.e. lack of space or inconvenient arrangement of space or both.\(^3\) If the standards had been set with

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1. Cowan points to the need to understand the relationship between the structural degeneration and functional obsolescence in buildings. He points out that whereas the structural degeneration is a gradual process related to the age of building, functional obsolescence happens in a series of steps each indicating the introduction of a new procedure or technique which suddenly lowers the functional effectiveness of the plan. See; COWAN, P. "Studies in the Growth, Change and Aging of Buildings". Transactions of the Bartlett Society, Vol. 1, 1962-63, pp. 55 - 84.


such considerations in mind, then more use could have been made of old dwellings, particularly when their life span is made longer by improvements in building materials and methods. The following remarks have been made by a city architect in Britain in a discussion of the Dudley Committee Report:

"There can be little doubt in our minds now that the standards of space laid down in the Dudley Report, 1944, were at that date adequate and far-seeing. Had we throughout the last 15 years, been able to build to these standards, there would have been little wrong with our post-war dwellings. Unfortunately, because of the unforeseen and unprecedented rising costs, these standards have been gradually whittled down to a point which everyone has now realized is rock bottom, so that rising costs or not, the pendulum must be allowed to swing the other way."  

More will be said throughout this study about the factors of time and change but it is necessary at this stage to emphasize the role of standards in the control of the quality of future housing stock and the achievement of good value for money.

Space standards can also be used as guides for rational housing production. In this sense, they provide acceptable sizes of dwellings on the bases of which a certain range of building components and elements can be

1. See; WOMERSLEY, J.L. Ibid.
standardized and mass produced, leading perhaps to more economy and better products. In Britain, the drive for standardization and 'variety reduction' has led to 'Dimensional Coordination',¹ 'Generic Plans'² and more recently, 'Metric Housing Shells'.³ The latter was not met with much approval by architects, particularly as it takes away the flexibility offered by Parker Morris.⁴ The idea of dwelling industrialization is certainly feasible, but this need not reduce the opportunity for variety in the building form. These questions, however, are discussed in more detail somewhere else.⁵

2.4 FACTORS OF SPACE STANDARDS

From the preceding discussions it can be seen that there are a number of social, functional, economic, technical and climatic factors which should be considered in the formulation of space standards. Throughout this study I would like to look into these factors, not as absolute and separate artifacts but as closely interrelated criteria which

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2. NATIONAL BUILDING AGENCY (Britain) "Generic Plans". London, HMSO 1965.
3. NATIONAL BUILDING AGENCY (Britain) "Metric Housing Shells". London, HMSO 1968.
5. The thesis by my colleague Gerry Ginader disputes that dwelling industrialization implies the reduction of all opportunity for variety in its final form. See; GINADER, G.K. "The Role of the Adaptable Dwelling". M(arch) Thesis, University of Edinburgh 1969.
interact to favour one decision on space standards or another. That is, to discuss *simultaneously* all the socio-functional, climatic and economic factors leading to decisions on space standards. By so doing, I aim to avoid one of the shortcomings of the present approaches; that of having to place unnecessarily too much emphasis on one criterion at the expense of the others.

There are however one or two factors to which I would like to draw particular attention, either because they have often been ignored or because of my belief that they can be of fundamental significance to our conception of space standards and our approaches to their formulation.

(i) **PLANNING FOR GROWTH AND CHANGE**

The need to understand the relationship between the structural degeneration and functional obsolescence of buildings has already been pointed out. This need is brought about by an accelerating rate of change in the pattern of use of buildings, in the social structure of the organizations housed by buildings and in the type of equipment and appliances presently available inside buildings. If good value for money is to be achieved, we have argued, the useful life of the dwelling must be extended throughout its physical lifetime.

In Britain, Cowan has shown that typical parish churches in being adapted to change in the pattern of worship and increase of local population have grown at a rate of about 100% per century. He also measured the rate
of growth of hospitals in Birmingham which showed 100% increase of size in only 40 years.\textsuperscript{1} Weeks points to the need for buildings such as hospitals, universities and airports "to have inbuilt potential for growth and change which is matched to the growth and change pattern in the organizations which (they) house".\textsuperscript{2} He argued that old buildings such as railway stations were designed to space standards which were lavish by comparison to modern buildings, and this has made them able to survive an intensification of use, serving now many times the number of passengers for which they were designed. Modern buildings on the other hand, are tailored more and more accurately to the work to be done in them and are provided with higher standards of service provision than in the past. "They are not, therefore, easily able to absorb larger populations or changes in the pattern of use of space."

In housing, the need to plan for growth and change is made necessary by a number of factors: the family is continually growing; with the growth of the family comes the restructuring of its internal relationships; third, there are the changes in style of living, in housing preferences and in the type of possessions that people own or use; and fourth there are the changes in the family's

\textsuperscript{1} \textit{Cowan, P.} Ibid. See also another article by the same author (and \textit{Nicholson, J.}) under the title "Growth and Change in Hospitals", in Transactions of the Bartlett Society, Vol. 3, 1964/65, pp. 63 - 88.


\textsuperscript{3} Ibid.
economic resources over time. The family house must be rapidly adaptable to these changes or otherwise it will be obsolete even though it may be structurally fit.

To plan for family growth and change it is necessary to understand the pattern of growth and the direction of change. For example, our surveys have shown that the average Sudanese family grows in a number of ways causing different types of pressures on existing space and creating different types of demands. The family grows by natural increase in its size as more children are born; by the incorporation of a single lodger or lodgers; and by the incorporation of a whole family branch. It is also important to distinguish between different types of house growth: the house grows by increase in space to accommodate more people or more functions; by increase in number of rooms for specialized functions; or by increase of a whole branch structure (e.g. the addition of a private room complex to house an incorporated family branch).

The significance of the factor of time and change in the formulation of space standards is basic. It may be possible to provide the family with just an open plot of land and the essential services but no 'floor space', on

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2. This compares with Peter Cowan's classification of building growth as: a) Growth by large functional units; b) growth by small additions to floor space; c) growth by large structural units; and d) growth arising from an intensive use of space. The last category is in my view a cause for growth rather than a type of growth of building. See; COWAN, P. "Studies in the Growth, Change and Aging of Buildings". Ibid.
the assumption that the family will be guided to add more rooms in the future. The plot under such circumstances needs to be planned in anticipation of future growth and change. This kind of approach has recently gained momentum in some developing countries particularly Latin America. Another type of approach which has been applied in some east African countries is to build houses for temporary use out of temporary materials and to accept, on these assumptions, modest space standards. In both types of approaches, the interdependence between future requirements and present standards is quite apparent.

(ii) PERSONAL EXPRESSION AND SECURITY OF TENURE

The need to personalize and territorialize one's own environment is not new. Ever since the process of house design ceased to be a matter for personal expertise there has been a continuous need to add and alter, to personalize and to give meaning. The vernacular house was built in stages and was characterized by its immediate and direct responses to human needs. It was therefore rather easy to change and adapt. The modern mass-produced house on the other hand, is designed for more widely shared characteristics and is moreover provided as a 'tight-fit' unit leaving fewer elements that can be personalized and showing less opportunity for change.¹

Alexander points to the need for buildings to be

adapted to the personal needs of the people who live in them. This is obvious; but he distinguishes between two kinds of adaptation; mass adaptation, defined as the process of adapting the house to general and widely shared characteristics; and personal adaptation, defined as the process of adapting the house to special personal idiosyncracies of its inhabitants. He argues that "the organization required for mass adaptation can be provided by technical means - whether by actual mass production or by mass communication leading to standard archetypes. But the personal adaptation cannot be created in advance by technical means of any kind. Dwellings must be designed in such a way that the personal adaptation takes place as people live in it."\(^1\)

People seldom exercise a wide variety of choice in mass produced projects. Standards therefore must be designed with a certain degree of 'tolerance' to allow various differences and preferences to be expressed. Personal expression in housing can take many forms varying from little carvings, internal decor and special fittings inside rooms to the whole external character of the house. With respect to space standards, it suggests the provision of types of spaces which can be easily adapted and personalized and the provision of such kinds of 'extra' spaces for the pursuit of personal hobbies such as gardening, food growing, keeping

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domestic animals and keeping (or showing-off) collections and valuable possessions. The importance of this kind of 'open-endedness' is not just in providing a chance for personalization of the housing environment but also in encouraging the people's participation in the organization of this environment; a matter which has received greater attention recently.

The desire to personalize and territorialize is not only expressible in these limited physical forms and features but also in psychological notions (such as feeling of belonging and security of tenure) which can have a profound impact on the whole urban environment and urban form. The concept of home ownership for example, suggests in some cases the provision of houses of relatively low physical quality (and perhaps of a temporary nature) thereby having a direct influence on the whole urban environment and form.

(iii) THE NEED TO SAFEGUARD COMMUNITY INTERESTS

With the need to allow people a certain degree of freedom in their dwellings comes the question of where to limit this freedom. Dwellings have the particular characteristic that although they are intended for private use, they affect the community in a number of ways through their external appearance, the destruction of certain amenities, the effect on health and safety etc. Individual valuations do not usually take into consideration these community interests. For example, a family may prefer a large dwelling with a large amount of space but with no proper waste disposal system to another dwelling with
smaller space but with proper sanitary installations, even though the first provides a hazard to the community. Shortage of land or resources may demand government intervention, in the interests of the whole community, to prevent speculation by those who can afford the expense. The state exercises its preferences by specifying certain limits or constraints (e.g. controlling land use through suitable planning, zoning and subdivision regulations); the individual exercises his preferences in the market within these limits and constraints.

In a developing country where the present levels of housing space attained by the majority is low, and where resources are few and competition for urban land is high, there appears to be good reasons for specifying maximum space standards. The standards can take the form of a range between minimum limits related to family social and functional requirements and maximum limits determined according to availability of land and economic densities. Within this range, the individual can be allowed his freedom of choice according to his specific preferences and characteristics. This point will be elaborated upon later in the study.

2.5 DEFINITION OF TERMS

(i) FLOOR SPACE: The total area of (a house) measured inside

1. Of course the state interests or preferences take account of individual preferences indirectly.

2. I have borrowed most of these definitions from STEVENS, P.H.N. "Densities in Housing Areas". Ibid. and UNITED NATIONS "Utilization of Space in Dwellings". Geneva, 1959, pp. 4 - 5.
the main external and party walls, including the thickness of internal partitions. It includes all rooms, covered balconies and verandahs, service space and circulation space. It excludes all communal staircases, passage ways and corridors.¹

(ii) FLOOR SPACE RATE: The ratio of the total floor space to the total number of inhabitants (usually expressed as sq. m. or sq. ft. per person).

(iii) LIVING FLOOR SPACE: Assumed to be equivalent to the sum of floor areas of living room, sitting room, playroom, kitchen and bedrooms measured within the enclosing walls.²

(iv) PLOT AREA: The area of a site with its own curtilage. It is equivalent to the sum of all ground floor space and all private open space(s) plus thickness of walls, partitions, etc.

(v) PLOT COVERAGE: The proportion of the plot area covered by the ground floor area of the house sited on it.

(vi) TOTAL LIVING SPACE: The total space available on all floors indoors and outdoors within the curtilage of a housing plot or a group of housing plots.

1. This conforms very closely with the definition of "Net Floor Area" widely used in the United Kingdom, and the definition of "Useful Floor Space" widely used in United Nation's studies.

2. In some countries, the kitchen is not counted as a habitable room and is therefore not considered in the calculation of "Living Floor Space". See: "Quality of Dwellings and Housing Areas". Ibid., p. 36.
2.6 SUMMARY

Space standards exhibit a continually expanding role in the life of family and society. Originally concerned with physical health requirements, they are now directed towards the general social, psychological as well as physical well being of the family. In addition they are formulated to ensure economy in the utilization of community resources of land and capital. On all these bases, they provide a guide to designers and developers of housing projects giving them a floor against which to base their plans and a yardstick for measuring the acceptability of housing projects proposed for financial or technical assistance.

In the formulation of space standards, attention is particularly drawn to the adoption of concepts and terminologies related to the specific socio-cultural and climatic circumstances which exist. The standards themselves should be designed in relation to the family and society needs, resources and objectives. All these are changing with time and it will be necessary in the formulation of space standards to consider the factors of time and change.
3.1 INTRODUCTION

Space standards specified by different countries are not uniform. They vary in their magnitudes, forms, units of measurement, degree of precision and degree of statutory significance. The variation in magnitude is due of course to variations in the socio-economic and climatic conditions of different countries. The variations in forms, units, legal significance and degree of precision are due, among other things, to differences in the objectives for the formulation of the standards. We have shown, for example, that in the past, when the concern was mainly with physical and moral health, the standards took the form of absolute minimums which were then made obligatory. As the objectives have now changed - or rather, expanded - new forms of standards have emerged.

This section gives a brief review of the type of standards currently used by different countries. It describes their forms, units and magnitudes and goes on to examine their methods distinguishing between standards in developed and developing countries. The review is by no means exhaustive; few examples are given where relevant to illustrate the discussion or to facilitate comparison. The aim behind this section is to gain some insight before we proceed to discuss forms and methods of space standards applicable to the specific conditions of central Sudan.
3.2 MAGNITUDES OF SPACE STANDARDS

The value of space standards differs from one country to another. Atkinson compared space standards in countries at different stages of economic and social development. He showed, for example, that the average floor space varies from 3.5 sq.m. per person in some large cities of Asian countries, 5-10 sq.m. per person in African and similar tropical countries, 8-10 sq.m. per person in Latin American and some east European countries to between 12 and 17 sq.m. per person in social housing of Western Europe.

Within the same country, space standards change with time. For example, Hole examined the development of the recommended minimum standards in Britain and concluded that they have undergone a 'marked change' related to a general improvement in standards of living. She showed that, over the past century, the overall floor space per person has increased at the rate of one sq. ft. every two years. She relates this to the introduction of a separate bathroom, more space for storage and circulation and speculates that the trend will be for more space for further amenities and for leisure pursuits.

1. ATKINSON, G.A. "Housing Standards with Particular Reference to Developing Countries in Tropical Regions." Ibid.

2. These comparisons must be viewed with care. As Atkinson himself pointed out, the fact that dwellings in most tropical and subtropical regions have less floor space is due in part to poverty, in part to the climate which encourages outdoor living and in part to the fact that families in these regions usually have fewer belongings.

3. HOLE, V. "Housing Standards and Social Trends." Ibid.
3.3 FORMS, UNITS AND DEGREE OF PRECISION

The new objectives for the formulation of space standards, as we have seen are numerous and complex; the forms and units for the formulation of the standards are also numerous and complex. In some cases, space standards have taken the form of absolute 'minimums', in other cases they have taken the form of a 'minimum-maximum' range within which dwellings are to be planned, while in a third case they have taken the form of 'average' sizes or model plans. To this last category belong the standardized concepts such as those used by Sweden and the Netherlands for the estimation of building volumes or the assessments of overcrowding conditions (see above).

Within each of these categories a number of units are used by different countries. These can be summarised as follows:

(i) Units specifying types of spaces (e.g. useful floor space, total living space, plot space);

(ii) Units specifying type of accommodation (e.g. number of rooms, number of habitable rooms, number of bedrooms);

(iii) Units specifying occupancy rates (e.g. floor space per person, persons per room);

(iv) Units specifying sizes of rooms according to function (e.g. size of bedroom, size of kitchen).

More than one of these units are sometimes used simultaneously. For example, in most countries of eastern and western Europe standards take the form of minimum sizes
of rooms according to their function, minimum living floor spaces and a range of sizes of useful floor space within which the dwelling should be planned according to the size of the family. In addition, other requirements are specified concerning such things as essential equipment, safety, stability and so on.¹

Such complex forms of standards were common practice in Britain till the early 1960's when the Parker Morris Report reacted strongly against them on the grounds that they limit the freedom of the designer and that they focus "undue attention on working out a pattern of room areas which will comply with the standards, whereas the important thing in the design of houses is to concentrate on satisfying the requirements of the families that are likely to live in them."² The report recommended minimum floor areas for houses and flats according to the size of the family, and other than adding some planning recommendations to guide the interpretation of the standards, allowed complete freedom for the designer.

This approach to space standards has its roots in Scandinavian countries. In Denmark, for example, standards are specified in the form of a wide range (of between 50 and 85 sq.m. for multi-family houses). The designer is required to indicate the arrangement of furniture on the plan, but otherwise is allowed complete freedom. The cases of Norway and Iceland are variants of the Danish system but they

¹. See "Quality of Dwellings and Housing Areas." Ibid., pp. 33-63.
². MINISTRY OF HOUSING AND LOCAL GOVERNMENT (BRITAIN) "Homes for Today and Tomorrow". Ibid., pp. 3-4.
specify further details such as main room areas, length of walls and cubic capacity of rooms.¹

The above examples of space standards in European countries differ in their form and degree of precision, but they all agree in recognition of the relation between size of family and size of house; a relation which could at least be maintained in local authority housing through government credits and grants. In contrast, the standards currently adopted by most developing countries place the emphasis on family income and rent-paying ability rather than its size. This is not without reasons. The lack of sufficient economic resources and the absence of efficient financial means have in many cases pushed substantial numbers of urban families to occupy far undersized dwellings. Many other families, particularly in the large cities of Africa, Asia and Latin America have remained homeless.² Under such circumstances, the major concern of standards has so far been on the number of houses that can be built and their cost or rent in

1. See UNITED NATIONS "Utilization of Space in Dwellings." Ibid., p. 10.
2. It has been estimated that by 1962, between 40% and 50% of the urban populations of Africa, Asia and Latin America, were living in overcrowded dwellings, slums and improvised shelters in unsanitary and unhealthy conditions. While this statement raises questions of definitions (as to what overcrowded or unhealthy etc.), it helps to give a rough indication of the background conditions under which standards are formulated. See; UNITED NATIONS (Department of Economic and Social Affairs) "Report of the Ad Hoc Group of Experts on Housing and Urban Development". New York, 1962, pp. 9-10. See also; ABRAMS, C. "Man's Struggle for Shelter ... in an Urbanizing World". Cambridge, The M.I.T. Press, 1964.
relation to the family income. Only superficial consideration has sometimes been given to the family size or other characteristics as factors in determining the size of house.

The standards - sometimes provided in the form of model plans - usually distinguish between different economic groups and for each group a different size and type of house is provided. For example, in the United Arab Republic, standards distinguish between three types of housing:

'economic' housing for families with incomes in the range £E(8-25) per month; 'average' housing for families with incomes in the range £E(25-50) per month, and 'above average' housing for those with incomes in the range £E(50-100) per month. For each of these groups a range of dwelling sizes is specified. The standards specify in addition numbers of rooms, average occupancy rates and maximum rents. The average dwelling area varies from around 10 sq.m. per person in 'economic' housing to around 30 sq.m. per person in 'above average' housing. Consideration to family size was given only within the range allowed for the particular economic group.

In Latin American countries, the minimum standards

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1. It is very difficult to criticize this type of approach to space standards or housing standards because it is very strongly connected with the kinds of political philosophies which exist in different countries. However, this kind of approach has in many cases led government programmes to be limited to the upper or the middle income groups. These questions will be the centre of our discussion in the next chapter.

2. See standards prescribed by the Ministry of Housing in the United Arab Republic; quoted by BARRADA, A.M. Ibid., p. 81.
prepared for the Agency for International Development distinguishing between housing of the conventional type for middle income families and minimum housing particularly applicable for upgrading the squatter settlements. In the latter case, priorities are set in the following order; firstly, the provision of minimum plots within a well laid out land development plan; secondly, water supply, sewage and refuse disposal; thirdly, drainage and hard surfacing or paving of principle streets; fourthly the provision of essential community facilities; and only fifthly, a core of minimum shelter, in some cases left for the family to build.

The Singapore Housing Development Board specifies standards for the purposes of its own projects in the form of numbers of rooms and total sizes of dwellings. The dwellings built on the bases of the standards are rented to tenants according to their ability to pay. The standards are specified as follows.

a) One room with kitchen, bathroom/W.C. and balcony,
   floor area: 240 sq.ft.
   rent: $20.00 per month;

b) Two rooms with kitchen, bathroom/W.C. and balcony,
   floor area: 400 sq.ft.
   rent: $46.50 per month;

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2. SOLOW, A. Ibid.

3. SINGAPORE HOUSING DEVELOPMENT BOARD. "Annual Reports" 1963/66 incl.
c) Three rooms with kitchen, bathroom/W.C. and balcony,

floor area: 550 sq.ft.

rent: $66.50 per month.

The list of examples can be long, but from the examples given it can be concluded that there is at present no standard way for the specification of space standards. In general, space standards in developed countries have usually taken the form of a minimum of a minimum-maximum range of floor space related to family size plus more details regarding desirable dwelling characteristics. In developing countries on the other hand, space standards are usually specified in the form of average floor areas or model plans based on the family economic ability with sometimes secondary consideration of family size. Attention is particularly drawn to the type of standards adopted for upgrading squatter settlements in Latin American countries where the emphasis is placed on the provision of a plot of land for the family plus the essential facilities and services. It will be noticed that space standards are considered simultaneously with other aspects of housing standards. The standards take the form of a list of priorities in which the plot size takes the first place and the floor space the last.

3.4 IN WHAT FORMS SHOULD SPACE STANDARDS BE EXPRESSED

This study has already pointed to the complexity and diversity in the basic criteria which underlie the formulation of space standards in different countries. It cannot be
possible, neither is it desirable to recommend any universal form or unit for the expression of standards. The forms and units of space standards should be selected by different countries more deliberately and systematically to suit their own objectives and their own socio-cultural and climatic circumstances.

The choice of a unit of measurement does in fact present some difficulty. Counts of 'habitable rooms' and 'total number of rooms' have been widely used for indicating the amount of privacy and specialization of function offered by the house. Neither of these two measures makes reference to the sizes of rooms. They have the additional disadvantage of ignoring the age and sex composition of the family, a factor which affects considerably the amount of privacy that can be gained by the family from a certain number of rooms in the house. The 'persons per room ratio' has been used, for statistical purposes, to indicate the degree of crowding in the house. Like the room counts, this measure leaves undetermined the sizes of rooms and therefore the possible intensity of their use. It also takes no consideration of other types of accommodation available in the house such as halls, verandahs, stores and kitchens which can do a lot to relieve overcrowding of rooms.¹

¹. We must distinguish between three types of overcrowding which can take place in the house: overcrowding of people, overcrowding of functions and activities and overcrowding of furniture and equipment. While rooms such as kitchens, halls and stores may not be used for living in, they can relieve the pressure on the habitable rooms by accommodating some of the functions or the furniture and equipment.
The rate of floor space in the house appears to give a more useful basis for the design and for the calculation of building volumes and costs. Whilst taking into consideration the total requirements of the family, it does not suggest any articulation of the dwelling space thereby leaving sufficient freedom for the designer. There is of course always the danger that in the absence of a sufficient number of able designers this freedom may be misused leading to bad arrangement of spaces.\(^1\)

The 'rate of floor space' has in fact been suggested as a measure of space standards in developing countries.\(^2\) Although it has the advantage of relating size of house to size of family, it does not, by itself, provide a sufficient measure of space standards under the specific conditions of developing tropical countries like the Sudan. There are many reasons for this.

In the first place, the rate of floor space does not take into consideration the amount of private open space available in the house. Under the tropical climatic conditions, the private open space in the house is at least as

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1. It has been suggested by Foote (and others) that the ideal measure of space should take into account total floor area, room count, bedroom count, total number of occupants and sex and age relationships of occupants. In my view, this type of measure is not only difficult to establish, but also undesirable as it limits considerably the choices of both designers and users. See; FOOTE (AND OTHERS) "Housing Choices and Housing Constraints". New York, McGraw Hill, 1960, p. 216.

2. See; UNITED NATIONS "Regional Seminar on Housing and Community Improvement in Asia and the Far East". New Delhi, Jan.-Feb. 1954. See also; Transactions of the CCTA CONFERENCE on "Housing and Urbanization." Nairobi, Jan. 1959, p. 41.
important for family living as the 'floor space'. A measure of floor space alone cannot therefore be sufficient to indicate the possible liveability of the house. Other measures such as 'total living space' or 'plot space' per family are more useful both as bases for the design and for the calculations of density standards and residential land requirements.¹

In the second place, the size of the family in these regions is, for a number of social and economic reasons, continually fluctuating. The phenomenon is certainly universal, but the fluctuations here are fast and unpredictable. The family allocated a house may soon bring another related branch unit or the bachelor allocated a small flat in an industrial town may soon get married and have children. In fact, surveys undertaken in mass housing projects in the Sudan, shortly after allocation pointed to large differences between assumed rates of occupancy and actual rates of occupancy.² All these considerations tend to obscure assumptions based on floor space rates.

The third, and most important reason, is connected with the concept of the house. This is not a finite 'thing' which is built and sold 'package-deal' as rate of floor space may suggest. With the growing tendency amongst developing

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¹ Stevens points to the importance of 'total living space rate' in the calculation of density standards. He concluded that "significant increases in density can only be obtained by considerable sacrifice in total living space standards". See; STEVENS P.H.M. Ibid., pp. 22-23. See also; TOON, V. "Housing Densities and Standards". Architectural Science Review (Sydney), Vol. 9, No. 1, March 1966, pp. 6-15.

² See Volume II, Chapter 2.
countries for the provision of 'expandable houses', 'core-unit houses', 'serviced plots', etc. A measure of rate of floor space tends to lose its significance as basis for the design of the house. That is simply because no 'floor space' may be provided at the beginning. The example of the Latin American approach has already been cited. Under such circumstances, an overall area measure can be more useful because it conveys an idea of the possibilities for future expansion and also of the amount of space that can be available for family living (both indoors and out of doors).

The significance of the rate of floor spaces comes mostly in the calculations of building costs and in the assessment of overcrowding conditions (inside rooms) both of which are useful for general planning purposes.

To summarize briefly, space standards in developing tropical countries can be conveniently formulated in relation to two measures: an overall area measure which takes into consideration the amount of open space available in the home, and a floor space measure which indicates the amount of sheltered space available. The former is useful for indicating the total habitable space, the possibilities for future expansion, and the calculation of density standards; the second is useful in indicating the amount of shelter, the degree of crowding inside rooms and the calculations of building programmes.
3.5 REVIEW OF THE METHODS USED FOR THE FORMULATION OF SPACE STANDARDS

It is perhaps useful now to describe some of the methods which have been used for the formulation of space standards and to examine the extent to which they can be applicable under the specific social, cultural, economic and climatic conditions of the Sudan. In general we can distinguish between four different methods which have been employed for the formulation of space standards for new buildings and for the assessment of the degree of usefulness or the degree of utilization of space in existing buildings. These can be broadly divided into: - the public health method, the functional method, the socio-psychological method and the appraisal method.

(1) THE PUBLIC HEALTH METHOD

The earlier standards, as we have mentioned above, had been formulated in response to people's deteriorating physical health. It was not surprising therefore that their concern was mainly with such basic requirements as ventilation, sanitation, sunlighting, etc., and that the standards themselves should be the concern of the sanitary engineer, the public health inspector and the social reformer. For example, in Britain space standards were first defined for hospital wards, army barracks, prisons and other communal buildings. These standards were calculated from the amount of oxygen consumed by the individual and the expected rate of air change in the room. They were derived from
existing knowledge about the cause and spread of disease.¹

Current interest of public health in housing has been extended to "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."² Housing itself is recognized as "a complex process involving phases of public health, planning, architecture and engineering, economics and finance, cultural and social traditions, government and the behavioural sciences, so intertwined with one another that it is difficult to isolate a single element for study, analysis and discussion."³ The importance of the residential environment as a whole was particularly emphasised by public health authorities.⁴

Current standards formulated from the public health point of view take into consideration a number of housing and environmental requirements such as weather protection, adequacy and state of sanitary facilities, provision of water supply and the degree of crowding of the occupants both in bedrooms and in the house as a whole. On top of these, reference is usually made to personal social and economic

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¹ See for example DOUGLAS GALTON'S "Principles of Hospital Design." 1869; "Observations on the Construction of Healthy Dwellings, Hospitals, Houses, Barracks, Asylums, etc." 1860; and FLORENCE NIGHTINGALE'S "Notes on Hospitals."


³ Ibid., p. 7.

criteria. The question of space standards is usually viewed within this complex from the points of view of privacy, comfort and specialization of functions. These are usually stated in broad functional requirements rather than specific numbers or sizes of rooms or spaces. For example, the WHO Expert Committee recommended that the fundamentals of a healthful residential environment should include:

(a) a sufficient number of rooms, usable floor area and volume of enclosed space to satisfy human requirements for health and for family life consistent with the prevailing cultural and social pattern of that region and so utilized that there is neither overcrowding of living or sleeping rooms;

(b) at least a minimum degree of desired privacy both between individual persons within the household and for the members of the household against undue disturbance by external factors.

The CCTA Conference on housing and urbanization held

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1. The International Union of Family Organization put certain recommendations on space standards for application at an international level. These standards have in fact been criticized in the sense that each country has its own particular social and economic characteristics and that the standards suggested were too high even in relation to subsidized housing of many advance countries. See:
   (i) INTERNATIONAL UNION OF FAMILY ORGANIZATION "Minimum Habitable Surface" Cologne, 1957.
   (ii) WORLD HEALTH ORGANIZATION "Housing Programmes: The Role of Public Health Agencies". Ibid., p. 191.

2. WORLD HEALTH ORGANIZATION (WHO) "Expert Committee ...." Ibid., pp. 17-39.
in Nairobi 1959, made the following recommendation on space standards on health grounds:

"Adequate living space together with privacy, the space being based on a suitable floor area per person related to the size of families mostly to be housed, rather than by specified room sizes as giving greater design freedom."

It will be noticed that none of the Committees referred to stipulated any specific sizes of living spaces; rather, it was left for the individual countries to decide upon the sizes of living spaces most appropriate to local circumstances.  

(ii) THE FUNCTIONAL METHOD

The growing concern with the social and functional aspects of housing has generated a good deal of interest in user requirement studies. Such studies were made more essential by the introduction of mass production principles and the consequent restructuring of the traditional relationship between designer and user. Through such studies, the designer is provided with information on users' needs and preferences. Systematic data on bodily dimensions and sizes of furniture and equipment come from anthropometric studies;

1. COMMISSION FOR TECHNICAL COOPERATION IN AFRICA SOUTH OF THE SAHARA "Housing and Urbanization". Ibid., p. 41.

data on space requirements of domestic activities are obtained from functional studies and furniture groupings; these are usually supplemented with surveys of users' opinions, preferences and adaptations.

The functional method is based on the amount of space that is required to cater for different activities and functions performed in the home. It starts by recognizing the type of activities performed in the home, studying their organization and relative importance in the life of the family and then assessing their space and general design requirements. One of the most promising examples to date may be seen in the methods of observation and analysis which preceded the publication of two booklets on housing standards in Britain: "Homes for Today and Tomorrow", and "Space in the Home."¹ The philosophy advocated by these two documents was that "housing standards should as far as possible be couched in terms of the activities that the occupiers will want to pursue and not on the numbers and sizes of the usual rooms and offices."²

The supplement to the main report followed to illustrate some of the main family and personal activities for which the design of the house has to cater. A number of activities have been selected, analysed and examined in

¹ MINISTRY OF HOUSING AND LOCAL GOVERNMENT (BRITAIN)  
² "Homes for Today and Tomorrow". Ibid., p. 5.
relation to their space requirements. The variation of these activities according to family life was further examined. The space requirements of activities were set out in detail together with their types and sizes of furniture. ¹

Recently, the Activity Data Method (ADM) was developed for recording user requirements in buildings.² Although specifically devised for the ministry of defence installations, it was in fact suggested for general application. Like the methods referred to above, the ADM starts with the compilation of a complete list of the activities to be accommodated by the building. It relies on information supplied by the users of the building as well as observations made by the information collectors. The ADM has two main features; the 'data sheets' and the 'link diagrams'. The data sheets give details of the type of activity, the space it occupies, the environment in which it is performed and the equipment necessary for its performance. The link diagrams express the functional relationships between different activities giving a certain value for each relationship according to the type of building.

These kinds of functional methods have been widely accepted both in Britain and abroad and have been of some value as bases for the design and for the appraisal of

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1. See "Space in the Home". Ibid.
house plans. Their application to the Sudanese house is met with a number of difficulties. These will become clearer later in the study (Volume II); but it can be stated here that the Sudanese family's desire for space in the home is not so much for the activities performed as it is for some other social, climatic and psychological connotations. Under these circumstances, too much emphasis on activities can lead to types of houses which may be technically acceptable but otherwise socially and culturally unsatisfactory. Thus instead of identifying separate activities and developing methods for measuring their spatial requirements, we must first identify those pertinent social and cultural norms affecting the arrangements of activities and we must assess directions of future changes. Activities themselves must be viewed as an integral part of a complete 'socio-functional and climatic set up.'

(iii) THE SOCIO-PSYCHOLOGICAL METHOD

This is based on observations and measurements of human responses to the spatial arrangement of the home environment. Although this method can be considered an ex-

1. A lot of work on similar lines has been done in Holland, Denmark, Norway and Canada. See for example:
   (1) BOUWCENTRUM "Habitation" Rotterdam, 1957.
   (ii) NORWEGIAN BUILDING RESEARCH STATION (NEI) "The Assessment of the Usefulness of Dwellings: A Question of a Method." A note translated by Mr. A. Gilmour of the ARU, Edinburgh from BD-Orientering, No. 3, 1963, pp. 18-33 (mimeographed).

tension of the public health approach (in the sense that it is concerned with social and mental well-being), it differs from it in at least one respect. While the public health methods usually specify some desired qualities which are known to contribute to the physical social and mental well-being, the socio-psychological methods usually take the nature of the response of the people involved as a measure of the quality of the environment in terms of social relationships, psychological homeostasis, productivity, etc. These aspects are of course possible within a wide range of environmental qualities, but any serious deficiency in one environmental quality or another is likely to be reflected in such things as lack of adjustment, misbehaviour or simply lack of satisfaction.

The advocates of this method emphasize the view that "houses will be more livable if they were designed to take account of socio-psychological or 'human' values." These "are based on the totality of a number of factors, such as an individual's ideals, motives, attitudes and tastes, which are determined by his cultural background, education, habits and experiences."1 The studies by Cornell University Housing Research Centre concentrated on the relationship between the social and psychological values of families and

housing requirements. They rejected for the purpose "the studies on housing preferences, time and motion and 'planting' a family in the artificial environment of a laboratory." The study distinguished between three main family value groups (the economy group, the family group, and the personal group) and for each the requirements were worked out separately in terms of privacy, sociability of adults, etc.1

The socio-psychological methods rely mostly on experimental situations to determine the effects of different factors of the environment upon behaviour. In these situations the users of housing have been asked to express their degree of satisfaction with existing planning or housing arrangements. These kinds of opinion polls have usually been supplemented by observations on family adjustment and adaptation. A number of studies have also been arranged on such aspects as symbolic properties, social values and cultural norms. Among the most interesting examples are the studies of Chombart de Lauwe in France, Odd Brochmann in Norway, Lennart Holm in Sweden, Svend Riemer in the United States and Dennis Chapman in Britain.2

The work of Chombart de Lauwe is of particular interest to the subject of the present study. De Lauwe attempted to determine thresholds of floor space related to family aspirations and patterns of behaviour. He found that below a

1. "Houses are for People". Ibid.
minimum threshold of 8 sq.m. per person tension arises in the relation between mother and children, while children's misbehaviour becomes much more frequent. He pointed to another threshold of between 14 and 16 sq.m. per person under which the degree of occupants' satisfaction decreases.\(^1\)

The study of the relation between space and behaviour or survival has in fact received the attention of many researchers (both with animals and human beings). The difficulty is that most studies in this field tend to indicate critical thresholds beyond which some undesirable results will be likely to emerge (e.g., human misbehaviour or animal aggression), but they seldom specify what should be habitable or acceptable given a range of social and environmental conditions. The other difficulty is that the findings of these kinds of studies are applicable only within the limited range of social and environmental conditions under which they have been undertaken. Were these circumstances to change, not only would the value of the individual factor under consideration change, but its relative importance would also change. It will therefore be difficult to arrive at any general conclusions from such studies except at a methodological level, because of the immense differences in social and cultural circumstances of different countries and of subregions within one and the same country.

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THE APPRAISAL METHODS

In practice, the methods used by different countries for appraising the quality of housing take into consideration a number of characteristics determining habitability, sanitary standards and safety.¹ In this particular instance, however, we are only interested in those methods which are used for the assessment of the degree of utilization or the degree of usefulness of the space in the home. Such assessments are usually performed with respect to the fulfilment of functional requirements as well as the economy of the house plan in the use of space and other resources.

With regard to the utilization of the space in the home no specific method seems to have yet gained a universal acceptance and the appraisal of plans is still largely a matter for subjective experiences and value judgements. Graphical methods of furniture arrangements are used in Scandinavian countries and France; mathematical dimensions in Germany; score systems in the United States; economic market value of the dwellings in Finland; and check-lists showing desirable dwelling features in the United Kingdom and some Scandinavian countries. These are usually supplemented by surveys of consumer preferences and experiences.

¹ See for example:
(3) "Quality of Dwellings and Housing Areas." Ibid.
A graphical method suggested by the Norwegian Building Research Station performs the appraisal of plans according to a predetermined set of standards giving furniture arrangements and anthropometric data. The required furniture is superimposed onto the house plans according to a conventional programme of activities allowing for alternative arrangements. In this way, different plans are evaluated with respect to sizes and shapes of rooms, layout of rooms, circulation spaces, etc.¹

Another method for the evaluation of the spatial arrangements of house plans has been suggested by the United Nations' 'Utilization of Space in Dwellings'. This also takes the type of activities performed in the home as bases for the appraisal; but it differs from the Norwegian method in that it does not assume any specific arrangement of activities. Instead, it compares the economy of different plans with different arrangements in terms of space utilization. Special attention is given to dual-purpose areas of floor space, circulation areas etc. Mathematical figures are used as bases for comparison.²

In the United Kingdom, a number of methods have been used for the appraisal of house plans: First there are the surveys of users' opinions and experiences such as those undertaken by the Ministry of Housing and the Building Research Station;³ second, there are the check lists

1. NORWEGIAN BUILDING RESEARCH STATION (NBI) "The Assessment of the Usefulness of Dwellings..." Ibid.
2. UNITED NATIONS "Utilization of Space in Dwellings" Ibid., Appendix B.
prepared by the Ministry of Housing;¹ and third there are the graphical methods based on activities and furniture arrangements such as those suggested by "Space in the Home."²

3.6 DISCUSSION AND SUMMARY

The ultimate aim of the designer of mass housing is the creation of an environment as close to the needs of its inhabitants as resources will permit. By virtue of his profession, the designer's sphere of control is limited to the physical aspects of the environment, but his designs are evaluated relative to a number of social, cultural and other characteristics of the users of his design. It follows that the designer's ability to create the most suitable physical environment is largely influenced by his ability to perceive and evaluate the desirable characteristics that the environment should provide for.

(1) THE NEED FOR A COMPREHENSIVE APPROACH

A fundamental prerequisite of the production of good designs is therefore the knowledge of what constitutes a 'good'³ environment. This involves two stages. The first stage⁴ is the identification of the salient features of the

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2. MOHLG "Space in the Home", Ibid.
3. 'Good' of course relative to the scale of existing social and cultural values and other characteristics shared by the population or a specific group of it.
acceptable environment and the translation of these into readily acceptable standards and criteria (space, light, ventilation, privacy, open space, etc.). The second stage involves the study of the interactions and the control of the relationships of different standards within the framework set by existing climatic, social, cultural and economic circumstances. This means, in other words, considering the environment as a whole entity.

Standards such as those set by the Parker Morris Report go some way towards the second stage (i.e. consideration of the environment as a whole entity), but otherwise there is little in the literature to indicate the formulation of standards from this wider perspective. In fact, standards are still viewed independently and with varying objectives leading sometimes to unacceptable wholes. A recent study by the Swedish Institute of Building Research collected material on the methods adopted by different countries for the formulation of standards and came to the conclusion that: "The material collected gives little information on the order of precedence of the various qualities. Standards are reported for each characteristic separately, although many of them are, indeed, interdependent."\(^1\) Perhaps more has been achieved in these respects in the field of manned space flight "(Here) one is faced with a situation in which the external environment or macro-environment is so hostile as to be absolutely untenable, and where, in consequence, the

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1. See "Quality of Dwellings and Housing Areas." Ibid.
internal environment of the space craft must become an artificially created environment combining both micro and macro qualities. Fraser goes on to provide a number of examples from this field where attempts have been made to define acceptable limits of different components of the environment which combine to define the bounds of habitability.

A lot of material exists in different countries concerning minimum or desirable characteristics of dwellings. What is needed is to develop a systematic framework within which these characteristics can be viewed simultaneously in the light of existing social and cultural and economic circumstances.

(ii) THE DIMENSION OF TIME

It is essential to emphasize here the changing interrelationships between the physical and social components of the system. As we have shown earlier in this study, societies differ considerably in their conception of what constitutes an acceptable environment. Within the same society, the relative importance of each aspect changes with time. This is the reason which led Martin, in discussing the environmental health aspects of housing, to conclude that: "it is dangerous to attach too much importance to studies that have been carried out in the past. Their findings are true only when considered against the complex social background of the period in which they were made."
Eversley, in Britain, points to the changes in popular demand for space in the home arising from increased leisure, higher real incomes, and educational standards. He concludes that "Parker Morris Standards are already obsolete, long before they have been generally adopted." The important point to emerge from these examples is that the evaluation of different aspects of the environment must take into consideration the factor of time and the possible future changes.

(iii) THE DIMENSION OF CONTROL

The views advocated by Eversley are in direct contrast to those advocated by Ruth Glass. The latter, viewing the problem from a different angle (scarcity of building space), arrived at the conclusion that: "It may well become appropriate and feasible to limit, or even to scale down, domestic space standards. It will certainly be necessary to be equally concerned with the definition of maximum space standards, as with that of minimum standards." This contrast incidentally supports the view that there is a need for a more comprehensive approach to the question of standards. However, the views raised by Glass underline another dimension to be added to our comprehensive model - the dimension of control.

Control may be necessary for a number of reasons which can vary from levelling the urban inequalities to safeguarding

communal health and interests. Views differ about such aspects, but one thing about which there is no disagreement is that a form of control will be required to ensure the fulfilment of the desired functional requirements of buildings and the economy in the utilization of land and other resources.

From the variety of evidence summarized above, we must accept the view that there is yet no comprehensive method for the formulation of space standards or housing standards. By comprehensive method is meant that kind of method which considers simultaneously all the social, psychological, functional and public health requirements of families and all the climatic, economic statutory and other criteria, giving sufficient consideration to future requirements. This does sound ideal, but the need for this kind of approach is urged by a number of competing demands (on urban land, resources, etc.) which make it inevitable to compromise and to reconcile. Lewis Mumford writes:

"The new approach to housing is distinguished by the fact that it no longer looks for a satisfactory dwelling house in terms of a single factor - good design, a more socialized system of exploiting the land. For the dwelling is in reality a very complex adaptation to an exceedingly complex set of requirements; and it is quite unlikely that any simplified solution, expressible in purely mechanical terms will satisfy all the necessary conditions. What is important is to treat the geographic, economic, social, technical and personal requirements on a single plane." ¹

In a developing country like the Sudan the need for such a comprehensive approach is urged by a number of factors of which the wide gap between needs and resources is the most obvious.
CHAPTER 4: THE NEED FOR A COMPREHENSIVE APPROACH TO THE FORMULATION OF SPACE STANDARDS

4.1 INTRODUCTION

It will be virtually impossible to make any meaningful suggestions on the question of space standards without making some reference to the role ascribed to the formulation of housing standards generally. By definition, the standard of space is one aspect in the measurement of housing quality and its value depends largely on the relative weight given to it in relation to other aspects of housing standards and on the way housing standards themselves are viewed within the development programmes. For example, different answers can be obtained to the question of space standards if these standards are designed as a social welfare measure or as an integral part of a housing programme directed to serve wider cross sections of the population.

This section attempts to discuss the need for a comprehensive approach to the formulation of housing and space standards. The discussion is pursued at the beginning within the context of the developing countries but it is finally geared to the specific circumstances in urban areas of central Sudan. Amongst the developing countries, there is in fact a great heterogeneity in social values and objectives and in physical and economic conditions; but this section - mainly based on the results of a number of recent studies on housing and standards in developing countries - aims to give emphasis to the following broad points:

1) Standards can be effectively formulated in relation to the overall development programmes in such a way
as to specify levels of acceptability of housing which can be attained by or made available for wider sections of the population.

2) The measurement of the acceptability of housing should be performed simultaneously in relation to various qualities of housing and its environment.

4.2 THE ROLE OF HOUSING STANDARDS IN THE DEVELOPMENT PROCESS

In the past, the question of standards has been approached from a humane, but economically and administratively narrow viewpoint. This has led to proposals which helped to improve the quality of housing, but by so doing has raised the housing cost beyond the means of large sections of urban families. The improved standards were therefore only enjoyed by the few while the poorer classes of the population continued to live in substandard conditions.¹

It is now generally recognized that satisfactory housing for all citizens is a social necessity and that some degree of responsibility rests on the government for achieving this goal. The trend towards a greater degree of government responsibility is due in part to the emergence of the concept of planning on a country wide scale and in part to the fact that many of the elements which enter into the process of home building have passed the stage where they can be managed by the individual family.² The government has access

1. Such situations are known to have existed in Britain following the industrial revolution and to have eventually led to the introduction of the 1919 State Subsidy System; See Hole, V. "Housing Standards and Social Trends" Ibid.

to means of large scale production, development of building industry and control of land use etc. National governments have in fact assumed varying degrees of responsibility, as witness the development plans.

Housing need is one of many problems facing a developing country which include economic development, health, nutrition, education and so on. Governments find themselves pressed hard to determine the relative weight to be given to housing in relation to the other sectors of the development to bring about the optimum balance in fulfilling these competing demands. Within the housing sector, there are needs for housing in quantity and quality, for related facilities and services and for reconciling the needs of various economic and social groups. In order to guide the development therefore, minimum housing standards have been formulated by different countries to codify existing levels of acceptability of housing.¹

4.3 THE SITUATION IN THE DEVELOPING COUNTRIES

The results of a number of studies on housing and standards in developing countries suggest that the standards presently adopted by many countries are hardly relevant to the situations which exist. They demonstrate that these standards have been conceived in relation to an absolute level

¹ Housing standard is generally defined as "a measure of the level of acceptability (of housing) at a given time and place and in a given set of cultural technological and economic conditions." See; UNITED NATIONS "Methods for Establishing Targets and Standards for Housing and Environmental Conditions." New York 1968, pp. 9-10.
of quality inspired by standards in other highly advanced countries; and that available resources in developing countries cannot support the production of housing built to such standards on a scale commensurate with the present and future population growth. For example, John Turner argues that the application of minimal standards of this kind to any Latin American country "reveals a quantitative problem quite beyond solution by any conceivable housing agency;" and that "this has meant disproportionately small government contributions to popular housing, even though it constitutes by far the largest and most important financial demand in these countries."¹

Almost invariably these studies emphasize the need for more radical and more comprehensive approaches to housing standards and programmes in developing countries:

The Royal Commission to East Africa (1953-55) arrived at the following conclusions among others:

"Piece meal measures, such as the provision of a limited amount of good housing, not only fail to solve the problem of improving the conditions, but may even make it more difficult by encouraging an increase in the urban populations ...

... An overall urban policy, which takes all factors, for example the availability of land, population growth and financial resources, into account, should be framed as soon as possible after an appreciation has been made of the situation in urban areas..."²

². REPORT OF THE ROYAL COMMISSION TO EAST AFRICA (1953-55) London, HMSO.
Charles Abrams wrote as follows:

"It is manifest therefore that all prevailing ideas of wholesale slum clearance and building of costly housing must be abandoned, and that some fresh thinking must be brought to bear on the shelter problem...." 1

Van Huyck, reporting from India suggests that:

"Radical and original rethinking of housing standards and housing types is necessary to develop a housing programme on a scale commensurate with the expected population increase and at a rate sufficient to curb further deterioration of the urban environment." 2 He suggests that the emphasis must be on the type of programme that can fully meet the housing and environmental requirements of all low income families and that housing standards must be viewed from this broader angle.

As bases for this new approach a number of suggestions have been put forward. These are well summarized in the words of the Royal Commission to East Africa: "The aim should be to RAISE the level of all housing by using all available resources. House ownership is an important factor in encouraging stability and governments should concentrate on HELPING house owners to build their own houses." 3

With regard to housing standards, the emphasis was placed on the provision of basic facilities and services and on social and environmental requirements. For example, the


Royal Commission reported that: "The social requirements for housing are sufficient accommodation, privacy, simple but controlled sanitation and essential services. Governments can contribute to the improvement of housing by providing demarcated and serviced plots, technical assistance and machinery, and by relieving shortage of building materials ... In order to (bring) standards of building and sanitation within the reach of the majority of their inhabitants, the urban areas should be divided into three or more zones."¹

Opinions differ about the way the standards should be achieved;² one thing about which there seems to be a general consensus of opinion is that the minimum standards should encompass the great majority of the population and not just the few families and that they should relate to the whole urban environment of housing and not just the individual house.

4.4 THE SITUATION IN URBAN AREAS OF CENTRAL SUDAN

The conclusions and recommendations of the studies described above are not irrelevant to the Sudan.

In reviewing the present housing conditions in urban areas of central Sudan I have pointed to a persistent lack of balance between the needs of different family types and the standards applied; between the groups of houses and

¹. Ibid.
². For example, a group of United Nations’ experts emphasizes lowering the standards and the adoption of traditional designs, local material and skills. Another group discourages lowering the standards but advocates an industrial approach to the problem. See; UNITED NATIONS (Centre for Housing Building and Planning) "Design of Low-Cost Housing and Community Facilities." Abstracted by the Ekistics Vol. 25, No. 147, pp. 63-86.
their direct and essential facilities and between different environmental standards within one and the same housing area. 1 This in itself provides a good case for a more comprehensive approach to the formulation of housing and space standards. There are, however, a number of other reasons which operate to magnify the problem and to press the case even further.

The population in the towns of central Sudan is growing fast. This is partly because of natural population increase, but mostly because of immigration to the towns. Moreover, with the introduction of more industries in the towns, the improvement of roads and the growing demand of rural people for education, health and other urban services, the problems of urbanization promise to be more serious in the future. In addition to the accumulating housing deficit, the national programmes must therefore be prepared to deal with problems of a more substantial scale, and perhaps of a new kind. Already estimates are given of squatter settlers in the three towns alone as between 10 and 20 thousand people. The movers to the towns are poor and the national resources cannot be sufficient to provide housing for every family in need. Under such circumstances more comprehensive and effective policies will be needed if life in the future Sudanese town is to be tolerable.

Coupled with the demand for more housing is the demand for better housing and for community facilities and services. So far the emphasis of most housing improvement programmes

1. See Chapter 1 above.
has been on the main structure of the house. Under the climatic and social conditions of the Sudan, where a major part of the family living is performed out of doors, there seem to be good reasons for the provision of clean, sanitary and habitable spaces. Because the resources are limited, the choices that can be made between different aspects of housing standards are also limited. For example, an improved standard of construction or higher allocations of space may mean poor sanitation or no facilities, etc. It will be necessary to view all these aspects together within a general framework related to family and community needs, resources and objectives.

All the above factors suggest the need for a more comprehensive approach to the formulation of housing and space standards in urban areas of central Sudan. There are in fact good opportunities for this kind of approach. Foremost among these are the establishment recently of a separate ministry for housing and the widespread acceptance of the need for the formulation of a national housing programme related to national development plans and based on a closer understanding of the nature and magnitude of the problem.  

4.5 THE APPROACH TO HOUSING STANDARDS

On principle, we can distinguish between three kinds of approaches to the formulation of housing standards:

The first is to assess the standards in direct relation to the family economic ability; this approach tends to produce types of houses which are economically feasible, but socially and functionally unacceptable. The second approach is to assess the standards in relation to the family social and functional requirements with secondary consideration of the family economic ability; this may result in standards which are socially and functionally acceptable but too high in relation to the economic ability of the low-income families. The third, and apparently most attractive strategy is to view the problem from both ends; this involves a compromise between the maximum economic ability of the family and the minimum standards required to cater for its social and functional requirements. There are of course some situations where the State shoulders part of the expense involved in bridging the gap between the two extremes.

In a developing country, like the Sudan, the gap between the maximum economic ability of the low-income family and the minimum socially acceptable standard is too wide. The compromise between the two extremes can therefore result in discomfort from both points of view: the standards too low to be socially acceptable and yet too expensive to be attainable by the majority of families.

To improve this relationship, it will be necessary to identify those aspects of housing standards which must be provided from the beginning and others which can perhaps be gained in time as the family's circumstances improve; figure 2. This is in fact one of the main reasons why it is
DIFFERENT APPROACHES TO THE FORMULATION OF STANDARDS

1. Standards mainly based on family income: Houses economically feasible but socially unsatisfactory.

2. Standards based on family social and functional requirements: Houses socially and functionally acceptable but too expensive to be attained by the majority of low income groups.

3. Standards based on family social and functional requirements and economic ability: Either the minimum social and functional requirements are compromised, or the family max economic ability compromised or both. (In a developing country, where the gap between the two extremes is wide, this can be meaningful from both points of view).

4. Identify aspects of family requirements which can be compromised upon (where necessary for reasons of cost) and other aspects which must be secured.

5. Find ways in which these aspects compromised upon can be secured in time.
found necessary to distinguish between floor space standards and plot space standards, but the same argument applies equally to all other aspects of housing standards.

The aspects to be compromised upon will of course depend on the type of family. In fact for some families it might be found essential to secure all the desired aspects. However, this means that a number of housing programmes have to be planned in order to meet the requirements of families with different characteristics and orders of priority. It may be necessary under certain circumstances to emphasize self-help programmes; in a second set of circumstances it may be necessary to provide houses capable of improvement in time; while in a third case it may be necessary to introduce a form of subsidy or perhaps accept temporary measures pending future improvements in national resources.

4.6 SUMMARY

I have tried in this section to discuss the interdependence between space standards, housing standards and development programmes. This kind of discussion is considered to be crucial to the type of space standards which can be developed. The evidence provided by a number of studies on housing and standards in developing countries supports the need for a more comprehensive approach to the questions of housing and space standards. These must be viewed as integral parts of programmes directed to serve wider cross-sections of the population within the limits of available resources and national programmes. The emphasis was particularly placed by these studies on the environment of the house
as an important factor in the development of housing standards.

The above considerations appear to be of vital significance to the present and expected future circumstances in the Sudan. The present resources cannot be sufficient to meet the housing and environmental problems arising from rapid population growth particularly in the major towns. This situation calls for the development of types of standards which can be fully operative. The standards must be relevant as bases for effective solutions to the problems posed by different types of families and on a more substantial scale. It is with this understanding that the question of space standards will be dealt with in this study.
CHAPTER 5: DEVELOPMENT OF A METHOD FOR THE FORMULATION OF SPACE STANDARDS IN URBAN AREAS OF CENTRAL SUDAN

5.1 INTRODUCTION

The aim of this final chapter is to suggest, in the light of the foregoing discussion, a method which can be used for the formulation of space standards for low-cost housing in urban areas of central Sudan. Before we attempt the task, it is perhaps feasible to give a short account of the basic considerations and assumptions which will have a bearing on our suggested method.

5.2 SOME BASIC CONSIDERATIONS AND ASSUMPTIONS

(i) The most suitable types of standards are, in my view, those which combine the best features of traditional practice together with the economy and rationality of modern techniques. The habits of outdoor living and the social values held by many families in this region provide good opportunities for cheap, but effective measures. In particular, the current practice of families to build their houses over a number of years in direct relation to their needs and economic resources, provides such an opportunity and the standards must be formulated to leave room for progressive development and adaptability.

(ii) The standards ought to be defined in such a way as to be attainable or conceivably made possible for the bulk of the population, at least in urban areas. Where lack of sufficient resources make it inevitable
to sacrifice some desired aspects of housing quality, it should be possible to identify those aspects which can be sacrificed (or compromised upon) with less discomfort. This involves, not only the standard of space, but all other aspects of housing standards.

(iii) The standards should be flexible enough to meet the needs and priorities of different types of families within the limits set to safeguard community interests. With regard to space standards, there should be minimum limits (based on family needs and resources), as well as maximum limits (based on the requirements of urban densities and urban land).

(iv) The standards must be expressed in such a way as to provide a guide for the design and a reliable basis for the planning of housing programmes. They should be simple and easy to comprehend and to apply without leaving unnecessarily wide margin for exercising personal judgements or misinterpretations.

(v) The method to be adopted for the formulation of space standards should make it possible to consider simultaneously all the factors involved. The family social and functional requirements must be related from one side to the family economic ability and order of priority (in relation to other aspects of housing quality), and from the other side to the needs and resources of the community.

(vi) It is assumed that all the management and policy criteria related to the formulation of standards have
either been considered, or else are going to be considered together with the implementation of the standards; (e.g. developing building materials and construction industry, controlling land use and preventing land speculation, developing a central authority with whom the responsibility for the implementation of the standards will be delegated).  

5.3 **FORMS AND UNITS OF SPACE STANDARDS**

In the light of the above considerations it is believed that space standards for urban areas of central Sudan should be formulated in relation to two types of habitable spaces as follows:

(i) **Minimum Plot Space Related to Family Size:**
This indicates the minimum amount of habitable space available in the dwelling for family living (both indoors and out of doors), as well as the capacity of the dwelling for future expansion. It is also useful in the calculations of density standards and total residential land requirements.

(ii) **Minimum Floor Space Related to Family Size:**
Although it may not be possible (in certain cases) to provide even the minimum amount of floor space required for the family social and physical functioning.

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1. The conditions necessary for setting standards have been discussed in some detail by a recent document published by the United Nations; See; UNITED NATIONS "Methods for Establishing Targets and Standards for Housing and Environmental Development." Ibid., pp. 12-20.
it will still be essential to estimate the minimum floor space requirements. This can (in such cases) be set as a target, towards which present and future programmes will be directed. It will also be essential to allocate the plot size with a clear idea of the floor space requirements so as to facilitate future growth when economic circumstances permit.

5.4 OUTLINE OF THE METHOD

The main lines of the method suggested for the formulation of space standards in urban areas of central Sudan can be stated briefly as follows:

(i) Formulation of minimum space standards related to family social and functional requirements.

(ii) Study of the feasibility of the minimum standards in relation to family income and national resources and objectives.

(iii) Formulation of maximum standards from the points of view of urban density and urban land requirements.

(iv) Description of the procedure to be adopted for arriving at optimum standards related to the requirements of different types and sizes of families (given certain national resources and objectives).

The last two points, it will be noticed, involve factors which go beyond the scope of the present study; but as the study itself stresses the need for a more comprehensive approach to the questions of housing and space standards, it became essential to discuss their relevance to the question
under investigation and to point to certain directions which can be followed by future research.

The following discussion elaborates on each of the above points.

(1) **FORMULATION OF MINIMUM SPACE STANDARDS RELATED TO FAMILY SOCIAL AND FUNCTIONAL REQUIREMENTS**

At the outset, it will be necessary to determine the minimum amounts of spaces which will be sufficient to provide for the family social and functional requirements. This necessitates a systematic study of the characteristics of the families involved as well as a detailed analysis of their ways of living and types of requirements. This type of information may not be readily available and it may be necessary to undertake field observations and surveys before it can be possible to establish a clear idea about the social and functional requirements of families.

In connection with space standards, the type of information required about the users of low-cost housing can be summarized under the following five headings:

1) **Factual Information:** Family sizes, income levels, occupations, age groups, types of households,

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1. In establishing this list, I have made reference to a number of publications and have consulted a number of experts, e.g.:
   
   
   
   (iii) **NOBLE, J. and ASH, J.** "Appraisal of User Requirements in Mass Housing." Architectural Journal, 24th August 1966, pp. 479-486. I have also consulted; Connie Byrom, the sociologist of the Architecture Research Unit, University of Edinburgh and Vere Hole of the BRS, Watford.
structure of households, etc.

2) **Observations of Family Pattern of Living in the Home:** Type of functions, organization of activities (in time, place, people involved, furniture and equipment, social and climatic requirements etc.), type of family possessions and domestic animals etc.

3) **Analysis of Causes and Trends in Family Pattern of Living:** The extent to which the type and distribution of functions in the home is influenced by customs, traditions and social values; for example, in what ways does the demand for privacy between sexes influence the size and organization of the space in the home; what changes are likely to come about and in what ways are these likely to affect the demand for space.\(^1\)

4) **Surveys of User's Opinions and Attitudes:** The remarks made by the tenants about their homes can be useful in pointing to unanswered requirements and in suggesting housing features which are satisfactory and others which are perhaps needing to be reconsidered. These types of opinion surveys are particularly meaningful if related to specific house features and specific types of families.

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1. These aspects are particularly important in this case because the largest proportion of the users of mass housing are in fact immigrant families from rural areas. It will be interesting to trace the type of changes which have taken place in family size, composition and social outlook following the move to town and to examine the impact of these changes on the spatial organization of the house.
5) **National Documentary Statistical Information**: This provides some bases against which the specific characteristics of the population under study can be measured in terms of demographic characteristics, income groups, occupancy rates, education levels etc. Figures 3, 4 and 5 summarize the type of information required as bases for the formulation of space standards.

There are in practice a number of methods which can be used for collecting this type of information. The choice of the method to be used depends partly on the kind of information required and partly on the characteristics of the situation (e.g. the ability of the informants to answer certain types of questions\(^1\) and the available staff and equipment).

Having collected the necessary information, it will be necessary to undertake a careful and systematic analysis and synthesis before a clear idea can be formed about the space requirements of different families. It can be possible at this stage to reappraise and to compare different...

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1. For example, in my surveys (reported in the first part of Volume II) I had to rely, as far as possible, on observation methods. Where it was necessary to undertake questionnaires, measures have been taken to simplify questions, to avoid misinterpretations and to ease communication between interviewer and informant.
AN OUTLINE OF A PROGRAMME FOR THE ASSESSMENT OF
USER REQUIREMENTS IN MASS HOUSING OF CENTRAL
SUDAN

USER REQUIREMENTS

ANALYSIS OF BACKGROUND CIRCUMSTANCES

• FAMILY STRUCTURE
• COMMUNITY STRUCTURE
• ECONOMIC STRUCTURE
• FORM OF HOUSING.

ANALYSIS OF PRESENT CIRCUMSTANCES

• ADAPTATION TO PRESENT HOUSES.
• ATTITUDES AND OPINIONS ABOUT PRESENT HOUSES
• OTHER FACTUAL INFORMATION ABOUT THE USERS

PRESENT AND EXPECTED FUTURE CHANGES

• CHANGES IN FAMILY SIZE
• CHANGES IN HOUSEHOLD STRUCTURE
• CHANGES IN ATTITUDES AND VALUES.
• OTHER CHANGES.

PERSONAL RESEARCH AND VALUE JUDGEMENT

• IMPLICATIONS OF THE ABOVE FINDINGS ON SPACE PROVISION AND SPACE USE.
• STUDIES ON THE COST IMPLICATIONS OF SPACE PROVISION.
• STUDIES ON THE SIZE & SHAPE OF URBAN PLOT.
• ETC.
OBSERVATIONS

ADAPTATION TO PRESENT CIRCUMSTANCES

TYPES OF ACTIVITIES
- DISTRIBUTION OF ACTIVITIES
TYPES OF FURNITURE
- DISTRIBUTION OF FURNITURE
MOVEMENT PATTERNS
- DISTRIBUTION OF TIME
STRUCTURAL ADDITIONS
- STRUCTURAL ALTERATIONS

ATTITUDES & OPINIONS REGARDING PRIST. CIRCUMSTANCES

LIKES & DISLIKES
FUTURE ADDITIONS
PRESENT DAY OMISSIONS
OTHER SUGGESTIONS

OTHER INFORMATION ABOUT THE USER

INCOME
FAMILY SIZE & COMPOSITION
AGE
EDUCATION

INTERVIEWING

ANALYSIS OF PRESENT CIRCUMSTANCES
plans with different features in relation to the requirements of different types of families and to establish some broad patterns and guiding principles. In the light of all the evidence available it can then be possible to formulate minimum space standards worked out to satisfy the social and functional requirements of various families. The standards, as mentioned earlier, should indicate floor space as well as plot space requirements.

(ii) STUDY OF THE FEASIBILITY OF THE MINIMUM SPACE STANDARDS

Throughout this study we have pointed to the need for a comprehensive approach to the question of housing and space standards. Here it will be added that the feasibility of the minimum space standards must be viewed in relation to other aspects of housing quality. This involves, among other things, considering the cost structure of the building as a whole and not only the cost arising from the minimum space standards. The latter is of course largely determined by the way the space is built upon. It will be inconceivable, for example, to scale down space standards to the minimum in order to reduce building costs and at the same time adopt unnecessarily lavish standards of construction, fittings and finishes. Improvements of various aspects of housing quality must be achieved simultaneously and coordinately in direct relation to present and future needs, resources and priorities.

1. The feasibility of the minimum standards no doubt involves a number of other factors which vary from reduction of building costs through improvements in labour productivity, building materials etc. to the introduction of government grants and subsidies.
Such considerations are in fact particularly important in a developing country like the Sudan where the resources available for housing are limited and the demands are numerous and varied. Under such circumstances a decision on one aspect of housing quality will influence all other aspects. Thus fashionable building materials may mean less space or an extravagant provision of floor space may mean few or no amenities or services etc. It is for all these reasons that we have called for a more comprehensive approach. All these aspects must be weighed within the same model which will include in addition relevant information on building production costs, rent paying abilities of tenants, preferences and priorities etc. A decision can then be established on 'optimum standards' in the light of a more informed view of the situation and different alternatives can be examined with some idea of their possible social and economic consequences. In establishing such a decision, consideration will of course need to be given to national resources (ability to give subsidies, credits, etc.), national objectives (preserving the quality of future housing in certain areas, encouraging home ownership etc.) and national interests (density control, zoning regulations etc.) It is within this complex that the feasibility of the minimum space standards must now be considered.

To begin with, it will be useful to estimate the proportions of the total population which will be able to afford the minimum space standards. This can be determined from a knowledge of the economic ability of the population
to be housed. Using any convenient measure (man-working-years, annual income etc.) the percentages of families who can afford the minimum space standards at different production costs can be indicated as shown in figure 6. This will give a rough idea of the magnitude of the problem which can be useful in working out detailed programmes.\(^1\) Quite likely, the resources available will not be enough to satisfy competing demands arising from different economic groups and it may be necessary to formulate a number of different programmes. For example, distinction can be made between programmes based on: emergency standards for new immigrants in temporary housing; higher, but still temporary standards which can be progressively developed to meet the minimum standards ultimately; and the minimum standards applicable for new permanent construction. For each kind of programme the amount of capital, land, subsidies etc. can be roughly estimated on a national or regional level.

Having gained some idea of the scale of the problem and identified possible lines of approach on the bases of national resources and objectives then it will be time to proceed for more detailed programmes based on a closer understanding of users' needs and resources.

Distinction must be made between the requirements of families belonging to different life cycles and economic classes and with different orders of priority. For certain

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1. In the calculation of programmes consideration will of course need to be given to other related aspects such as the amount of capital required to improve existing housing, to provide communal facilities and services, etc.
Figure 6: Percentage of families who can afford the minimum space standards at different production costs.

(a) Percentage of families who can afford, e.g.: 10%, 25%, 70%, 80%.

Production Costs (corresponding to a range of building standards)

(b) Subsidy, maximum family ability.
types of families, area may be given priority over standards of building material, fittings and finishes; for another, it may be desirable to provide the minimum area but with higher standards of construction and servicing; while for a third type of family the minimum floor space standards may need to be compromised (temporarily) pending further improvement in both family and national resources.

To distinguish between the requirements of different families, it is suggested that the low-income groups in urban areas be sub-grouped according to three variables (stage in life cycle, economic class and family size) as shown in figure 7. The most frequent type of families can then be identified and their requirements and priorities studied in greater detail. The significance of this kind of sub-grouping is not only in indicating family priorities with respect to different aspects of housing quality, but also in pointing to underlying population trends and patterns which can guide the formulation of policies and programmes.

For each type of family the standards must offer a certain degree of flexibility of choice. For example, there may be some families who will prefer to build above the minimum space standards but perhaps at lower construction standards. These may be allowed to do so but the following two conditions may need to be satisfied:

a) The standard of construction and amenity should not be below a certain minimum determined to protect public health, safety etc.

b) The standard of space should not be above a certain maximum decided (in the interests of urban density
Figure 7: Subgrouping of low-income families according to stage in life cycle, economic class and family size.
and urban land requirements) to prevent speculation. Otherwise private market arrangements will apply.

(iv) FORMULATION OF MAXIMUM SPACE STANDARDS

The increasing rate of urbanization in the Sudan and the present unanswered housing needs call for types of solutions which can be repeated at a more substantial scale than at present. Building at such a scale will soon bring about excessive pressure on urban land and will call for certain measures to prevent land speculation and to control urban sprawl. The present densities are too low (measured in absolute or relative terms)\(^1\) and one of the main reasons given is the large size of the urban plot.\(^2\) Whilst acknowledging the Sudanese family desire for privacy and private open space, there seem to be good reasons for specifying maximum plot standards in the interests of urban land and urban economics.

Apart from the absolute pressure on urban land, the size (and shape) of the urban plot affect the development of the community in a number of ways. Economically, they affect the development of the community with respect to cost

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1. The United Nations divide African countries in terms of average density of housing areas into 4 categories as follows: a first group with densities over 400 persons/hect; a second group with densities 250-400; a third group with densities 100-250; and a fourth group with densities less than 100 persons per hect. The Sudan was counted among the third group. The United Nations study suggested a density of 500 inhabitants per hect. as one that can enable the "best distribution of the ground in terms of a way of life, types of dwellings and clearly fixed urban habits". See, UNITED NATIONS: "Housing in Africa". Sept. 1965, pp. 62-69.

2. See Chapter 1.
of land, cost of construction and maintenance of roads, cost of installation, operation and maintenance of community facilities and services and cost of transportation of inhabitants and goods.\textsuperscript{1} Socially, the size and shape of the urban plots (and their corresponding densities) affect the community in terms of proximity to work, relatives, friends etc. Unless a new type of neighbourhood concept is introduced (and there may be one),\textsuperscript{2} the cost of the development of the community will be too high from both the economic and social points of view.

A study of neighbourhood concepts, layouts or density standards is beyond the scope of the present thesis, but the interdependence between space standards for the house and density standards for the community or the neighbourhood should be emphasized, particularly under the Sudanese social and climatic conditions. It should be possible for future research to experiment on various types of layouts and density standards with the object of establishing a range of solutions which can be socially and economically acceptable under the present and expected future conditions. On the bases of these densities and layouts, it will be necessary to specify maximum plot standards which can be related to the minimum standards formulated from the user’s point of view. Maximum floor space standards can then be calculated from considerations of plot coverage.

\begin{itemize}
\item 1. DOXIADIS ASSOCIATES "The Size and Shape of Urban Plots". The Ekistics, Vol. 9, 1960, pp. 289-300.
\end{itemize}
(v) TOWARDS OPTIMUM STANDARDS

Having now discussed the relevance of different factors to the question under study, it is perhaps of some value to suggest a procedure by which these factors can be viewed simultaneously. Figure 8a summarizes graphically some of the factors which enter into the formulation of space standards. Given a specific population sub-group (sharing roughly the same characteristics of stage in life cycle, income range and family size), the information about minimum space standards, maximum space standards and maximum purchasing power of tenants can be related to building production costs as shown in the figure.

It will be noticed that only the floor space standards are represented along the horizontal axis (excluding plot space). There are two reasons for this. The first is that total cost of building is more sensitive to variations in floor space than in plot space. In fact the latter is usually provided for the low income earner at a nominal price (for example the present cost per plot for the low income earner is £5.60). The second reason for not including the plot space standard has been mentioned earlier; that whereas it can be possible to compromise in the minimum floor space for reasons of cost it should not be possible to compromise in the minimum plot space as it represents the possibilities for future expansion. The cost of the plot space can therefore either be subtracted from the

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1. Most of the other factors involve value premises and decisions e.g. families preferences, national objectives, amount of resources that can be allocated for subsidy, credits etc.
Figure 8: Possible Alternatives for Families of Different Economic Groups

(a) Production Cost of Standard 1

(b) Subsidy

Minimum Floor Space (SQ. M.)

Maximum Floor Space (SQ. M.)
'maximum purchasing power' or else be included in the curves showing production costs.

The figure shows the range of possibilities available for the family. For example the family sub-group under consideration has the following three alternatives:

A) to build to the minimum floor space standard at production cost 3 at a total cost below the family maximum purchasing power.

B) to build at the same production cost a house with floor space above the minimum but at a total cost equivalent to the family maximum purchasing power.

C) to build at production cost 4 a house to the minimum floor area but at total cost equivalent to about half the family maximum purchasing power.

It will be noticed that alternative D will not be accepted because it falls beyond the maximum permissible standards.

The decision for any of these alternatives will of course depend on the type of priorities held by the specific group. For example, if the priority was for more floor space then alternative B will be the most appropriate.

Government policies can of course do a lot to increase or reduce the number of possibilities. For example, if it was decided that only houses built to production standard 2 will be allowed in the specific locality, then none of the above alternatives will be possible. Instead, the houses will either be built to standard E (and a form of subsidy will need to be given), or else the tenants need to be allowed to
build to floor space standards below the minimum, i.e. alternative F, figure 8b. Obviously, the first alternative can be suitable where sufficient funds can be raised for subsidy; the second alternative can perhaps be suitable where the families involved can be expected to achieve the minimum standards in the future (e.g. young growing families).

The object of the above exercise was not to arrive at any specific solution on optimum standards; rather, it was intended to demonstrate the need to consider all factors simultaneously. The process which has been summarized graphically here does in fact take place implicitly or explicitly every time a decision is taken on housing or space standards; but the evidence suggests that it is this process which is perhaps needing to be improved through a closer knowledge of the factors involved and through a closer understanding of the pattern in which they interact.

5.5 APPLICATION OF THE METHOD

It will be seen from the above analysis that some of the factors which enter into the formulation of "optimum standards" fall beyond the scope of the present study. In fact the formulation of optimum standards demands a number of coordinated efforts from various directions. The present study however, starts by formulating minimum space standards related to family social and functional requirements and discussing the feasibility of these standards in relation to economic resources and priorities of different types of families.¹

¹. See Section 5.4 above.
To pursue the above objectives, it was essential to undertake a number of field observations and interviews in a number of low-cost housing projects in urban areas of central Sudan. The results of these observations and interviews are reported and discussed in the first part of Volume II. The second part goes on to redefine the type of functions performed in the Sudanese low-income family home and to assess their space and general design requirements. Some recommendations on space standards are put forward and some related planning, management and policy criteria are discussed. Particular emphasis is placed on the way the standards can be implemented to suit the requirements of families of different economic classes and stages in life cycle. Finally, some lines for further investigation are pointed at.

1. In the light of the method described above; See Section 5.4 (1).
REFERENCES (According to order of appearance in the thesis)


5. DEPARTMENT OF STATISTICS, KHARTOUM 'First Population Census, 1955-56'.


7. FAWZI, S. 'Social Aspects of Low-Cost Housing in the Northern Sudan'. Khartoum 1954. See 'Preface' by the Commissioner of Labour.


9. HAMID, A. (Director of National Housing Authority) 'National Housing and the Experiment of Khartoum North'. Paper, delivered at the Round Table Conference, Khartoum, March, 1967.


12. EL AGIB, A.A. 'The Housing Problem: Dimensions and Solutions' Paper, delivered at Round Table Conference, Khartoum, March 1967.


15. REPUBLIC OF THE SUDAN 'Town Planning Regulations 1957'.


17. MAZARI, S.A. 'Urbanisation in the Sudan' Paper, prepared during 1965 (mimeographed).

18. UNITED NATIONS 'Housing in Africa' 1966.


22. RAPOPORT, A. 'Yagua, or the Amazon Dwelling' Article in EKISTICS, Vol. 25, No. 147, Feb. 1968.

23. ARCHITECTURE RESEARCH UNIT 'Privacy and Courtyard Housing'. University of Edinburgh, 1968.


27. MINISTRY OF HOUSING AND LOCAL GOVERNMENT (BRITAIN)  
   also 'Space in the Home' HMSO 1963.

28. COWAN, P.  
   'Studies in the Growth, Change and Aging of Buildings'. Transactions of the  

29. HOLE, V.  
   'Housing Standards and Social Trends'.  

30. WOMERSLEY, J.L. (City Architect, Sheffield)  
   'Value for Money' Housing Review, Vol. 10, No. 5.  

31. MOHLG (Britain)  
   'Planning Bulletin No. 8'. London, HMSO.  
   1963.

32. NATIONAL BUILDING AGENCY (Britain)  
   'Generic Plans'  
   also 'Metric Housing Shells' London, HMSO, 1968.

33. ARCHITECTURAL JOURNAL  
   Article - 'Architects Say No to Metric Housing Shells'. A.J. 28th May,  
   1969.

34. GINADER, G.K.  
   'The Role of the Adaptable Dwelling' M. Arch.  

35. COWAN, P. and NICHOLSON, J.  
   'Growth and Change in Hospitals' Transactions of the Bartlett  

36. WEEKS, J.  
   'Indeterminate Architecture' Transactions of the  
   Bartlett Society, Vol. 2. 1963/64.

37. RAPPORT, A.  
   'The Personal Element in Housing: An Argument for Open-Ended Design' RIBA  
   Journal, July 1968.

38. ALEXANDER, C.  
   'Thick Wall Pattern' Architectural Design,  
   July 1968.

39. UNITED NATIONS  
   'Utilization of Space in Dwellings'  

40. UNITED NATIONS (Dept. of Economic and Social Affairs).  
   'Report of the Ad Hoc Group of Experts on Housing and Urban Developments'. New York,  
   1962.

41. ABRAMS, C.  
42. **DIVISION OF INTERNATIONAL AFFAIRS** 'Proposed Minimum Standards for Permanent Low-Cost Housing and for Improvement of Existing Substandard Areas'. Prepared for the Latin America Bureau, Ideas and Methods Exchange No. 64.

43. **SINGAPORE HOUSING DEVELOPMENT BOARD** 'Annual Reports'. 1963/66 incl.


45. **UNITED NATIONS** 'Regional Seminar on Housing and Community Improvement in Asia and the Far East'. New Delhi, Jan. - Feb. 1954.


47. **DOUGLAS GALTON** 'Principles of Hospital Design', 1869.

also 'Observations on the Construction of Healthy Dwellings, Hospitals, Houses, Barracks, Asylums etc.' 1880.

48. **FLORENCE NIGHTINGALE** 'Notes on Hospitals'.


50. **INTERNATIONAL UNION OF FAMILY ORGANIZATION** 'Minimum Habitable Surface'. Cologne, 1957.


60. CHOMBART DE LAVUE, P. 'The Sociology of Housing: Research Methods and Future Perspectives'. First CIB Congress, Rotterdam, 1959.


<table>
<thead>
<tr>
<th>No.</th>
<th>Author(s)</th>
<th>Title</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>70.</td>
<td>MUMFORD, L.</td>
<td>'The Culture of Cities' London, 1953.</td>
<td></td>
</tr>
<tr>
<td>73.</td>
<td>TURNER, J.</td>
<td>'Dwelling Resources in South America' Architectural Design, August 1963.</td>
<td></td>
</tr>
<tr>
<td>74.</td>
<td>REPORT OF THE ROYAL COMMISSION TO EAST AFRICA</td>
<td>1953-1955, London, HMSO.</td>
<td></td>
</tr>
<tr>
<td>76.</td>
<td>UNITED NATIONS</td>
<td>'Design of Low-Cost Housing and Community Facilities' Abstracted by the Ekistics, Vol. 25. No. 147.</td>
<td></td>
</tr>
<tr>
<td>77.</td>
<td>INSTITUTE OF GENERAL ADMINISTRATION</td>
<td>'Transactions of the Round Table Conference' Khartoum, March 1967.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>also SUDANESSE INSTITUTE OF ARCHITECTS 'Transactions of Conference on Development of Housing in the Sudan'. Khartoum, March 1968.</td>
<td></td>
</tr>
</tbody>
</table>
